International Journal of Business and Society, Vol. 23 No. 1, 2022, 226-243

CLOUD COMPUTING ADOPTION IN SMALL AND MEDIUM ENTERPRISES (SMEs): A SYSTEMATIC LITERATURE REVIEW AND DIRECTIONS FOR FUTURE RESEARCH

Olakunle Jayeola
School of Business and Economics, Universiti Putra Malaysia, Malaysia
Faculty of Administration and Management Sciences, Adekunle Ajasin University, Nigeria

Shafie Sidek[♣]
School of Business and Economics, Universiti Putra Malaysia, Malaysia

Azmawani Abd Rahman
School of Business and Economics, Universiti Putra Malaysia, Malaysia

Anuar Shah Bali Mahomed
School of Business and Economics, Universiti Putra Malaysia, Malaysia

Jimin Hu
School of Business and Economics, Universiti Putra Malaysia, Malaysia
Faculty of Foreign Languages, Ghanzhou Teachers College, China

ABSTRACT

This paper presents a systematic literature review of the current state of cloud computing adoption (CC) in small and medium enterprises (SMEs) with the main objective of providing insights into data analysis techniques, CC services being investigated, and further assessing studies and their associated theories/frameworks, publication trends and outlets, geographical distribution and the most important adoption factors over 10 years (2011-2020). Six databases were consulted for a total of 76 articles. The findings indicate that Partial Least Squares Structural Equation Modeling (PLS-SEM) and interpretative analysis were the most frequently used quantitative and qualitative data analysis techniques. Generic CC services were investigated more than specific CC business applications. The number of publications has fluctuated over the last decade, and the vast majority did not incorporate any underlying theory. The Journal of Small Business and Enterprise Development and IEEE conferences proceedings were major publication outlets. Asia recorded the highest number of studies, whereas cost savings is the most important adoption factor. This study contributes to CC research by providing deeper insights into data analysis techniques used, CC services investigated, and other crucial research issues of CC adoption in SMEs to guide future research directions and SMEs' cloud computing implementation.

Keywords: Cloud Computing; Systematic Literature Review; Adoption; SMEs.

Received: 22 December 2020
Accepted: 16 November 2021
https://doi.org/10.33736/ijbs.4610.2022

♣ Corresponding author: Department of Management and Marketing, Universiti Putra Malaysia, 43400, Serdang Selangor, Tel: +60176896209; Email; shafiesidek@upm.edu.my

1. INTRODUCTION

Small and medium enterprises (SMEs) constitute the largest percentage of businesses in many countries and continents and play significant economic roles. They account for over 99 % of EU businesses, close to 60% of GDP, and close to 70% employment in Europe (Nowotarski & Paslawski, 2017). In the US, small businesses account for 99% of the whole business population, and they contribute 47.5% of the entire workforce (Small Business Administration, 2018). SMEs need to harness cheap and available information technology (IT) to drive competitiveness and better performance that will sustain them in supporting the economies of their host countries. Cloud computing (CC) is one of these novel and affordable technologies for small business operations. The CC model has been attracting more attention in recent times because it guarantees a paradigm shift on how skills and IT resources are provisioned (Rekik et al., 2019). CC is relatively cheap, requires little technical skills, and has the potential to consolidate bilateral relationships among enterprises; all who have significant benefits for SMEs that adopt and implement the technology (Jäger et al., 2016; Moeuf et al., 2018). CC has evolved as an innovation that enables firms of all sizes, irrespective of IT proficiency, to easily access sophisticated IT services without recurrent maintenance, employee re-retraining, and high upfront cost (Vu et al., 2020). CC enhances the performance and competitiveness of SMEs (Khayer et al., 2020; Wangechi, 2017) by allowing them to communicate seamlessly across all functions. Nonetheless, SMEs appear to be hesitant to adopt CC, and thus, research has been focused on understanding issues related to this technology's adoption. Additionally, this research domain includes review studies (e.g., Adam & Musah, 2015; Alkwasi et al., 2015; Jayeola & Sidek, 2019; Priyadarshinee et al., 2014; Salleh et al., 2018).

These review studies have shed light on the impact of CC adoption on SMEs (Adam & Musah, 2015; Salleh et al., 2018); country, year, journal, and theoretical classification (Alkwasi et al., 2015); and the categorization of studies into themes such as risk analysis, CC conceptualizations, and CC application ability (Jayeola & Sidek, 2019; Priyadarshinee et al., 2014). However, a review of data analysis techniques used in the methodology and CC services studied are lacking. This study contends that the practice of reviewing prior research methodologies, such as qualitative, quantitative, or mixed methods, is ineffective in providing deeper insight into data analysis techniques that could guide future research in technique selection to enhance research findings and conclusions. Additionally, since CC services are unique and important for various purposes, the variants investigated for adoption in SMEs require clarification in order to discover under-researched CC services. As a result, this study fills a void in the literature in these research areas and updates some previously reviewed pertinent issues. The purpose of this paper is to summarize the current literature on CC adoption in SMEs from 2011 to 2020, with a particular emphasis on the following topics: (1) data analysis techniques used in the methodologies of the studies; (2) CC services being investigated; (3) publication trends over time and which publication outlets publish studies in this research area; (4) framework/theory application in these studies; (5) geographical distribution of these studies; and (6) most important adoption factors; all while charting a future research agenda for researchers.

This paper is organized as follows. After this introduction, the second section is the literature review, which provides an overview of cloud computing. The third section discusses the methodology for this study. The fourth section presents findings, while the fifth section discusses the findings. Lastly, section six presents the conclusions, future research directions, and limitations of the study.

2. LITERATURE REVIEW

CC has its origin from other technologies, including internet technologies, virtualization, distributed and parallel systems, multi-core chips, and grids (Buyya et al., 2009). A standard definition of CC does not exist, but key industry actors and academic researchers are significantly making efforts to provide a standard definition (Senyo et al., 2018). The National Institute for Standards and Technology's (NIST) definition is widely cited among various CC definitions. According to NIST, CC is "a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction" (Mell & Grance, 2011).

