



The Cloud Computing and Performance: Systematic Literature Review (by PRISMA Method

الحوسبة السحابية والأداء: مراجعة منهجية
للأدبيات (بطريقة عناصر الإبلاغ المفضلة
للمراجعات المنهجية والتحليلات التلوية)

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Abstract:

Objectives: The study examines the impact of cloud computing adoption on business performance. The study aimed to analyze and classify the contributions of the studies published in the cloud computing field. The cloud literature is analyzed systematically from the management and business points of view. The review is limited to journal articles and papers published between 2013 and 2024.

Methods: Based on the PRISMA methodological guide, mixed quantitative and qualitative methods were used.

Results: The study concluded that there is an effect of cloud computing adoption on performance in the sample of articles studied and that there is a positive relationship between most dimensions of cloud computing adoption by SMEs and performance dimensions.

Conclusions: The study recommended the necessity of paying attention to Cloud computing technology because of its effective role on performance first and then completing work with the required efficiency and effectiveness.

Keywords: Cloud Computing; Management; Risk management; Systematic literature review.

المخلص:

الأهداف: تتناول الدراسة تأثير تبني الحوسبة السحابية على أداء الأعمال. تهدف الدراسة إلى تحليل وتصنيف إسهامات الدراسات المنشورة في مجال الحوسبة السحابية. تم تحليل أدبيات الحوسبة السحابية بشكل منهجي من وجهة نظر الإدارة والأعمال. اقتصرت الدراسة على مقالات المجلات والأبحاث المنشورة بين سنة 2013 و2024.

المنهجية: استنادًا إلى دليل الإرشادات للمراجعات المنهجية والتحليلات الوصفية، تم استخدام أساليب كمية ونوعية مختلطة.

النتائج: خلصت الدراسة إلى أن هناك تأثير لتبني الحوسبة السحابية على الأداء في عينة المقالات المدروسة وأن هناك علاقة إيجابية بين معظم أبعاد تبني الحوسبة السحابية من قبل الشركات الصغيرة والمتوسطة وأبعاد الأداء.

الخلاصة: أوصت الدراسة بضرورة الاهتمام بتكنولوجيا الحوسبة السحابية لما لها من دور فعال على الأداء أولاً ومن ثم إنجاز العمل بالكفاءة والفعالية المطلوبة.

الكلمات المفتاحية: الحوسبة السحابية؛ الإدارة؛ إدارة المخاطر؛ مراجعة الأدبيات المنهجية.

