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RESEARCH ARTICLE

Factors Affecting Cloud Computing Adoption in the Education Context–Systematic Literature Review

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ABSTRACT This systematic literature review investigates the factors influencing cloud computing adoption within both educational and organizational settings. By synthesizing a comprehensive body of research, this study finds and analyzes the determinants that shape the decision-making process about cloud technology adoption. Security, cost-effectiveness, scalability, interoperability, and regulatory compliance are examined across educational institutions and organizational contexts. Additionally, socio-economic, political, and technological factors specific to each context are explored to provide a nuanced understanding of the challenges and opportunities associated with cloud computing adoption. The review reveals commonalities and differences in adoption drivers and barriers between education and organizational environments, offering insights into tailored strategies for effective implementation. This research contributes to the existing literature by shedding light on the multifaceted nature of cloud adoption and offering valuable guidance for educators, organizational leaders, policymakers, and technology providers looking to use cloud computing to enhance operations and services.

INDEX TERMS Cloud computing adoption, cloud computing model, organizational adoption.

I. INTRODUCTION

Cloud computing is a revolutionary technology, it has redefined the interaction of companies and users with computing and data storage [1], [2]. Instead of depending on local servers and physical infrastructures, Cloud computing allows access to computing resources, such as storage, processing, and software, over the internet. This innovation has brought advantages, such as scalability, flexibility, and cost reduction, making it an indispensable tool for organizations worldwide. With the progress of networking and the widespread use of mobile devices, the adoption of cloud computing has brought about a significant transformation in the computing landscape, resulting in substantial social impact [3].

Cloud computing is a way of sharing computing resources in a virtual environment, where information and applications are stored and run on remote computing terminals, known as the ''cloud''. With Cloud computing, companies and organizations can access the computing resources they need without investing in their hardware and infrastructure.

Cloud computing involves using cloud-based solutions to meet an organization's computing needs. This adoption has grown in recent years, driven by the flexibility, savings, and innovation it offers. Most companies are currently using

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or adopting web services solutions to improve operational efficiency, reduce costs, and meet the demands of their customers.

Companies can choose from several Cloud computing infrastructure models based on their specific needs and requirements, as highlighted by [3] and [4]. Top models include:

- Private Cloud: In this model, the cloud infrastructure is dedicated exclusively to a single organization. It is ideal for companies that want to maintain tighter control over their data and applications to ensure greater security and compliance with specific regulations.
- Public Cloud: The public cloud is shared by multiple organizations and users and is managed by a cloud service provider. This model offers scalability, reduced costs, and easy accessibility, making it a popular option for companies looking for agility and flexibility.
- Hybrid Cloud: The hybrid cloud combines elements of private and public clouds, allowing integration between these environments. Companies that want to keep more sensitive data or applications in a private cloud while using the public cloud for other workloads often choose this approach.
- Community Cloud: In this scenario, the infrastructure is shared by several organizations with common interests or requirements. This model is commonly adopted in sectors such as governments or research institutions, where several entities must collaborate and share resources.

Cloud computing technology has substantially transformed how organizations access and use information technology resources. This innovative approach enables on-demand delivery of a wide range of services and resources over the Internet, eliminating the need to make significant investments in local physical infrastructure. A fundamental aspect in the classification of Cloud computing is the division of services into three main categories, as highlighted by [3], [5], and [6] Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS).

- IaaS, or Infrastructure as a Service, offers a flexible foundation for computing, storage, and networking resources, allowing organizations to build and manage virtual environments. This provides a scalable and customizable approach where companies can deploy and manage operating systems, applications, and databases according to their preferences.
- PaaS, or Platform as a Service, goes further, providing not only the infrastructure but also a set of tools and development environments for building, testing, and deploying applications. This enables agile and efficient development, allowing development teams to focus more on application logic and less on the underlying infrastructure.
- SaaS, or Software as a Service, is the layer most oriented towards end users. In this approach, the software is delivered via the cloud and accessed through web browsers, eliminating the need for local installations. This provides convenience and accessibility, allowing users to use applications from any device with an internet connection.