CC embodies distinct characteristics that differentiate it from conventional IT. These characteristics are (1) Pervasiveness- Irrespective of location and time constraints, it is straightforward to connect to the cloud for resources through diverse networks, even in the lack of complex hardware facilities; (2) Flexibility- CC can respond to clients' business demands either by compression or expansion of relevant IT resources like storage, CPU, bandwidth, etc.; (3) Scalability- Extension or enlargement of application software and hardware coupled with rapid deployment is possible for both new and old businesses; (4) Resource Sharing- CC permits the distribution of computing and preserving resources to some customers from a pool of resources that are available at the other end of the cloud; (5) Pay per use- Users can make use of cloud service according to their practical requirements, and as such are charged based on the amount of space used (Bhattacherjee & Park, 2014; Yu et al., 2018).

The three major service models of CC implementation are: Software as a Service (SaaS), Infrastructure as a Service (IaaS), and Platform as a Service (PaaS). In SaaS, applications are made available or rented out by service providers via the internet. SaaS is different from conventional IT solutions where there is a need to download and install applications (Khajeh-Hosseini et al., 2012; Wu, 2011). In IaaS, storage, processing, networks, and other vital computing facilities are provided based on consumers' capabilities to enable them to run and deploy random software applications efficiently (Bruque-Cámara et al., 2016; Mell & Grance, 2011). In PaaS, service providers offer developers' applications similar to the traditional desktop settings. PaaS empowers IT staff and independent software vendors to develop and deploy online applications with speed making use of third-party infrastructure (Raut et al., 2017).

CC comprises of four types, namely, private, public, community, and hybrid, which are further explained by (Das et al., 2011; Raut et al., 2017) as the following- (1) Private clouds- used by various departments or sections of the organizations and the configuration are inside the firewall of the organization. (2) Public clouds- configured outside the organization's firewall. (3) Community cloud is a type of cloud meant for users from organizations that share a common interest. (4) Hybrid clouds are a combination of either the public, private, or community clouds. Common CC services include Facebook, Twitter, Gmail, WhatsApp, Instagram, and many more. For operational efficiency and effortless communication, businesses also subscribe to CC applications such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), and Supply Chain Management.

3. METHODOLOGY

This paper adopts a systematic literature review. A systematic literature review is a reproducible and straightforward method of identifying, assessing, and synthesizing all available research studies by academics, practitioners, and researchers on a specific topic domain, area of interest, or research question (Sandberg & Aarikka-Stenroos, 2014; Tranfield et al., 2003). A systematic literature review is specifically suitable for studying "what" and "how" contents in a review of the literature (Abatecola et al., 2013) and identifying gaps that can inform future research after the categorization of research work concerned with these issues (Aquilani et al., 2017).

To conduct the systematic literature review, we followed the eight-step systematic literature review process of Xiao and Watson (2019) as follows:

- Formulate the problem
- Develop and validate the review protocol
- Search the literature
- Screen for inclusion
- Assess quality
- Extract data
- Analyze and synthesize data
- Report findings

Step 1- This review, motivated by adoption of cloud computing in SMEs focuses on six research questions; (1) Which data analysis techniques are used in the research methods? (2) What CC services are being investigated (3) What are the publication trends over particular periods and which publication outlets are publishing studies in this research area. (4) Which frameworks/theories are applied (5) What are the geographical distributions of these studies (6) What are the most important adoption factors.

Step 2- To develop and validate the review protocol, a research plan was designed. First, the keywords for the search that were adequate to discover relevant CC adoption studies in SMEs were compiled. Second, the inclusion and exclusion criteria were set up. Third, the search strategies for the articles related to CC adoption in SMEs were developed. Fourth, the quality assessment criteria and screening procedures for articles that relevantly discuss the CC adoption in SMEs were set. Fifth, strategies for extracting, synthesizing and reporting data related to the six research questions of this study were established. The subsequent steps detail how these five processes were carried out. Finally, as suggested by Xiao and Watson (2019), the review protocol was validated by two senior IS academics, with their suggestions incorporated to refine the protocol.

Step 3- For a comprehensive search of the literature, keywords were combined into search strings. For instance, search strings (such as "cloud computing adoption in SMEs", cloud usage in small business", "SaaS implementation for SMEs"," Drivers and inhibitors of cloud in SMEs") were used. By searching six electronic databases- ScienceDirect, ACM Digital Library, Emerald, ProQuest, IEEE Xplore and Google scholar manually, identified were papers published from 2011 till 2020.

Step 4- In order to screen for inclusion, the inclusion and exclusion criteria was specified. The inclusion criteria were: peer-reviewed, empirical research papers, conference papers, written in the English language, focused wholly on SMEs. The exclusion criteria were discussion paper, technical report, non-academic report, conceptual paper, non-English paper, literature review, conceptual paper and unavailable full text.

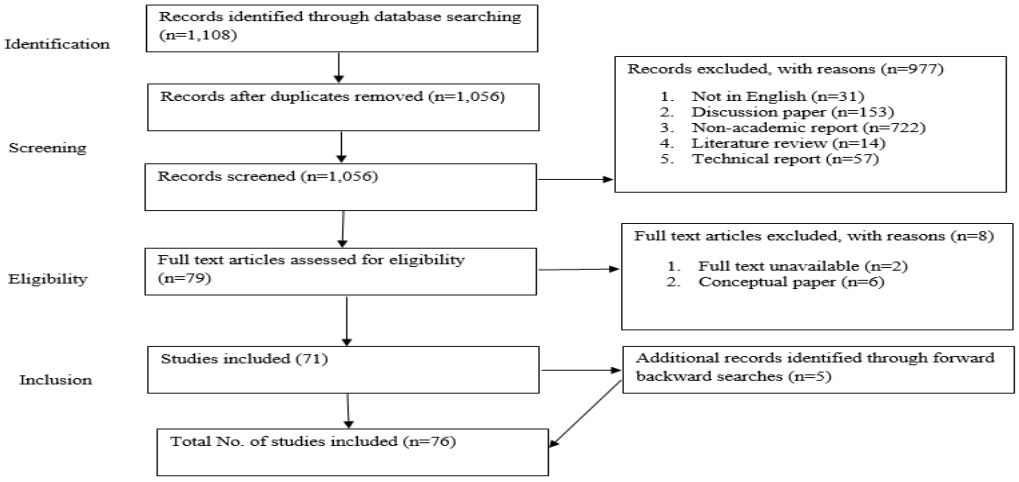
Step 5- The quality assessment criteria were defined. An article met the quality assessment criteria if it was solely focused on CC adoption in SMEs; the data collection and analysis techniques used were explained in detail in the paper; and the article's findings were relevant to the article's objective and research questions. Each author read the abstract independently, and where necessary, the more detailed sections of the papers were scrutinized to ensure that they covered the predefined scope. Following that, additional papers were identified via forward and backward searches (articles that cited the reviewed studies and articles that were cited by the reviewed studies) (Xiao & Watson, 2019), resulting in the final selection of 76 articles that met the initial quality criteria (see Figure 1).