Citation

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1 Introduction

The term 'Cloud Computing' was first proposed at the end of 2006 by Eric Schmidt, the CEO of Google. Cloud computing is currently one of the main components of the fourth industrial revolution and is considered to be the most innovative technology in the most developed countries (Fargana Abdullayeva, 2023, P.1). Today, the cloud computing is a major technological trend, with the definitive aim of radically changing IT processes and the IT market (Vasiljeva, Shaikhulina, Kreslins, 2017, P.2). This technology Cloud computing is designed to serve businesses by increasing performance, reducing costs, increasing storage capacity and facilitating worldwide access. This can be useful for most small and medium-sized enterprises (SMEs) in the early stages of development. Although this type of computing system has existed in the online domain and has been useful for many services in Western countries for many years, the idea of cloud computing is fairly new to many emerging countries, where evolving businesses are primarily interested in reducing set-up costs and developing skills (Priyadarshinee et al., 2017, P.1), in the same context companies are using cloud computing in the areas of human resources, IT management, financial management, security management, business intelligence, sales and marketing, customer service, procurement and purchasing, content management, office productivity, supply chain and logistics, tax calculation, manufacturing and production line operations. The benefits of cloud computing include cost minimization, improved internal and customer services, and the consolidation, scaling, distribution and efficient use of IT resources within organizations (Allassafi, 2021, P.1). There are three types of service model: software as a service (SaaS), platform as a service (PaaS) and infrastructure as a service (IaaS). SaaS is the highest level of the cloud, with all services offered by cloud providers. Users adopting PaaS only manage their applications and data, while those adopting IaaS will have their infrastructure, such as server, storage and network, managed by the provider. (Amron, Roslina, Chuprat, 2017, P.2). Cloud computing is characterized by pay-as-you-go, scalability, configurability and rapid, low-cost implementation, and has considerably altered the shortcomings of traditional information technologies, such as high cost or a stereotyped software framework (Deng et al., 2021, P.4). In addition, cloud computing services offer viable tools to facilitate business performance and provide affordable solutions, enabling businesses to improve their current operations more efficiently (A. Al-Sharafi et al., 2023, P.4). Although many of the benefits of Cloud computing are well known and documented, businesses are still concerned about the risks and consequences of moving mission-critical applications to the Cloud. As a result, the distributed nature of Cloud computing raises a number of issues, including threats to security and privacy, national and international regulations, and the external business environment in which the company operates (El-Gazzar et al., 2016, P.1). Its interest and usefulness have taken the intention of individuals, organizations and businesses during the outbreak of the coronavirus (COVID-19) pandemic that has drastically affected everyone and every aspect of life across the world. All businesses, organizations, ways of working and trade have had to find ways to survive and excel in these drastic conditions. The rapid and unprecedented spread of COVID-19 has made businesses and organizations extremely unstable. It is worth noting that the pace of economic growth of each country mainly relies on the available human capital and technological exploration (Sharma, Singh, Daim, 2023, P.1). Since (COVID-19) has truly shattered investor confidence and turned our lives upside down, technologies have become our lifeline. One of the solutions is to have workers work remotely. However, businesses are facing obstacles and finding it difficult to meet the current challenge of remote work. And other businesses are struggling to cope with this new phenomenon. For example, companies that have invested in cloud computing infrastructure have overcome the current pandemic and are operating well. Therefore, cloud computing helps employees and colleagues to collaborate and communicate securely in a remote environment. On the other hand, other organizations that do not have cloud computing infrastructure are struggling to operate smoothly. Cloud computing reduces the challenges of remote working, such as chatting, interacting, and tracking work from home securely (Alhomdy et al., 2021, P.1). Almost all sectors, such as small and large businesses, healthcare and educational institutions, and universities, have been forced to convert their services electronically. All these organizations, such as companies, universities, and many others, have become extremely dependent on cyberspace for their daily activities. As the disease has spread widely and rapidly around the world, the demand for online services has increased along with the crisis. The demands for services are much greater than before. With the increasing sophistication of technology, these services make it easier to do things online, such as shopping, paying bills, education, college registration, medical consultations, sea and land transportation, and hotel reservations. Competition among businesses has increased significantly during this pandemic to achieve customer satisfaction, given the lack of in-person options. Customer trust is achieved by providing better online services (Alashhab et al., 2021, P.2). In fact, cloud computing facilitates collaboration, communication, and essential online services during the COVID-19 crisis,

which has forced people to work from home, but they need to communicate and collaborate online. Cloud computing therefore plays a vital role in addressing the challenge of working from home and providing efficient services, in a lockdown situation, cloud computing technology helps provide commendable services in all areas including healthcare, education, commerce, etc. It provides advanced infrastructure to facilitate digital transformation, indeed All countries are trying to reduce the spread of this virus and therefore this technology helps in reducing the spread of this virus by providing online services and also an innovative environment that improves the creativity and productivity of workers. This Cloud computing technology has proven to be effective as a solution to limit the spread of the pandemic and also save millions of lives around the world. This technology is also very useful in predicting the future impact of the SARS-Co-2 virus (Ravi pratap singh, 2021, P.1). Concretely, the global COVID-19 pandemic has forced organizations to rethink the way they work, study, help and socialize. Cloud computing has therefore played a vital role in enabling organizations and governments to quickly use crisis management and continuity solutions, and by this fact the coronavirus pandemic has reshaped the way businesses and organizations use cloud computing. Some recent trends in cloud computing make sense: for example, cloud adoption rates seem to be higher than ever. However, we also see cloud computing trends in the areas of compliance and security (Athambawa, Johar , Khatibi, 2023, P.20). The Current studies focus on the technical, security and adoption aspects of cloud computing. But to date, little is known about how SMEs that have adopted cloud computing have been able to manage the risks and exploit the benefits of cloud computing to improve their performance (Salleh, Husnayati, 2016, P.105). The aim of this study is to present a detailed systematic analysis of the literature on the impact of cloud computing adoption on organizational performance between 2013 and 2024. The three research sub-questions for this detailed analysis that we aim to address are as follows:

- How does Cloud Computing contribute to digital transformation?
- How can we effectively manage the risks associated to Cloud Computing adoption?
- What is the impact of Cloud Computing adoption on performance?