In summary, the division of Cloud computing into IaaS, PaaS, and SaaS represents a way to categorize and understand the various cloud-based service offerings. Each of these categories offers distinct approaches to meeting organizations' needs, from infrastructure flexibility to application development and software delivery, providing a wide range of options for taking full advantage of the benefits of the cloud.

The Financial, Information, and Communication Technology (ICT) and manufacturing sectors have stood out as pioneers in the adoption of Cloud computing at a global level. According to one study, these industries have an average of 7.24 cloud applications adopted per business unit, compared to an average of 5.4 applications for all industries [9]. A survey conducted in South Africa also indicates that the ICT sector leads the adoption of Cloud computing, with 54%, followed by the manufacturing sector at 47% and the financial sector at 33% [7]. This demonstrates the importance and growing relevance of Cloud computing in crucial sectors of the global economy.

In research on the adoption of web-based services in the financial sectors, as reported by [8], a study carried out by the Economist Intelligence Unit in 2016 highlighted that 74% of respondents indicated that Cloud computing will play a crucial role in the banking sector in the coming five years. This study also emphasized that emerging banking products and markets illustrate a harmonious coexistence between cloud computing and established business systems. In another investigation conducted by [8], it was explained that financial sectors, including banks, capital markets, insurance, pensions, and savings credit unions, have shown interest in joining Cloud computing.

Cloud computing has become increasingly common and relevant in various industry sectors and organizations worldwide, as highlighted by [9] and [10]. Cloud computing adoption models play a fundamental role in providing structures and guidelines that help companies understand, plan, and implement the transition to Cloud computing, as highlighted by [4].

Adopting cloud computing in the educational context is an increasingly important area, driven by the need to provide flexibility, efficiency, and accessibility to learning environments. Various factors influence this technological transition in educational institutions, focusing on available technological infrastructure, including broadband quality and hardware suitability. Financial aspects, such as costs and budgets, play a critical role in institutional decisions, although [11] noted a need for further research to identify adoption-influencing factors.

Information security, particularly concerning sensitive student data, is a crucial factor. Additionally, the capacity to integrate with existing systems, considerations of elements like remote access and mobility, and the importance of training to empower the educational community are crucial

aspects to be examined. Therefore, education has evolved from being confined to the four walls of a classroom to a more flexible online environment using cloud computing technology [11].

Previous studies on cloud computing adoption have highlighted various advantages of using this technology in Higher Education Institutions (HEIs), especially in developed countries, and the technology is rapidly growing, enhancing the performance of HEIs worldwide [11].

In developing countries, adopting cloud computing in education is an opportunity to achieve literacy goals and provide quality education with minimal investments [12]. Also is identified that the education sector faces the greatest challenge in delivering quality and extensive education to the remote parts of the nation.

In their quantitative study [13], notable factors and sub-factors relevant to cloud computing adoption in Ethiopian Higher Education were explored using Technology-Organization-Environment (TOE) models and the Diffusion of Innovation Theory (DOI). The quantitative study involved a questionnaire with 500 respondents related to four factors: Technological, Organizational, Environmental, and Sociocultural.

These models represent theoretical and practical approaches to understanding and evaluating the different stages and factors involved in the adoption of cloud technologies. They provide a set of concepts, strategies, and metrics that help companies make informed and strategic decisions regarding the use of the cloud as part of their technological infrastructure. In the literature, there are several Cloud computing adoption models available. Each model offers a unique perspective on the aspects involved in cloud adoption, ranging from cost-benefit analysis to considerations related to security, governance, risk management, and organizational aspects, as highlighted by [4], [14], and [15].

These models are based on essential theories and principles that help understand the factors that influence the decision to adopt Cloud computing, as well as determine the best way to implement it. Several theories play a crucial role in this context, including:

- Diffusion of Innovations Theory (DOI), proposed by Rogers in 1962, which explores how innovations spread and are adopted by different groups of users [16].
- The Technology Acceptance Model (TAM), developed by Davis in 1989, focuses on the acceptance of new technologies based on the user's perception of their usefulness and ease of use [17].
- Unified Technology Acceptance and Use Model (UTAUT), created by Venkatesh et al. in 2003, which integrates multiple theories to predict technology adoption and use [18].
- Unified Technology Acceptance and Use Model 2 (UTAUT2), an improved version of (UTAUT), developed by Venkatesh et al. in 2012, which considers social and cultural factors in technology adoption [18].
- The Adoption Maturity Model (MMA), proposed by Moore in 2014, describes different stages of maturity in the adoption of innovative technologies [19].