Step 6- The articles were downloaded and shared equally among the authors for intensive reading and data extraction. The data was extracted by recording (1) data analysis techniques used in the methodology (2) CC services investigated (3) publication years and publication outlets (4) theories/frameworks applied (5) geographical distribution (6) adoption factors investigated and comparing the number of times they were found significant and insignificant, in order to calculate their acceptance rate and reach conclusion on the most important adoption factors.

Step 7- In analyzing and synthesizing the data, the authors discussed the information recorded and resolve discrepancies where possible. After ensuring that the critical information recorded was aligned with the research questions enumerated in step 6, all of the information was integrated using excel sheet.

Step 8- The findings were reported and discussed sequentially in response to the research questions. Following that, the review's conclusion, future research directions, and limitations were discussed.

Figure 1: Article selection process



4. FINDINGS AND DISCUSSION

4.1. Research methods/data analysis techniques

Numerous previous review studies in CC focused on the general research methods used in prior studies while ignoring the data analysis techniques used. To our knowledge, this review study is among the few to examine data analysis techniques used in CC studies, with the goal of guiding future research in data technique selection. Although the reviewed studies employed quantitative, qualitative, and mixed methods approaches, the data analysis techniques used were only classified as quantitative or qualitative, as no study employed both techniques.

Overall, the quantitative analysis techniques recorded the highest, accounting for 73.7% of the studies-see Table 1. Partial Least Squares Structural Equation Modeling (PLS-SEM) was the most utilized quantitative analysis tool with (32.1%) usage, followed by Descriptive statistics (21.4%), Logistics Regression and Multiple Regression (12.5%) each, Analysis Hierarchy Process (AHP), ANOVA, Relative Importance Index (RII), (3.6%) each. Interpretive Structural Modeling (ISM), Decision Making Trial was integrated with Evaluation Laboratory (DEMATEL), T-test, Exploratory Factor Analysis (EFA) registered (1.8%) each. Some quantitative analysis techniques were integrated and recorded (1.8%) each. For example, Generalized Linear Modeling (GLM) was combined with Artificial Neural Network (ANN) modeling, and Artificial Neural Network (ANN) was merged with PLS-SEM.

Although SEM has two variants, namely Covariance-Based Partial Least Squares (CB-SEM) and PLS-SEM, nonetheless, PLS-SEM has been widely used to analyze quantitative data in SMEs' CC adoption studies, while CB-SEM has been rarely used. Each of these techniques has different assumptions and uses. Finding PLS-SEM as the most utilized quantitative analysis tool might be related to its ability to model complex multivariate data and diverse closely related predictors (Hair et al., 2014; Stieninger et al., 2018) common in IS adoption like CC. Also, PLS-SEM is simpler to

apply; does well with smaller samples; used for predicting critical driver constructs; does not require normality distribution, and can effectively handle reflective and formative measurement models (Hair et al., 2014). Unlike PLS-SEM, CB-SEM does not effectively address these conditions, which may be one of the reasons for PLS- SEM's widespread application. Nevertheless, CB-SEM is robust when the aforementioned conditions are met (Hair et al., 2014), hence, a beckon to scholars in this research domain.

Descriptive statistics recorded more application in the empirical literature than multiple and logistic regressions. Multiple regression and logistic regression have better explanatory power than descriptive statistics; unexpectedly, they have been less applied. Other higher explanatory quantitative analysis techniques such as ISM, AHP, ANOVA, and linear regression were equally less utilized. Furthermore, the usage of multi-quantitative analysis techniques, which add rigor to data analysis received little attention from only two articles. For instance, (Khayer et al., 2020) combined ANN and PLS-SEM while (Habahbeh et al., 2018) combined GLM and ANN. Integrating more quantitative data analysis techniques such as GLM and SEM, ISM and AHP, AHP and SEM, among others, can enhance the rigor of data analysis and reliable conclusions that can enhance CC adoption in SMEs.

The qualitative data analysis techniques recorded 26.3% of the studies - see Table 2. Under the qualitative data analysis techniques, Interpretive analysis recorded the highest (50%), followed by Thematic analysis (30%), Content analysis (10%), Grounded theory (5%), and Grounded theory integrated with content analysis (5%). As the interpretative analysis is the most applied analysis tool for the qualitative method, this is an indication that most researchers' (e.g., Alshamaila et al., 2013; Twum-Darko & Sibanyoni, 2014) motives were to make sense of the qualitative collected data and consequently make informed judgments bordering on the adoption of CC. Thematic analysis was the second most used qualitative data analysis technique. The major themes identified were classified using Tornatzky and Fleischer's (1990) TOE framework; examples include (Ajimoko, 2018; Seethamraju, 2014). Additionally, Kihara and Gichoya (2013) and Korongo et al. (2013) used Political, Economic, Social, and Technological (PEST) and Strengths, Weaknesses, Opportunities, and Threats (SWOT) analyses (2013). Content analysis and grounded theory were sparsely applied. Reasons might be that grounded theory is less-flexible, and the procedures might vary between different sources, and content analysis does not rely on subjective judgement (Saunders et al., 2016). Nevertheless, the grounded theory may provide a holistic approach from data collection to analysis when its procedures are followed. Similarly, content analysis helps identify actual facts (Saunders et al., 2016), enriching the empirical research focused on adopting CC in SMEs.

Only 1 article applied multi-qualitative analysis (grounded theory and content analysis), which indicates that the rigor of analyzing qualitative data in this research domain is nascent.