The main focus of our research is to study the impact of Cloud computing adoption on performance. A descriptive analysis was carried out in order to draw conclusions regarding the relationship between the adoption of Cloud computing and the achievement of performance. In fact, the analysis showed that technology adoption and acceptance are the most studied topics. Most of the studies on Cloud computing examine the benefits of Cloud computing adoption as well as the challenges, particularly in terms of data security and confidentiality, and budgeting and pricing issues have been particularly studied. In the field of organizational management, the mastery of digital skills and information technologies has become a necessity for coping with changes in the external environment, and the results of this study can serve as a guide for managers and researchers, particularly from a management point of view. In this way, this study can support the efforts of businesspeople to strengthen the competitive advantages of their companies through the adoption of cloud computing.

There are studies on Cloud Computing, which can be divided into two categories: narrative studies and SLR 'Systematic Literature Review' studies. Narrative literature review studies focus on the semantic characteristics of documents, while SLR studies focus on the quantitative and reproducible elements of documents and articles. One of the advantages of the systematic literature review is that it provides a simple structure of the literature. Literature reviews are important for defining and identifying hypotheses, themes and research questions as well as proposing methodologies that may be useful for further studies (Omurgonuisen, Kazancoglu, 2021, P.3), Furthermore, the systematic literature review can classify, study and build up all the studies relating to a particular area of research, a subject area or an important phenomenon (Rajabion et al. , 2019, P.272). In addition, systematic reviews should strive to be sensitive, which means searching for as many studies as possible to minimize bias and be effective. Other authors have defined systematic reviews as scientific investigations in which the unit of analysis is the main original studies, constituting an essential tool for synthesizing the scientific information available, increasing the validity of the conclusions of individual studies and identifying areas of uncertainty where research is needed (Martinez et al., 2019, P.213).

The method used in this study complies with the PRISMA guidelines and comprises five steps: 1) literature review, 2) inclusion and exclusion criteria, 3) study selection, 4) quality assessment, and 5) data extraction and synthesis (Erfannia, Alipour, 2022, P.2).

2 Method

The number of studies on the interest of the Cloud computing adoption to improve the performance taken into consideration in this study and their interpretation is based on the publications on the subject, and a systematic review of literature based on the PRISMA method.

2.1 Inclusion and exclusion criteria

2.1.1 Inclusion criteria

These studies included studies published in English only, studies for which the full text was available, studies that examined the impact of cloud computing adoption on performance while analyzing the associated risks, studies that introduced and evaluated a new tool for managing the risks associated to cloud computing adoption, and studies published between 2013 and 2024.

2.1.2 Exclusion criteria

The following studies were excluded: studies in non-English languages, studies for which the full text was impossible to obtain, and summary papers, letters, dissertations, technical notes, posters, and papers that used Cloud Computing in a field other than Management.

2.1.3 Studies selection

A total of 500 papers were identified. Of these, 230 articles were duplicates and were therefore excluded. Of the remaining 270 papers, 130 were excluded after examination of their titles and abstracts, respectively. The full texts of the remaining papers ($n = 140$) were examined according to the inclusion and exclusion criteria, and 82 papers were excluded. Next, the snowball method was applied to the full texts of the remaining relevant papers ($n = 58$).

The papers in our study were published in several countries, including the United States, the United Kingdom, Saudi Arabia, India, Malaysia and China. The 58 papers included were published in various journals. They address issues related to the impact of Cloud Computing adoption on business performance, while analyzing the associated risks.

In the diagram below, we present the PRISMA methodological guidelines for conducting our systematic review.