In addition to these theories, some other theories and approaches contribute to understanding the adoption of Cloud computing and its impact on organizations. These models and theories provide a solid foundation for research and practice related to cloud technology adoption.

These models can vary significantly in terms of complexity, scope, and focus. Some models are more oriented toward cloud adoption's economic and financial assessment, while others prioritize risk and security analysis. Furthermore, the applicability of models may vary, with some being more generic and suitable for a wide range of sectors and organizations, while others are more specific and targeted at contexts or market segments. This diversity of models allows companies to choose the one that best suits their specific needs and circumstances, providing a personalized approach to cloud technology adoption, as discussed by [4] and [15].

Using these models provides companies with a robust framework to analyze various aspects related to the adoption of Cloud computing. This includes the ability to identify the specific requirements and challenges of your operations, as well as define migration and implementation strategies that suit your unique needs. Furthermore, these models help to anticipate and mitigate potential problems and obstacles that may arise during the cloud adoption process.

Another crucial benefit is the ability to evaluate the Return on Investment (ROI) and expected benefits of cloud adoption. This allows companies to make informed and strategic decisions about the transition to Cloud computing, ensuring that investments in technology are effective and aligned with business objectives.

Models play an essential role in providing companies with the tools necessary for a structured and informed approach to adopting cloud computing. They help optimize results and minimize the risks associated with this technological transformation. Cloud computing adoption models are fundamental in guiding organizations during the transition process to Cloud computing. They offer frameworks and approaches that enable comprehensive and systematic analysis, helping to make informed and strategic decisions to maximize the benefits and minimize the risks associated with cloud adoption.

This systematic literature review will explore fundamental research questions related to companies' adoption of cloud computing. The research aims to deepen the understanding of the factors that influence the adoption process of this web-based technology. The research questions address the possibility of representing this process through a conceptual model considering internal and external variables (H1). Furthermore, the review will investigate which existing technology adoption models and frameworks suit web-based technology adoption (H2). The potential factors associated with the adoption process of Cloud computing

by companies (H3) and those that can contribute positively to the success of this adoption (H4) will also be explored. The objective is to provide valuable insights for professionals and researchers interested in the effective implementation of Cloud computing in organizations.

II. MATERIALS AND METHODS

Investigating Cloud computing adoption models requires the use of appropriate data and methods to obtain significant insights into the influencing factors and adoption processes of this technology. These data and research methods are fundamental to obtaining an in-depth understanding of organizations' decisions and behaviors regarding the adoption of Cloud computing. Next, we will discuss the materials and methods commonly used in this area of study.

A systematic literature review aims to collect empirical data that meet qualification criteria, striving to answer a research question, by employing techniques and routines to minimize bias and seeking plausible and reliable results [20], [21].

Conducting a systematic literature review is a comprehensive and structured process that aims to thoroughly explore what existing research has to say about a specific topic, using protocols as a basis for support.

PRISMA 2020, an acronym for "Preferred Reporting Items for Systematic Reviews and Meta-Analyses", is a protocol and checklist widely recognized and adopted in scientific research, particularly in systematic literature reviews and meta-analyses. PRISMA 2020 was developed to improve the quality and transparency of the preparation and presentation of these studies, providing a structured guide for researchers [22].

The PRISMA 2020 protocol guides researchers through all stages of conducting a systematic review, from developing a well-defined research question to selecting studies, extracting data, assessing the quality of evidence, and presenting results in a format standardized.

These guidelines have played a crucial role in promoting quality and rigor in scientific research, facilitating replication, critical evaluation, and synthesis of evidence, thus contributing to significant advances in knowledge in several areas. In this context, PRISMA 2020 has become an essential tool for researchers and professionals seeking to conduct systematic reviews and meta-analyses robustly and transparently.

This systematic literature review uses the PRISMA 2020 checklist, which is a checklist that covers a series of essential items that must be included in the preparation and presentation of systematic reviews and meta-analyses. These items range from the clear formulation of the research question to the synthesis and presentation of results. The main objective of the PRISMA 2020 checklist is to ensure the quality, consistency, and transparency in the reports of these studies, making them more accessible and understandable to other researchers, health professionals, and the scientific community in general.