Table 1: Quantitative analysis techniques

S/N	Analysis	No	%
1	Descriptive statistics (mean, SD, percentage)	12	21.4
2	PLS-SEM	18	32.1
3	Logistic regression	7	12.5
4	ISM	1	1.8
5	AHP	2	3.6
6	Multiple Regression	7	12.5
7	GLM and ANN	1	1.8
8	ANOVA	2	3.6
9	DEMATEL	1	1.8
10	RII	2	3.6
11	T-test	1	1.8
12	EFA	1	1.8
14	ANN and PLS-SEM	1	1.8
	Total	56	100
	TOTAL % = 73.7%		

Table 2: Qualitative analysis techniques

S/N	Analysis	No	%
1	Thematic analysis	6	30
2	Content analysis	2	10
3	Interpretive analysis	10	50
4	Grounded theory and content analysis	1	5
5	Grounded theory	1	5
	Total	20	100
	Total % = 26.3%		

4.2. Cloud computing services

As shown in Table 3, the majority of the studies (72.4%) examined generic CC services, whereas cloud ERP focused research was (17.1%). The SaaS-based studies constitute (6.6%), while mobile(m)- retail application, SaaS, Big data analytics, and CRM represent (1.3%) each of the CC services examined. Numerous researchers' focus on generic CC services in SMEs indicates that distinctions between diverse CC services are frequently overlooked. In SMEs, the factors affecting each type of CC services will undoubtedly be unique. Cloud ERP is the second most researched CC application, while CRM, m-retail, and big data analytics have received scant attention. Every single one of these business applications is critical. For instance, cloud ERP integrates a firm's various logistical divisions, such as human resources, sales, and warehousing (Khamis & Mohd, 2016). On the other hand, CRM, big data analytics, and m-retail applications are vital for managing customer relationships, massive business data, and retail logistics; all of which are imperative functions in SMEs. Surprisingly, researchers did not consider cloud-based SCM that integrates the supply chain and lowers the labor cost of communication in SMEs (Bruque-Cámara, et al., 2016).

Similarly, SaaS, one of the primary cloud computing service models, has received little research, while IaaS and PaaS have remained unexplored. Although the majority of CC services and applications are hosted as SaaS, however, IaaS and PaaS are equally prominent in SMEs' CC configurations. On the other hand, in SMEs CC adoption studies, specific CC types such as public,

private, community, and hybrid have rarely been examined in detail; instead, all have been studied broadly.

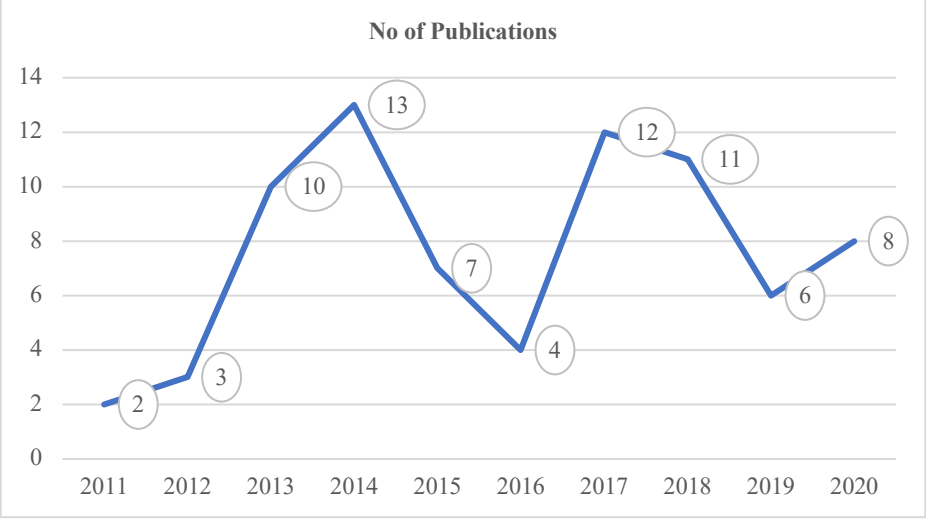
Table 3: Cloud computing services

S/N	Cloud computing services	No	%
1	Generic CC services	55	72.4
2	ERP	13	17.1
3	Mobile retail application	1	1.3
4	SaaS	5	6.6
5	Big data analytics	1	1.3
6	CRM	1	1.3
	Total	76	

4.3. Year of publication

The articles are classified according to their years of publication, as shown in Figure 2. Year 2011 (2 articles), 2012 (3 articles), 2013 (10 articles), 2014 (13 articles), 2015 (7 articles), 2016 (4 articles), 2017 (12 articles), 2018 (11 articles), 2019 (6 articles) and 2020 (8 articles). The number of publications progressed steadily from 2011 to 2014 and reduced in 2015 and 2016. The number picked up again in 2017, dropping off till 2019 and started increasing in 2020. There were noticeable fluctuations in the number of annual publications on CC adoption in SMEs in the period under review. With the rise and fall pattern of the publications within a few years' interval, it can be predicted that publications may continue in this trend. While CC technology continues to mature with improved security and privacy factor and friendly governments' policies, SMEs' usage of CC will almost certainly increase steadily. Therefore, consistently increasing the rate of research is advocated to match the speculated growing rate of CC adoption in SMEs.

Figure 2: Classification of articles by year of publication



4.4. Publication channels

For the purposes of distribution via publication channels, any type of paper published in journals was classified as a journal paper. In contrast, papers published in conference proceedings were classified exclusively as conference proceedings papers. Meanwhile, we conducted a detailed follow-up examination of the conference proceedings papers to ensure they were not simultaneously published in journals. Journal articles recorded 74% (56 articles) from 51 journals, while conference proceedings papers recorded 26% (20 articles) from 19 conferences (see Table 4 and 5**)**. In the journal publication, the Journal of Small Business and Enterprise Development recorded the highest number of articles 5.4% (3 articles), the International Journal of Information Management, Journal of High Technology Management Research, and The Electronic Journal Information Systems Evaluation recorded 3.6% (2 articles) publication each. The others recorded 1.8% (1 article) each.