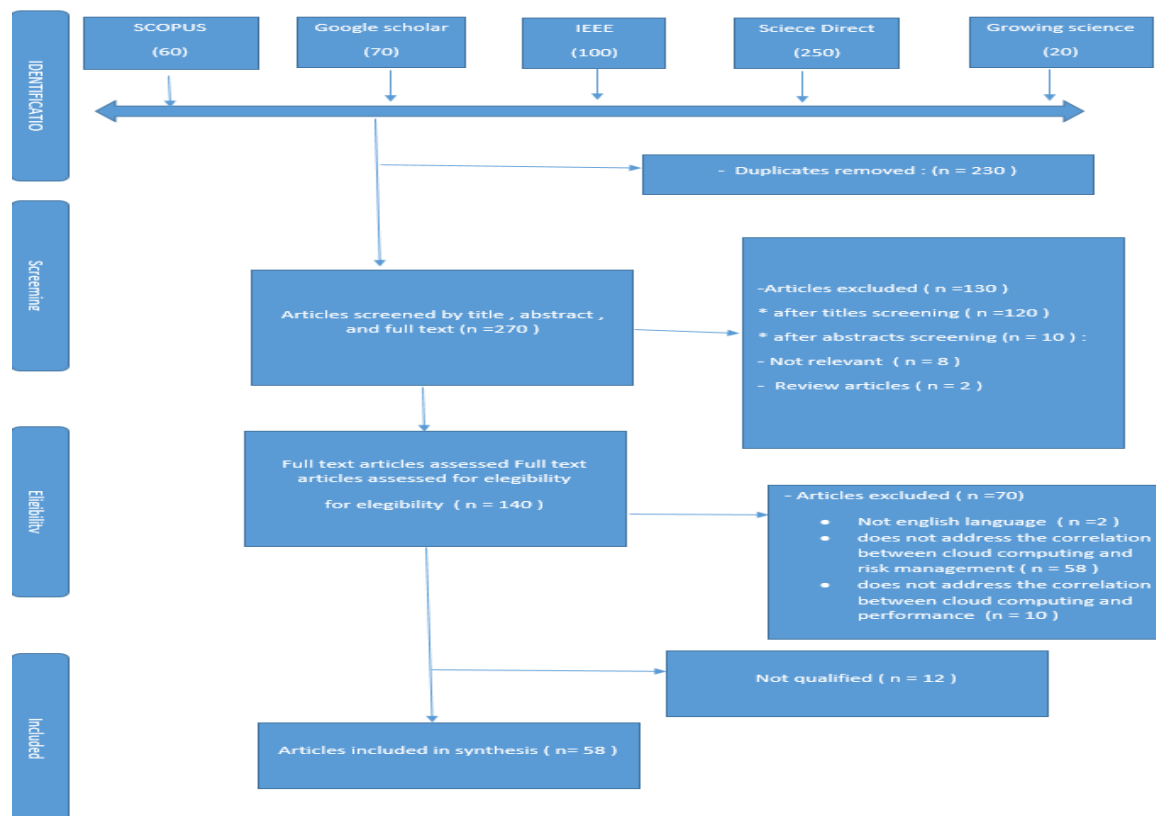


Figure 1: PRISMA flow diagram of study selection

3 Results

The bibliographic search was carried out for studies published between 2013 and 2024. Although the methodological guide, in the case of PRISMA recommends a fully electronic search strategy for at least one major database, the use of a single database does not guarantee that all relevant studies will be found and therefore various databases must be consulted. In this sense, bibliographic searches in fields other than the complete databases were carried out to minimize any bias.

Regarding electronic databases, 74% (104 papers) of the papers were selected from the Direct science database. 19 % (26 papers) were selected from the IEEE (Institute of Electrical and Electronics Engineers). 3% (4 papers) were selected from Google scholar, 2% (3 papers) were selected from Growing science. 2% (3 articles) each paper is selected from a different source one is from MDPI databases and the other from Semantic Scholar.

The sources of the 58 papers selected and included in our study, as shown in (Figure 1), are presented as follows:

Table 1: Sources of the 58 papers selected using the PRISMA method

Types of Sources	Number of papers	Percentage (%)
DIRECT SCIENCE	35	60%
IEEE	16	28%
Google scholar	5	9%
Growing science	1	1.5%
Semantic Scholar	1	1.5%

Source: Result obtained by analyzing scientific articles in excel.

3.1 Review analysis by year

As mentioned in (Figure 2) studies on cloud computing technology have increased significantly since 2014. The number of studies reached its peak in 2016. This can be linked to the emergence of the concept of the digital industry from 2011 onwards.

Cloud Computing is an essential part of the fourth industrial revolution as a new information and communication technology, and in the same context the number of studies began to increase remarkably from 2023 onwards.