By following the PRISMA 2020 checklist, investigators can improve the quality of their systematic reviews and meta-analyses, contributing to the reliability and usefulness of this evidence in clinical decision-making and advancing knowledge across diverse disciplines. It is an essential tool to ensure that research is conducted in a structured manner and with the highest quality standards.

To begin the investigation, we established the records search strategy. In this context, use the content of records available in the following three specific repositories or, if necessary, we can include a relevant specific record from another repository, as shown in Table 1.

TABLE 1. List of online repositories.

Repositories
Elsevier - https://www.elsevier.com
Google Scholar - https://scholar.google.com
IEEE Xplore - https://ieeexplore.ieee.org
ResearchGate - https://www.researchgate.net
Semantic Scholar - https://www.semanticscholar.org
Springer - https://www.springer.com

TABLE 2. Keywords used in the investigation.

Keywords used in the investigation
"cloud computing adoption"
"organizational adoption"
"cloud computing model"

It is worth mentioning that the process of defining these search keywords is iterative and involves several cycles of experimentation, review of the records found, and search refinement. This iterative process is essential to improve the robustness of the search and retrieve the most pertinent primary records, as outlined by [20] in Table 2.

The research was carried out using Harzing's Publish or Perish - Version 8 application, available for download at: [https://harzing.com/resources/publish-or-perish/windows], the Publish or Perish software is widely used for research, citation analysis, and impact assessment of academic publications.

Therefore, in our investigation, a limit of 500 results per keyword was used and a time range from the years 2017 to 2022, the investigation found 1500 records, 500 records for each search (keyword), and the 1500 records were imported into the Zotero application - Version 6.0.30 available for download at: [https://www.zotero.org/download].

When records were analyzed, 65 were duplicates, and 1 record was retracted by Fake Peer Review, Fake Peer Review is an unethical practice in which individuals or groups attempt to influence or manipulate the peer review process

in academic publications way deceptively and dishonestly. This involves creating fictitious peer reviews or engaging fake reviewers to benefit a particular author or group of authors. Therefore, only 1434 records remained from the initial search.

The records were analyzed according to the guidelines of the systematic literature review protocol prepared by the first researcher. In Table 3 we can see the total number of records found.

TABLE 3. Records found in the repositories.

Repository	Result
Elsevier - https://www.elsevier.com	119
Google Scholar - https://scholar.google.com	9
IEEE Xplore - https://ieeexplore.ieee.org	173
ResearchGate - https://www.researchgate.net	66
Semantic Scholar - https://www.semanticscholar.org	12
Springer - https://www.springer.com	158
Other repositories	895
Total	**1434**

The first step in preparing the analysis of the data was to export the information to a spreadsheet, reading to read reading to read the titles, abstracts, and conclusions.

The second was separating the records by repositories, 119 records are from the Elsevier publisher, 9 records are from the Google Scholar, 173 records are from the IEEE Xplore publisher 66 are from the ResearchGate, 12 are from the Semantic Scholar, 158 records are from the Springer publisher, and 895 from other repositories, and a thorough analysis of records and eligibility was carried out using the Inclusion and Exclusion criteria.

After completion, it was essential to establish the criteria that would be used for the selection and exclusion of identified records. The purpose of defining these criteria is to identify primary studies that provide direct evidence in response to the research questions [21].

The inclusion and exclusion criteria of the systematic literature review represent the specific conditions established for the selection and rejection of relevant studies during the analysis process. These criteria are determined during the review planning phase and their main objective is to ensure the accuracy and reliability of the results obtained.

Inclusion criteria are the requirements that studies must meet to be considered relevant to the research question under analysis. They stipulate the characteristics of the studies that will be taken into consideration for the final selection, such as the type of study, the target population, the interventions or exposures analyzed, as well as the outcomes of interest [20].

These criteria are fundamental to maintaining consistency and impartiality in the process of selecting studies to be analyzed, thus avoiding possible biases in the review and ensuring that only pertinent and high-quality studies are considered to provide a reliable answer to the research question in question.