Journal of Small Business and Enterprise Development might have recorded the highest publication output since it focuses specifically on small businesses. Meanwhile, top IS journals such as the International Journal of Enterprise Information Systems, Journal of Enterprise Information Management, and International Journal of Information Management registered fewer publications because they emphasize IS technologies rather than organizational type (such as small businesses). In broad terms, the article publications were highly spread among the journals with the view that there was no high concentration in any particular journal. This trend could be attributed to the interdisciplinary nature of CC usage.

The conference proceedings papers were presented in 19 conferences held between 2012-2020. The IST-Africa Conference held in 2013 recorded 10% (2) conference papers, while others recorded 5% (1 article) each. Overall, the IEEE conferences held between 2013 to 2020 recorded the highest, 25% (5 articles), and the Pacific Asia Conference on Information Systems (*PACIS*) conference recorded 10% (2 articles) in 2013 and 2016. The IEEE's higher conference paper contribution might be its prestigious status as one of the largest organizations of technical professionals for promoting technology through regular conferences and publications.

Table 4: Publication channels of articles

S/N	Journal name	No	%
1	Journal of Small Business and Enterprise Development	3	5.4
2	VINE Journal of Information and Knowledge Management Systems	1	1.8
3	International Journal of Information Management	2	3.6
4	International Journal of Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering	1	1.8
5	International Journal of Enterprise Information Systems	1	1.8
6	Human Systems Management	1	1.8
7	Indian Journal of Science and Technology	1	1.8
8	Journal of Telecommunication, Electronic and Computer Engineering	1	1.8
9	Journal of Enterprise Information Management	1	1.8
10	Journal of Information Technology & Information Systems Research (JITISR)	1	1.8
11	International Journal on Cloud Computing: Services and Architecture	1	1.8
12	Springer International Publishing	1	1.8
13	Journal of High Technology Management Research	2	3.6
14	GSTF Journal on Computing (JOC)	1	1.8

15	Procedia Computer Science	1	1.8
16	Journal of Information Technology Management	1	1.8
17	Journal of Business Economics and Management	1	1.8
18	International Journal of Information Systems and Project Management	1	1.8
19	Business Process Management Journal	1	1.8
20	Journal of Innovation Management in Small and Medium Enterprises	1	1.8
21	Advances in Economics, Business and Management Research (AEBMR)	1	1.8
22	Acta Polytechnica Hungarica	1	1.8
23	Corporate Ownership and Control	1	1.8
24	KnE Social Sciences	1	1.8
25	Singaporean Journal of Scientific Research	1	1.8
26	Journal of Science and Technology Policy Management	1	1.8
27	International Journal of Asian Social Science.	1	1.8
28	Data in brief	1	1.8
29	Journal of Organizational Change Management	1	1.8
30	Procedia - Social and Behavioral Sciences	1	1.8
31	Procedia Computer Science	1	1.8
32	Electronic Markets	1	1.8
33	International Journal of Emerging Science and Engineering (IJESE)	1	1.8
34	International Journal of Information Technology Bharati Vidyapeeth's Institute of Computer Applications and Management	1	1.8
35	Electronic Journal of Information Systems in Developing Countries	1	1.8
36	International Journal of Computer Applications Technology and Research	1	1.8
37	Journal of International Technology & Information Management	1	1.8
38	Australian Journal of Basic and Applied Sciences	1	1.8
39	Information Systems Frontiers	1	1.8
40	Enterprise Information Systems of the Future	1	1.8
41	E a M: Ekonomie a Management	1	1.8
42	Asian Journal of Management Research	1	1.8
43	The Electronic Journal Information Systems Evaluation	2	3.6
44	Journal of ICT	1	1.8
45	Journal of Small Business Management	1	1.8
46	Advances in Information Science and Applications	1	1.8
47	International Journal of Arts and Sciences	1	1.8
48	IEEE Access	1	1.8
49	Technology in Society	1	1.8
50	Journal of Global Information Management	1	1.8
51	Sustainability (Switzerland)	1	1.8
	Total	56	100
	TOTAL % = 74%		

Table 5: Conference proceedings papers

S/N	Conference	No	%
1	8th European Conference on Information Management and Evaluation, ECIME 2014, Ghent, Belgium.	1	5
2	29th International Conference on Advanced Information Systems Engineering, CAiSE 2017, Essen, Germany	1	5
3	8th International Research Conference Management Challenges in the 21st Century, Bratislava, Slovakia.	1	5
4	7th International Conference for Internet Technology and Secured Transactions (ICITST-2012), London, UK.	1	5

5	IST-Africa 2013 Conference, Nairobi, Kenya.	2	10
6	14th Annual Conference on World Wide Web Applications. Durban, South Africa, 2012.	1	5
7	PACIS 2016, Chiayi city, Taiwan.	1	5
8	PACIS 2013, Jeju Island, Korea	1	5
9	IEEE International Conference on Cloud Computing in Emerging Markets, CCEM 2016, Bangalore, India.	1	5
10	IEEE International Conference on Cloud Computing in Emerging Markets, CCEM 2015, Bangalore, India.	1	5
11	IEEE 11th International Conference on Cloud Computing, 2018, San Francisco, USA.	1	5
12	2018 Open Innovations Conference (OI), Johannesburg, South Africa.	1	5
13	IEEE 10th International Conference on e-Business Engineering, ICEBE 2013, Coventry, UK.	1	5
14	14th International Conference on Advances in ICT for Emerging Regions, ICTer 2014, Colombo, Sri-Lanka	1	5
15	2018 International Conference on Internet and e-Business, ICIEB '18, Singapore.	1	5
16	7th International Conference on Information Technology and Electrical Engineering: Envisioning the Trend of Computer, Information and Engineering, ICITEE 2015, Chiang Mai, Thailand.	1	5
17	International Conference on Future Internet of Things and Cloud, FiCloud 2019, Istanbul, Turkey.	1	5
18	15th Iberian Conference on Information Systems and Technologies (CISTI), 2020, Seville, Spain.	1	5
19	2020 IEEE Conference on Open systems (ICOS), Kota Kinabalu, Malaysia.	1	5
	Total	20	100
	TOTAL % = 26%		

4.5. Research theories/frameworks

The majority of the reviewed articles, as evident in Table 6, indicates that a large chunk of the reviewed articles, 35, did not make use of any theory. The studies that used frameworks or theories employed either single or integrated ones. Among the studies that used one theory or model, the Technology, Organization, and Environment (TOE) recorded the highest usage of 15 articles—followed by Diffusion of Innovation (DOI) (2 articles). In contrast, Theory of Planned Behavior (TPB), Resource Dependency Theory (RDT), Structuration Theory, Perceived e-readiness Model (PERM) recorded (1 article) usage each. In the studies which integrated theories, DOI and TOE registered the maximum use of (12 articles) followed by the combination of TAM, TOE, and DOI (2 articles), and TAM and TOE (2 articles). All other theoretical integrations recorded (1 article) each. Aggregately, TOE was used in 34 articles, DOI (16 articles), TAM (4 articles), TBP (2 articles), TTF (2 articles), other theories and frameworks were used in 1 article each.