The year-on-year evolution of cloud computing adoption studies can be explained by a combination of technical, economic and social factors. Here is a general perspective on this evolution:

3.1.1 The 2015-2020 period

- Emergence of major competing Cloud service providers, such as Microsoft Azure and Google Cloud Platform, stimulating innovation and competition in the market (Quddus Khan, 2024, P. 5).
- Studies have shown that it is one of the fastest growing sectors of the digital economy. European governments and industry plan to invest €45 billion in the development of cloud computing by 2020. In cloud computing, remote server networks, storage systems (data centers and server farms) and their resources are used at the request of users (Krishna, Babu, Prasad, 2020, P. 1).

3.1.2 The years 2020 and beyond

- The recent outbreak of Covid-19 has further increased the need for businesses to implement digital business models. Only cloud platforms can provide the business agility, scalability and new capabilities required for this transformation. Despite the focus on digital transformation, cloud computing is an important technology for business transformation (Shailja Tripathi, 2023, P. 2).
- The spectrum of Internet of things (IoT) data sources includes sensor data, smartphones and social networks, which are modelled in different ways and use various communication protocols and interfaces. Most Internet of things (IoT) services are based on M2M communication protocols, which require the management of a large number of flows and benefit directly from the widely distributed storage capacities of the cloud computing infrastructure (Ejaz et al., 2017, P. 9).

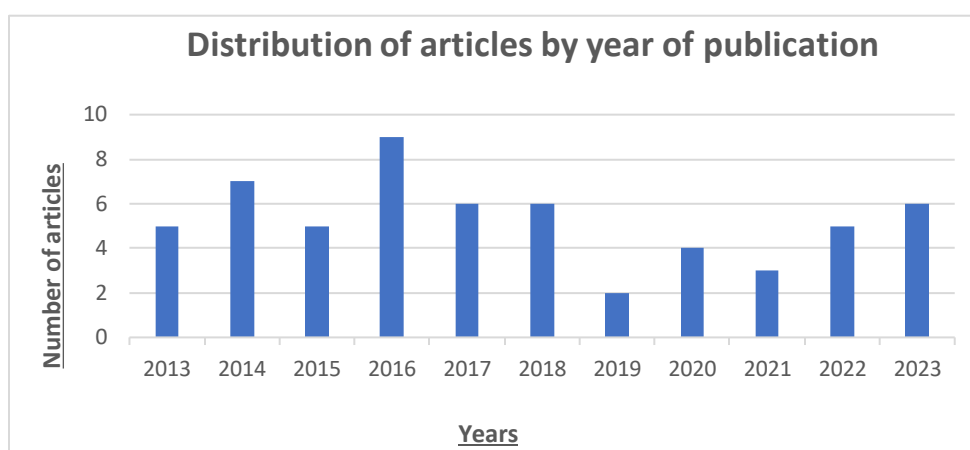


Figure 2: Distribution of articles by year of publication

3.2 Review analysis by author

Table 2 shows the number of authors for each paper. Taking into account the selected studies, the total number of authors is 28. It was observed that papers related to Cloud Computing and its relationship to risk management and performance achievement have more than one author. Approximately 9% of the papers (5 papers) have a single author, 31% of the papers (18 papers) written have 2 authors and 29% have 3 authors (17 papers). The proportion of papers with more than 3 authors (4, 5, 6 and 7 authors) is 31%.

Analyzing scientific papers according to the number of authors provides us with interesting information about research trends, collaborations and the complexity of the subject studied. Here are a few aspects to consider when carrying out this analysis:

- **Average number of authors:** on the basis of 58 papers selected using the PRISMA method, we found an average number of 3 authors per paper. This average indicates a trend towards broader, interdisciplinary collaborations.
- **Distribution of the number of authors:** After our analysis, we note a predominance of articles with a large number of authors, which may reflect extensive collaborations.
- **Types of collaborations:** The large number of authors of scientific papers related to our review of Cloud Computing, risk management and performance reflects inter-institutional, international and interdisciplinary collaborations.

Table 2: Analysis of papers by number of authors

Number of authors	Number of papers	Percentage
1	5	9%
2	18	31%
3	17	29%
4	12	21%
5	3	5%
6	2	3%
7	1	2%
28	58	100%

Source: Result obtained by analyzing scientific articles in excel.