Inclusion and exclusion criteria play a key role in the PRISMA 2020 Protocol, which refers to the widely recognized guidelines for conducting systematic reviews and meta-analyses. These criteria are sets of predefined rules that researchers establish to determine which studies will be considered in the review (inclusion) and which will be excluded from the scope of the analysis.

Inclusion criteria are the requirements or conditions that a study must meet to be considered relevant for the review. They are usually related to the research question and objectives of the review. Inclusion criteria help ensure that selected studies are relevant and contribute to answering established research questions.

On the other hand, exclusion criteria define the conditions that make a study unsuitable for review. This may include studies that do not meet quality requirements, are not available in a specific language, or do not address the topics relevant to the research.

Careful definition and consistent application of inclusion and exclusion criteria are essential for the objectivity and integrity of the systematic review. By following the established criteria, researchers seek to avoid bias in study selection and ensure that the review is conducted in a transparent and evidence-based manner. Therefore, inclusion and exclusion criteria play a crucial role in the PRISMA 2020 Protocol, helping to direct the review process and ensure the quality of results.

The coding used to inclusively evaluate the records found is presented in Table 4.

TABLE 4. Inclusion criteria codes.

Criteria/Code	Description of inclusion criteria
CI-01	Studies that used some type of Cloud computing adoption model or mention Cloud computing technology.
CI-02	Studies that used or reference Cloud computing adoption models and factors that influence the adoption of Cloud computing and theories used in developing a Cloud computing adoption model.
CI-03	Studies have as one of their objectives Cloud computing adoption models to support adoption decision-making.
CI-04	Studies recent, no more than six years old, namely published between 2017 and 2022, and which already have approval by the scientific community.

The coding used to exclusively evaluate the records found is shown in Table 5.

Exclusion can use only one criterion, while inclusion uses at least two criteria, upon completing the record search and selection, a set of records was chosen, and these records formed the basis for subsequent steps in the systematic literature review protocol. One of the crucial steps is the assessment of the quality of these records, which plays a fundamental role in improving the accuracy of data extraction

TABLE 5. Exclusion criteria codes.

Criteria/Code	Description of exclusion criteria
CE-01	Studies that do not use a Cloud computing adoption model.
CE-02	Studies that do not have as one of their objectives a Cloud computing adoption model to support adoption decision-making.
CE-03	Systematic review studies that do not belong to the three research repositories.
CE-04	Studies that are not written in Portuguese or English.
CE-05	Studies that are not fully available in the databases searched.
CE-06	Studies without the year of publication, do not address classic concepts related to the area of interest of this systematic review.
CE-07	Repeated studies: if the same study is available in different databases, only the first research will be considered.
CE-08	Studies that are irrelevant to the research, according to the research questions presented, and articles that are not in English and/or Portuguese.
CE-09	Studies that do not answer any of the research questions.
CE-10	Studies that present incomplete text, content, and results.

results, thus contributing to the credibility of the results obtained.

Quality criteria play a key role in conducting a systematic literature review. This rigorous methodological approach is used to synthesize and evaluate the available evidence in each field of research, becoming an important component in making informed decisions. Therefore, establishing solid quality criteria is essential to ensure the credibility and reliability of the results of a systematic review.

Below, we highlight some of the main quality criteria that researchers should consider when conducting a systematic literature review, as shown in Table 6.

TABLE 6. Quality criteria codes. source.

Criteria/Code	Description of the quality criterion
CQ-01	Was the article written with coherence and textual cohesion?
CQ-02	Were the methods or techniques reported objectively?
CQ-03	Was the use of a system explicitly mentioned?
CQ-04	Are there practical applications described in detail?

After analyzing all records, using the inclusion and exclusion criteria, we arrived at the following result of records by repositories as shown in Table 7.

It is recommended at this stage to pay careful attention to the terms used in the PRISMA 2020 Protocol, and, to facilitate this observation, the authors provide a glossary containing the terms used, as seen in Table 8.

TABLE 7. Records found in repositories for analysis and data extraction.

Repository	Result
Elsevier - https://www.elsevier.com	2
Google Scholar - https://scholar.google.com	1
IEEE Xplore - https://ieeexplore.ieee.org	9
ResearchGate - https://www.researchgate.net	3
Semantic Scholar - https://www.semanticscholar.org	1
Springer - https://www.springer.com	9
Total	**25**

TABLE 8. Glossary of PRISMA 2020 terms.