The high rate of non-application of theories and frameworks indicates that many studies chose their independent variables without recourse to any theory or framework. This observation is similar in a related CC review study (Senyo et al., 2018). This practice can erode the significance of established theories; hence, we argue for more theoretically-underpinned studies for extant literature on CC adoption in SMEs to gain prominence in IT/IS research circle. Overall, TOE and DOI had significant applications, respectively. The probable explanation is TOE's inclusion of organizational, environmental, and technological factors, which make it superior to other adoption models (Hossain & Quaddus, 2011) and the DOI's exclusive technology adoption factors.

Furthermore, the complementary value of DOI to the technology factors of the TOE is suggested as the reason for their increased integration.

Table 6: Research theories/frameworks classification

S/N	Framework/Theory	No	%
1	No theory	35	46.1
2	TOE	15	19.7
3	UTAUT & TOE	1	1.3
4	TAM, TOE & DOI	2	2.6
5	DOI & TOE	12	15.8
6	TTF, TOE & Organization Information Processing (OIP) theory.	1	1.3
7	TAM & TOE	2	2.6
8	Resource Dependency Theory (RDT)	1	1.3
9	TTF & TBP	1	1.3
10	TBP	1	1.3
11	Perceived e-readiness Model (PERM)	1	1.3
12	Inter-organizational System (IOS) model and TOE	1	1.3
13	Structuration Theory	1	1.3
14	DOI	2	2.6
	Total	76	100.0

4.6. Geographical distribution

The classification of the geographical distribution provides information about the continents from which the data were gathered. Asia, Europe, Africa, North America, Australia/Oceania, cross-continents, and global are the geographical location classifications. Cross-continental studies extended beyond a single continent, whereas the Global classification included articles that did not specify the source of their data. According to Table 7, the existing literature on CC adoption in SMEs is dominated by Asian articles (37). European articles came in a distant second place to Asia's (15 articles), while Africa ranked third in terms of publications (12 articles). Five articles were inventoried in North America. Three articles each from cross-continents and Australia/Oceania were documented, but only one article was classified as global. It is surprising that, despite the dominance of SMEs in many nations, we did not find any study on the continent of South America.

As Asian studies account for the largest portion of the review, it is important to highlight that most of such studies are in developing countries like Indonesia, Malaysia, Sri Lanka, and India. Europe's second-highest research contribution was from countries such as Finland, the UK, and Germany. Africa's third-highest contribution of the studies were in the context of countries such as Kenya, Nigeria, and South Africa. Based on the large concentration of extant literature on CC adoption in SMEs in Asia, it is argued that this may to some extent, be responsible for Asian SMEs' increased competitiveness in the world. Further, higher studies in Asia might be contributing to closing the digital divide between western and eastern countries.

Table 7: Geographical distribution

S/N	Continents	No	%
1	Europe	15	19.7
2	Asia	37	48.7
3	North America	5	6.6
4	Cross continents	3	3.9
5	Australia/Oceania	3	3.9
6	Africa	12	15.8
7	Global	1	1.3
	Total	76	100

4.7. Most important adoption factors

In the literature of CC adoption in SMEs, 117 unique adoption factors occurred 609 times in the research models of all 76 articles. All the research models tested the influence of more than one factor on CC adoption. Based on Table 8, the most important adoption factors of CC in SMEs were identified using a benchmark of at least 25% (19 times) occurrence in the reviewed papers. Thereafter, the comparison of times they were found significant and insignificant was used to calculate their acceptance rate, hence, concluding their importance. Although Security and Privacy was the most researched adoption factor (55 times), however, Cost Savings was the most important CC adoption factor for SMEs. 30 (83.3 per cent) out of 36 studies that used Cost Savings in their models concluded that it had a significant effect on CC adoption. Top Management Support was found significant in 23 (82.1 per cent) studies, whereas Compatibility was found significant in 23 (79.3 per cent) studies. 40 (76.9 per cent) of the articles that used Security and Privacy in their models found it a significant factor. Awareness was significant in 14 (73.7 per cent) of studies. Relative advantage, Competitive Pressure, and Regulatory Support were found significant in 25 (71.4 per cent), 14 (56.0 per cent), and 10 (50.0 per cent) of the studies that included them in their models.

As highlighted in Table 8, the most important factors influencing CC adoption in SMEs are the TOE and DOI core constructs; thus, it is unsurprising that both theories emerged as the first and second most applied theories/frameworks in the extant literature, respectively. The primary factor influencing CC adoption was cost savings. This finding is understandable, as SMEs are motivated by profit maximization, and thus a technology such as CC that lowers operational costs appears to be a viable option.