3.3 Methodological analysis of papers

In the studies using qualitative approaches, in-depth interviews (Darren, 2021. P.1). were conducted in 5 papers and the remaining papers were based on case studies and quantitative methods. In the quantitative papers, questionnaire tools (Adjei, 2021. P.4) were commonly used and, in some papers, databases were used to collect data. Questionnaires were often conducted online and sent via social networks or communicated with IT managers in companies and organizations. The response rate was high in most papers. It should be noted that conceptual studies are based mainly on two different research designs: one is based on synthesis studies and the other aims to build a model or framework.



Figure 3: Most frequently used keywords

3.4 Keyword analysis

The keyword analysis of the included papers provided insight into the general direction of the papers, research perspectives and fields of cloud computing adoption that focus more on organizational, technological, economic and managerial aspects (Figure 4). Keywords were collected and then these keywords were grouped into different combinations, for example the keywords «Cloud Computing Adoption» and «Cloud Computing Adoption Framework» were grouped into an adoption group. The collected keywords were analyzed using NVIVO software. The most used keyword was «Cloud Computing» of the total keywords. As mentioned in (figure 3), among the keywords relating to Cloud Computing, the main ones are «Adoption», «Security», «Risk», «Management», «Technology», «information» and «Performance».

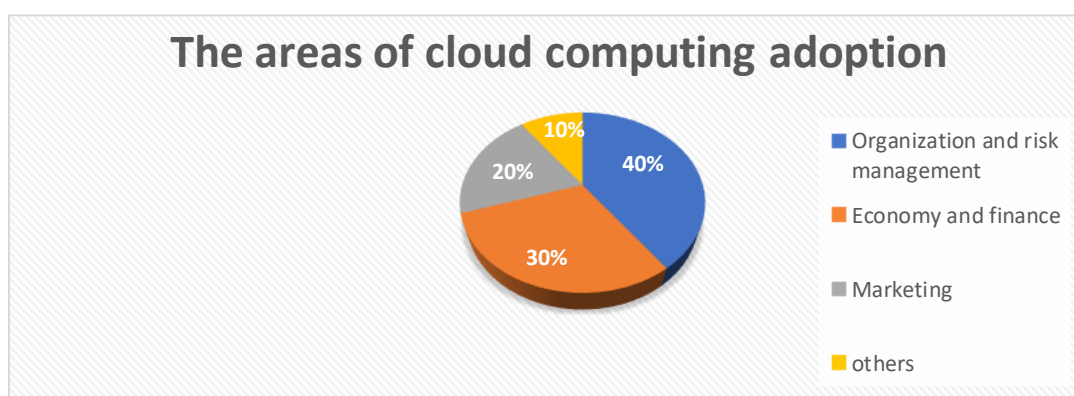


Figure 4: Words most frequently used in sources.

3.5 Analysis of the research areas

In this section, we analyze the papers according to their research area in general terms. As a result of the analysis, the activities using cloud computing and the most used research areas have been highlighted. In addition, this analysis would be useful in identifying business topics that have not received sufficient attention. As mentioned in (Figure 5), Management and Risk Assessment are the most studied areas (40%) in the cloud computing literature. The second most studied area is Finance and Economics (30%), followed by Sales/Marketing (20%) and the rest for the other areas.

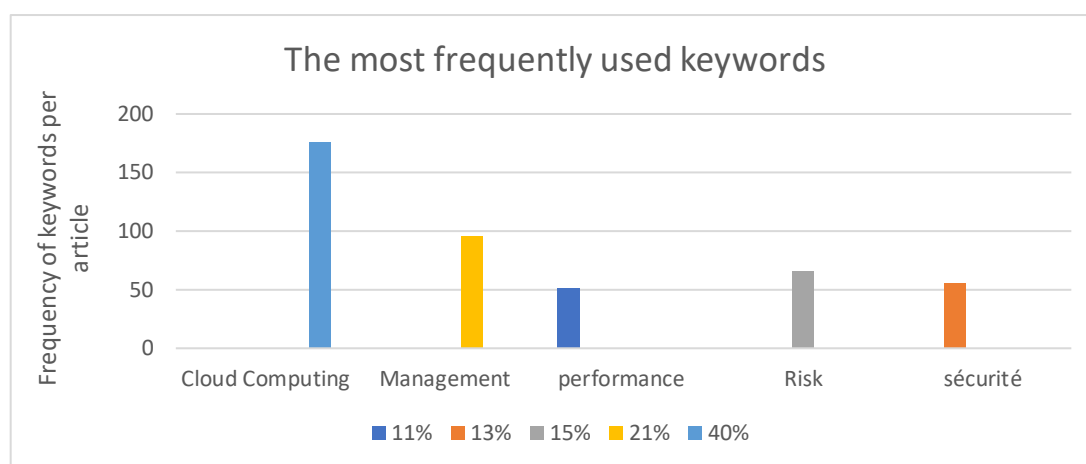


Figure 5: The areas of cloud computing adoption

3.6 Analysis of scientific papers by country

This study reflects a rich international diversity through the contributions of authors from different countries around the world. The papers presented in this section come from the following countries (figure 6):