PRISMA 2020 Glossary of Terms
Systematic Review: a review that uses explicit and systematic methods to compare and synthesize the results of studies that present a formulated question.
Statistical Synthesis: the combination of two or more studies with quantitative results. This encompasses effect estimation meta-analyses (described below) and other methods such as P values, calculating the range and distribution of observed effects, and counting votes based on the direction of the effect.
Meta-Analysis of Effect Estimates: a statistical technique used to synthesize results when study effect estimates and their variances are available, producing a quantitative summary of results.
Outcome: a fact or measure collected from study participants (such as quality of life, mortality).
Results (Result): the combination of a point estimate (such as a mean difference, risk ratios, or proportion) and a measure of its precision (such as a confidence/credibility interval) for a specific effect.
Report: a document (paper or electronic) providing information about a particular study. It may be a journal article, preprint, event summary, study registry entry, clinical study report, dissertation, unpublished article, government report, or any other document containing relevant information.
Record: the title or summary (or both) of a report indexed in a database or website (such as, for example, a title or summary of an article indexed in Medline). Records that refer to the same report (e.g., the same journal article) are "duplicates," however, records that refer to reports that are merely similar (e.g., a similar summary submitted at two different events) should be considered unique.
Study: an investigation, such as a clinical trial, which includes a defined group of participants and one or more interventions and outcomes. A "study" can have multiple reports. For example, reports may include the protocol, statistical analysis plan, baseline characteristics, results for primary effects, harm results, results for secondary effects, and results for additional mediator and moderator analyses.

The PRISMA 2020 Glossary of Terms is an essential tool for those involved in systematic reviews and meta-analyses. The glossary provides a detailed understanding of specific terms used in the context of PRISMA 2020, allowing for accurate implementation of the guidelines and promoting quality and consistency in the conduct

of these studies. By clearly and concisely addressing the fundamental concepts of PRISMA 2020, the glossary serves as a valuable resource for researchers, academics, and professionals seeking to improve the rigor and transparency of their systematic reviews and meta-analyses of PRISMA (n. d.).

Before beginning the drafting process, it is highly recommended to consult the PRISMA 2020 Protocol, as a prospective analysis of the components of this protocol can ensure that all essential elements are adequately addressed [23]. PRISMA 2020 includes a Checklist made up of seven sections and twenty-seven sub-items (as illustrated in Table 9), as well as a Flowchart, as seen in Table 11.

If the researcher has any questions about the elements that make up Table 10, he or she has the option of consulting an Expanded Checklist, which is available on the PRISMA2 Protocol website. This list provides a more detailed explanation of these items. It is then displayed in Table 10 with the recommended elements for use in the summary of a systematic literature review.

In addition to the checklists mentioned, the PRISMA 2020 Protocol offers a PRISMA 2020 Flowchart) that assists researchers in organizing the steps necessary to conduct a Systematic Review. This diagram is available on the PRISMA 2020 Protocol website, which you can request by clicking on the link. [http://prisma-statement.org/prismastatement/flowdiagram], where it can be downloaded in an editable and fillable format (Microsoft Word). Additionally, the protocol offers variations of this diagram, allowing adaptations according to the specific needs of different types of systematic reviews.

The PRISMA 2020 flowchart is a visual representation of the steps that must be followed when conducting a systematic literature review with the Protocol [22]. This flowchart is designed to assist researchers in organizing the review process and transparently presenting the workflow. It typically begins with the initial identification of many studies relevant to the research. As the process progresses, it shows the three steps which are: Identification, Screening, and Inclusion of the records, based on pre-defined criteria, it also illustrates the reason for excluding studies, if applicable. This graphical representation is valuable for demonstrating the transparency of the review process and for helping readers understand how studies were selected and included in the analysis. It is particularly useful in systematic reviews and meta-analyses, where clarity of the selection process is essential for the validity of the results.

In summary, the PRISMA 2020 flowchart is a visual tool that is part of the PRISMA 2020 Protocol guidelines and helps document the workflow when conducting systematic reviews, promoting transparency and quality in research. according to Figure 1.