Table 8: Most important adoption factors

Construct	Occurrence	No of times significant	No of times insignificant	Acceptance %
Security and Privacy	52	40	12	76.9
Cost Savings	36	30	6	83.3
Relative Advantage	35	25	10	71.4
Compatibility	29	23	6	79.3
Top Management Support	28	23	5	82.1
Competitive Pressure	25	14	11	56.0
Regulatory Support	20	10	10	50.0
Awareness	19	14	5	73.7

5. CONCLUSIONS, FUTURE RESERCH DIRECTIONS AND LIMITATIONS

SMEs are the economic backbone of their host countries (Jayeola et al., 2020). For them to be competitive and successful, it is the right decision to adopt CC, an innovative and cheap information communication technology. This systematic literature review has yielded some useful results in the quest to gain state-of-the-art knowledge of the extant literature on CC adoption in SMEs. The PLS-SEM proved to be the most applied quantitative data analysis technique as it has less-restrictive assumptions. On the other hand, CB-SEM was not used to analyze data on SMEs' CC adoption. CB-SEM is more rigorous, and future research in this domain should apply it in their data analysis provided it meets their objectives, and any of its assumptions will not be violated. With the less explanatory power of descriptive analysis, multiple and logistic regressions that have more explanatory power need more consideration from quantitative methods' researchers. For the qualitative data analysis, the interpretative analysis tool was subscribed to by most studies. Future research can increase the application of other qualitative data analysis techniques with limited usage identified in this study. Increased thematic analysis, for example, can uncover some new emergent themes that can help advance understanding in this research context. Also, grounded theory and content analysis might be effective in offering holistic analysis and "manifest content" (Saunders et al., 2016) that can enrich qualitative data in CC adoption in SMEs. Multi-level analysis; using two or more analysis techniques capable of improving the rigor of data analysis, findings and conclusions are uncommon in both quantitative and qualitative analyses. This viewpoint could be improved in future investigations. Examining CC service models, types, or business applications in broad terms may lead practitioners to make incorrect conclusions and decisions. Hence, future research should focus more on specific less-researched CC services such as big data analytics, CRM, m-retail, SCM, IaaS, PaaS, public, private, community, and hybrid to discover the unique factors that influence their adoption in SMEs. CC is becoming more mature, and its adoption is likely to increase significantly with SMEs. Therefore, a steadily growing research is advocated so that the proportional research output might help keep track of novel, comprehensive, relevant, and contextual issues of CC adoption in SMEs. The interdisciplinary nature of CC may have contributed to studies being published in a variety of multidisciplinary journals and conference proceedings; a trend we anticipate will continue.

TOE was found to be the most commonly used theory in the extant literature, and the majority of the studies did not use any theory. Future studies can build on this to employ more established theories, allowing CC to achieve relevance in the IS research field. Commonly integrated theories were TOE and DOI, thus, future studies can improve by integrating diverse theories that can produce higher predictive power. The complementarities of each theory should be used as a metric for selection and integration. Given that Asia tops the list of empirical research in terms of CC adoption among SMEs, this suggests that CC adoption is more frequent in SMEs on this continent, explaining Asian SMEs' increasing worldwide competitiveness. The South American researchers need to contribute to the academic discourse on CC adoption in SMEs because no study was found from this continent. Europe, North America, Africa, and Australia had a low contribution of papers; hence, efforts are required from IS scholars in these continents to accelerate their contribution to the literature. Security and privacy were the most researched adoption factors of CC in SMEs; this buttresses the point that the safety of data is among SMEs' priorities when deciding to adopt CC. Meanwhile, cost savings was the most significant factor for SMEs to adopt CC since this indirectly enhances their profit and revenue.

This study made some contributions to the literature and strengthened knowledge in the research area of CC adoption in SMEs. Besides deepening insights in the data analysis techniques used by empirical studies rather than the universal research methodologies prior review studies had focused on, it also highlights under-researched CC services in SMEs. Furthermore, this study provides a snapshot of studies' geographical areas, publication channels, theories/frameworks, and most important adoption factors. In this light, the knowledge provided by this study points out areas that require further research efforts. As a result, SMEs, cloud vendors, and regulatory agencies can leverage the knowledge to successfully implement, develop sound policies, and offer CC services that contribute to an improved technological landscape. Similar to all studies, this review study has some limitations. The publication set examined was developed based on some criteria, from six databases, within a specific period. Therefore, this study was suited to the particular conditions following the availability of the body of research. It is acknowledged that some studies might have been omitted. For future review study, the right step is to revise and expand the research protocol strategy used in this study.

REFERENCES

Abatecola, G., Mandarelli, G., & Poggesi, S. (2013). The personality factor: how top management teams make decisions: a literature review. *Journal of Management and Governance, 17*(4), 1073-1100.

Adam, I. O., & Musah, A. (2015). Small and Medium Enterprises (SMEs) in the Cloud in Developing Countries: A Synthesis of the Literature and Future Research Directions. *Journal of Management and Sustainability*, *5*(1), 115–139

Ajimoko, O. J. (2018). Considerations for the adoption of cloud-based big data analytics in small business enterprises. *Electronic Journal of Information Systems Evaluation, 21*, 63–79.

Alkwasi, G. A., Mahmood, A. K., & Baashar, Y. M. (2015). Factors influencing the adoption of cloud computing in SME: A systematic review. *2015 Proceedings of the International Symposium on Mathematical Sciences and Computing Research 2015*, (iSMSC), 220-225.

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

Aquilani, B., Silvestri, C., Ruggieri, A., & Gatti, C. (2017). A systematic literature review on total quality management critical success factors and the identification of new avenues of research. *The TQM Journal, 29*(1), 184-213.

Bhattacherjee, A., & Park, S. C. (2014). Why end-users move to the cloud: A migration- theoretic analysis. *European Journal of Information Systems, 23*(3), 357–372.

Bruque-Cámara, S., Moyano-Fuentes, J., & Maqueira-Marín, J. M. (2016). Supply chain integration through community cloud: Effects on operational performance. *Journal of Purchasing and Supply Management, 22*(2), 141–153.

Buyya, R., Buyya, R., Yeo, C. S., Yeo, C. S., Venugopal, S., Venugopal, S., & Brandic, I. (2009). Cloud computing and emerging IT platforms: Vision, hype, and reality for delivering computing as the 5th utility. *Future Generation Computer Systems, 25*, 599–616.

Das, R. K., Patnaik, S., & Misro, A. K. (2011). Adoption of cloud computing in e-governance. *Advanced Computing,* 161–172.

Habahbeh, A., Fadiya, S. O., & Akkaya, M. (2018). Factors influencing SMEs cloud ERP adoption: A test with generalized linear model and artificial neural network. *Data in Brief, 20*, 969–977.

Hair, J. F. (2014). *A primer on partial least squares structural equations modeling (PLS-SEM).* Los Angeles: Sage.

Hossain, M. A., & Quaddus, M. (2011). The adoption and continued usage intention of RFID: an integrated framework. *Information Technology & People, 24*(3), 236-256.