- The United States
- The United Kingdom
- France
- Germany
- Malaysia
- China
- India
- Canada and others

The fact that several authors of different nationalities are interested in and contribute to the literature on cloud computing can be explained by several factors:

- **Global nature of the technology:** Globalization of science and technology is an integral aspect of globalization (Aqueil, 2014, P.1) and the Cloud computing is a widely adopted technology on a global scale. As such, it is attracting interest and contribution from researchers, practitioners and experts in various countries who are striving to understand, exploit and perfect this technology.
- **Impact on various sectors:** Services sectors are likely to benefit particularly from the adoption of cloud computing, as they often have huge amounts of data, need to exchange data with customers or work from various or different locations (Haug, Kretschmer, Strobel, 2016, P.5). Additionally, the Cloud computing has a significant impact on many sectors, including information technology, business, health, education, etc. Researchers of different nationalities are interested in its potential in their respective fields and are contributing to research to explore best practices and challenges specific to each area.
- **International collaborations:** International collaborations between researchers of different nationalities are common in cloud computing technology. Research projects often require diverse expertise from different countries, leading to collaborations between researchers from different backgrounds.
- **Knowledge dissemination:** Cloud computing research conferences, journals and forums are often international, attracting researchers from all over the world to share their ideas, discoveries and experiences. This encourages a diversity of perspectives and approaches in cloud computing research.
- **Economic importance:** Some notable European countries, such as France, Italy, Germany, the UK and Spain, have adopted cloud computing as a mode of operation in their business environments in line with their unique economic characteristics (Omolola, 2024, P.12). Cloud computing also has significant economic importance, with a rapidly expanding global market. Researchers of different nationalities are interested in understanding the economic implications of cloud computing, as well as its effects on employment, innovation and economic growth.

This geographical diversity reflects the scale of the international commitment and worldwide interest in Cloud Computing and its usefulness in improving performance and achieving strategic objectives for organizations and companies.

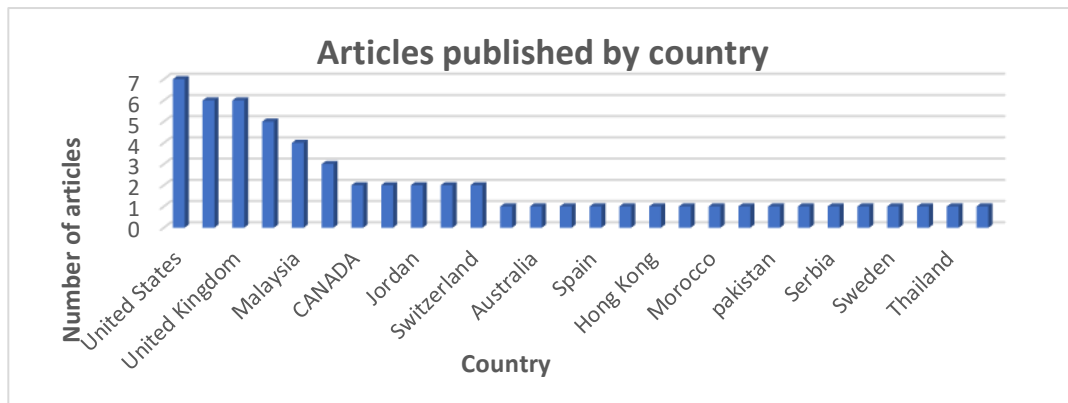


Figure 6: Distribution of articles published by country

4 Discussion

The adoption of cloud computing has become a central issue in the IT sector, because of its profound implications for business performance. Numerous studies have highlighted the benefits of cloud computing, particularly in terms of flexibility, cost reduction and improved operational efficiency.