After analyzing the titles, summaries, and conclusions of the 472 records, the column called ‘‘Exclusion Criteria’’ was filled in in the Microsoft Excel file to categorize the excluded

TABLE 9. PRISMA 2020 checklist.

Section - topic	N.	Checklist item	Reported on page no.
Title			
Title	1	Identify the article as a systematic review, meta-analysis, or both.	1
Abstract			
Structured summary	2	Present a structured summary including, if applicable: theoretical framework; goals; data source; eligibility criteria; participants and interventions; evaluation of the study and synthesis of methods; results; limitations; conclusions and implications of the main findings; systematic review registration number.	1
Introduction			
Rational	3	Describe the rationale for the review in the context of what is already known.	1
Goals	4	Present an explicit statement about the issues addressed concerning participants, interventions, comparisons, outcomes, and study design (PICOS).	1
Methods			
Protocol and registration	5	Indicate whether a review protocol exists, if and where it can be accessed (e.g. email address), and, if available, provide information about the review record, including the registration number.	5
Eligibility Criteria	6	Specify study characteristics (e.g. PICOS, length of follow-up) and report characteristics (e.g. years considered, language, whether published) used as eligibility criteria justification justifying,	6
Information sources	7	Describe all sources of information in the search (e.g. database with coverage dates, contact with authors to identify additional studies) and date of the last search.	4
Search	8	Present the complete electronic search strategy for at least one database, including the limits used, in a way that can be repeated.	5
Study selection	9	Present the study selection process (i.e. search, eligibility, those included in the systematic review, and, if applicable, those included in the meta-analysis).	5
Data collection process	10	Describe the method of extracting data from records (e.g. forms for pilot, independent, in duplicate) and all processes for obtaining and confirming data from researchers.	5

TABLE 9. *(Continued.)* **PRISMA 2020 checklist.**

List of data	11	List and define all variables obtained from the data (e.g. PICOS, funding sources) and any references or simplifications made.	4
Risk of bias in each study	12	Describe the methods used to assess the risk of bias in each study (including specifying whether it was done during the study or at the outcome level), and how this information was used in data analysis.	4
Summarizatio n measures	13	Define the main results summary measures (e.g. relative risk, average difference).	4
Summary of results	14	Describe the methods of analyzing data and combining results from studies, if performed, including consistency measures (e.g., I^2) for each meta-analysis.	4
Risk of bias between studies	15	Specify any assessment of risk of bias that may influence the cumulative evidence (e.g. publication bias, selective reporting in studies).	4
Additional analysis	16	Describe additional analysis methods (e.g., sensitivity analysis or subgroup analysis, meta-regression), if performed, indicating which were pre-specified.	4
Results			
Study selection	17	Present numbers of studies screened, assessed for eligibility, and included in the review, reasons for exclusion at each stage, preferably through a flow chart.	10
Characteristic s of the studies	18	For each study, present characteristics for data extraction (e.g. study size, PICOS, follow-up period) and present the citations.	10 to 12
Risk of bias in each study	19	Present data on the risk of bias in each study and, if available, any assessment of results (see item 12).	10
Results of individual studies	20	For all results considered (benefits or risks), present for each study: (a) simple summary of data for each intervention group and (b) estimated effects and confidence intervals, preferably using forest plots.	11
Summary of results	21	Present results for each meta-analysis performed, including confidence intervals and consistency measures.	11
Risk of bias between studies	22	Present results of the risk of bias assessment between studies (see item 15).	5
Additional analysis	23	Present results of additional analyses, if performed (e.g. sensitivity or subgroup analysis, meta-regression [see item 16]).	4
Discussion			
Summary of the evidence	24	Summarize the main results, including the strength of evidence for each result; consider its relevance to key groups (e.g. healthcare professionals, users, and policymakers).	28
Limitations	25	Discuss limitations at the study and outcome level (e.g., risk of bias) and the review level (e.g., incomplete retrieval of identified research, reporting bias).	30 and 31
Conclusions	26	Present the overall interpretation of the results in the context of other evidence and implications for future research.	30
Financing			
Financing	27	Describe sources of funding for the systematic review and other supports (e.g. data supply), and the role of funders in the systematic review.	1 and 31

records, resulting in the selection of 25 records for detailed reading, as shown in Table 11.