Jäger, J., Schöllhammer, O., Lickefett, M., & Bauernhansl, T. (2016). Advanced complexity management strategic recommendations of handling the "industrie 4.0" complexity for small and medium enterprises. *Procedia CIRP, 57*, 116–121.

Jayeola, O., & Sidek, S. (2019). Factors of cloud computing adoption by SMEs. A review. *Proceedings of the 7th International Conference on Business, Accounting, Finance and Economics, BAFE 2019*, (October 2019), 203-213.

Jayeola, O., Sidek, S., Rahman, A. A., Mahomed, A. S. B., & Jimin, H. (2020). Contextual factors and strategic consequences of cloud enterprise resource planning (ERP) Adoption in Malaysian Manufacturing SMEs: A Conceptual Framework. *International Journal of Economics and Business Administration, 8*(3), 176–201.

Khajeh-Hosseini, A., Greenwood, D., Smith, J. W., & Sommerville, I. (2012). The Cloud Adoption Toolkit: Supporting cloud adoption decisions in the enterprise. *Software - Practice and Experience*, *42*(4), 447–465.

Khamis, H., & Mohd, Z. (2016). Exploring the challenge impacted SMEs to adopt cloud ERP. *Indian Journal of Science and Technology, 9*(45), 75-88.

Khayer, A., Talukder, M. S., Bao, Y., & Hossain, M. N. (2020). Cloud computing adoption and its impact on SMEs' performance for cloud supported operations: A dual-stage analytical approach. *Technology in Society, 60*(1): 101225.

Kihara, T., & Gichoya, D. (2013). Adoption and use of cloud computing in small and medium enterprises in Kenya. *2013 IST-Africa Conference and Exhibition, IST-Africa 2013*, 1–12.

Korongo, J. N., Samoei, D. K., & Gichoya, D. M. (2013). Cloud computing: An emerging trend for small and medium enterprises. *2013 IST-Africa Conference and Exhibition, IST-Africa 2013*, 1–7.

Mell, P., & Grance, T. (2011). *The NIST definition of cloud computing: Recommendations of standards and technology*. NIST Special Publication, 800- 145. 1-7

Moeuf, A., Pellerin, R., Lamouri, S., Tamayo-Giraldo, S., & Barbaray, R. (2018). The industrial management of SMEs in the era of Industry 4.0. *International Journal of Production Research, 56*(3), 1118–1136.

Nowotarski, P., & Paslawski, J. (2017). Industry 4.0 concept introduction into construction SMEs. *IOP Conference Series: Materials Science and Engineering, 245*(5).

Priyadarshinee, P., Jha, M. K., & Raut, R. (2014). Cloud computing adoption in SMEs: A literature review. *Proceedings of the Twelfth AIMS International Conference on Management*, 214-242.

Raut, R. D., Gardas, B. B., Jha, M. K., & Priyadarshinee, P. (2017). Examining the critical success factors of cloud computing adoption in the MSMEs by using ISM model. *Journal of High Technology Management Research, 28*(2),

Rekik, M., Boukadi, K., & Ben-Abdallah, H. (2019). An end-to-end system to enhance business process performance through new outsourcing to the cloud strategies. *International Journal of Business and Systems Research, 13*(1), 1–20.

Salleh, N. A., Hussin, H., Suhaimi, M. A., & Md Ali, A. (2018). A systematic literature review of cloud computing adoption and impacts among small medium enterprises (SMEs). *Proceedings - International Conference on Information and Communication Technology for the Muslim World 2018, ICT4M 2018*, 278–284.

Sandberg, B., & Aarikka-Stenroos, L. (2014). What makes it so difficult? A systematic review on barriers to radical innovation. *Industrial Marketing Management, 43*(8), 1293-1305.

Saunders, M., Lewis, P., & Thornhill, A. (2016). *Research methods for business students. Seventh Edition.* Pearson Education Limited.

Seethamraju, R. (2014). Adoption of SaaS Enterprise Systems - A Comparison of Indian and Australian SMEs. *Proceedings of the 14th International Conference on Advances in ICT for Emerging Regions, 1*, 179-184.

Senyo, P. K., Addae, E., & Boateng, R. (2018). Clod computing research: A review of research themes, frameworks, methods and future research directions. *International Journal of Information Management, 38*(1), 128–139.

Small Business Administration. (2018). *Small business profile*. https://www.sba.gov/sites/default/files/advocacy/2018-Small-Business-Profiles-US.pdf

Stieninger, M., Nedbal, D., Wetzlinger, W., Wagner, G., & Erskine, M. A. (2018). Factors influencing the organizational adoption of cloud computing: a survey among cloud workers. *International Journal of Information Systems and Project Management, 6*(1), 5–23.

Tornatzky, L. G., & Fleischer, M. (1990). *The Processing of Technological Innovation.* Lexington Books.

Tranfield, D., Denyer, D., & Smart, P. (2003). Towards a methodology for developing evidence informed management knowledge by means of systematic review. *British Journal of Management, 14*(3), 207-222.

Twum-Darko, M., & Sibanyoni, J. L. (2014). Role of cloud computing as technology innovation in small and medium enterprises in South Africa. *Corporate Ownership and Control*, *12*(1CONT6), 557–571.

Vu, K., Hartley, K., & Kankanhalli, A. (2020). Predictors of cloud computing adoption: A cross-country study. *Telematics and Informatics, 52*, 101426.

Wangechi, Z. (2017). *Cloud computing adoption and organization performance among small and medium enterprise (SMEs) in Nairobi County.* (Master's Dissertation, University of Nairobi, Kenya). http://erepository.uonbi.ac.ke/handle/11295/10258

Wu, W. W. (2011). Mining significant factors affecting the adoption of SaaS using the rough set approach. *Journal of Systems and Software, 84*(3), 435–441.

Xiao, Y., & Watson, M. (2019). Guidance on Conducting a Systematic Literature Review. In *Journal of Planning Education and Research*, *39*(1), 93–112.

Yu, Y., Li, M., Li, X., Zhao, J. L., & Zhao, D. (2018). Effects of entrepreneurship and IT fashion on SMEs' transformation toward cloud service through mediation of trust. *Information & Management, 55*(2), 245–257.