4.1 The benefits of Cloud Computing

- **Scalability:** As an emerging and fast-growing IT paradigm since 2006, cloud computing has changed the way IT is managed, delivering benefits such as cost savings, dynamic scalability, enhanced efficiency and optimized use of IT resources (Hang Au, Fung, Tses, 2016, P.1).
- **Reduced cost:** Cloud computing reduces costs because resources are only bought and paid for when they are needed, because when it is used as a billing model, it works on a usage basis rather than a start-up cost basis. The infrastructure is not purchased, which reduces its initial and maintenance costs. Customers do not own the infrastructure, but can use online cloud services to meet the organization's needs. Businesses don't have to worry about what the future requires, as they can easily obtain additional services at any time. What's more, as a business grows over time, the cloud becomes scalable and easily responds to increasing demands over time (Ahirwar, Parihar, 2021, P.5).
- **Improving operational efficiency:** Businesses are migrating or deploying their software applications to the cloud computing both to deliver new services and value more quickly in order to increase revenue, and to improve operational efficiency in order to boost their bottom line. Operational efficiency in the production of application services is improved by: reducing the unit costs of production and service creation, and reducing waste, in particular: overproduction of application services, waste or inefficient use of resources, poor quality costs, excess time consumed by activities and the creation of functionality that is not valued. Measuring and managing the unit cost of service production, the cost of wasted capacity and the cost of creating functionality enables organizations to methodically improve their operational efficiency time (Bauer, 2018, P.19).

4.2 Challenges of Cloud computing adoption

Despite these benefits, the adoption of cloud computing is not without its challenges. Concerns about data security, regulatory compliance and change management can slow adoption. Most previous studies have addressed the technical and operational issues associated with cloud adoption, including topics such as risk assessment, factors influencing trust, managing the costs of cloud computing for SMEs, exploring policy formulation for SMEs in cloud computing, and issues of security, privacy and trust, and data security (Alkawsi, Mahmood, Baashar, 2015, P.2).

- **Risk Security:** Du point de vue des entreprises, le cloud computing est devenu l'une des technologies clés qui offrent de réelles promesses aux entreprises, avec de réels avantages en termes de coût et de puissance de calcul. Malgré les progrès des technologies cloud et le nombre croissant d'utilisateurs de cloud, le cloud computing étant une technologie nouvelle, il introduit de nouveaux risques de sécurité qui doivent être évalués et atténués (Drissi, 2013, P.2). The main risks associated with cloud computing technology relate to the following areas: authentication, data security and confidentiality, interface with internal systems, system availability, business continuity, content ownership and other legal requirements. Of these risk factors,

security and confidentiality are the areas most concerned, because cloud computing data is stored outside the company's premises (Chou, 2015, P.2).

5 Conclusions

The continuing evolution of cloud computing adoption is a testament to the growing relevance of cloud computing as a pillar of modern IT infrastructure, with profound implications for businesses, governments and society as a whole. This is reflected in the growing number of studies on cloud computing produced by several authors of different nationalities. This diversity of studies is the result of international collaborations that offer a wealth of expertise.

In addition, the adoption of cloud computing has proved to be a revolution in many areas. This technology has rethought the way businesses, organizations and governments manage their data, applications and IT infrastructures. Whether in business management, finance and economics, commerce - sales and distribution, cloud computing has delivered significant benefits through easy access to on-demand computing resources, enabling easy scalability and reducing management and maintenance costs resulting in improved performance.

Finally, the adoption of cloud computing will continue to shape and profoundly transform the way businesses, organizations and governments operate and provide their services in the future.

5.1 Recommendations

- **Assessing the performance of different cloud models** (Comparing the impact of cloud adoption on the performance of different types of cloud (public, private, hybrid) in different usage scenarios) .
- **Impact of security on performance** (Analyze how security measures (encryption, authentication) can affect the performance of cloud services and study the trade-offs between security and performance in critical scenarios).
- **Impact of emerging technologies** (Research the impact of new technologies, such as edge computing and serverless, on cloud computing performance and also assess how artificial intelligence can optimize resource management and improve performance).
- **The introduction of Cloud computing in government services in Morocco** (as part of the digitization of government services, it is recommended that Cloud services be introduced in order to be efficient).
- **Future prospects** (Explore future trends in cloud computing and their potential impact on performance in the private and corporate sector).

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