III. RESULTS

Upon completing the record search and selection, a set of records was chosen, and these records will form the basis for subsequent steps of the systematic literature review. One of the crucial steps is the assessment of the quality of these records, which plays a fundamental role in improving the accuracy of data extraction results, thus contributing to the credibility of the results obtained. Continuing the analysis of the selected records, we identified the years in which the records were published. In Figure 1 we can see the total number of records selected and published for each year of publication.

Table 12 lists the records selected for data extraction. It is important to highlight that data extraction must be carried out carefully, discriminating relevant points, such as the title of the article, the authors, the year of publication, the country of origin of the article, the type of publication (for example, whether it was presented in a congress, conference or if it is a book chapter), among other details. In this systematic literature review, the following fields in Table 14 will be used: Author, Title, and Publication, as recommended by [20].

To better understand the importance and credibility of the analyzed records, the number of Citations that the 25 records had was also verified, and the fields were used: Author, Year, and Citation [20], in Table 13, we can observe them.

In Table 14, we can observe the Typification (article publication type), the following fields: Author, Year, and Typification were used in this Table [20].

The research questions H1, H2, H3, and H4 were investigated in the context of a systematic literature review,

TABLE 10. PRISMA 2020 checklist for summaries.

Section/topic	N.	Checklist item for a summary	Mentioned (Yes/No)
Title			
Title	1	Identify the report as one revision systematic.	**Yes**
Context			
Goals	2	Provide one registration explicit of the) goals) or question(s) main(s) that the review addresses.	Yes
Methods			
Criteria in Eligibility	3	Specify the criteria for inclusion and exclusion for the revision.	Yes
Sources of information	4	Specify the sources in information (per example, based on data and records) used for identifying your studies and the date on which each _ was searched for the last turn.	Yes
Bias risks	5	Specify the methods used to assess your scratches in biases in the studies included.	Yes
Syntheses of Results	6	Specify the methods used to present synthesized results.	Yes
Results			
Studies included	7	Introduce O number total in studies participants included It is summarizing your characteristics relevant.	**No**
Synthesis of the Results	8	Introduce your results for all your effects, preferably indicating the O number in studies included It is participants for each one. If one meta-analysis was carried out, reports The I estimated summarized It is O interval in trust/credibility. If you are comparing groups, indicate The direction of the results (for example, which group is favored).	**No**
Discussion			
Limitations of the evidence	9	Provides a summary of the limitations of the evidence included in the review (e.g., study risk of bias, inconsistency, and imprecision).	Yes
Interpretation	10	Provides a general interpretation of the results and important implications.	**No**
Others			
Financing	11	Specifies the main source of funding for the review.	Yes
Registration	12	Indicates the name and registration number.	No

TABLE 11. Listing of the quality of the records using the complementary criteria.

Criteria/Code	Quality description	Total
CQ-01	Was the article written with coherence and textual cohesion?	13
CQ-02	Were the methods or techniques reported objectively?	11
CQ-03	Was the use of a system explicitly mentioned?	1
CQ-04	Are there practical applications described in detail?	0

and the results obtained allow us to reach the following conclusions.

a) Adoption of Cloud Computing In an Educational Context

The adoption of cloud computing resources represents a valuable contribution to the educational landscape, promoting significant advances in how educational institutions operate. Cloud computing offers a flexible and scalable infrastructure, allowing schools, universities, and other educational entities to access high-quality computing resources without the need for heavy investments in local hardware and infrastructure.

This innovation in cloud service adoption provides substantial benefits, such as improving accessibility to advanced technologies, promoting collaboration among students and teachers, and facilitating efficient management of educational data and applications. In this context, the adoption of cloud computing plays a crucial role in reducing technological disparities and empowering educational institutions to offer more dynamic and personalized learning experiences.

We will explore how the adoption of cloud computing transforms the educational landscape, driving innovation, efficiency, and equal access to technological tools, thereby creating an environment conducive to educational development and student success.

Teachers play a significant role in the adoption of cloud computing in universities. The successful implementation of this technology often requires the collaboration and active involvement of educators. Here are some ways in which teachers can influence the adoption of cloud computing in universities:

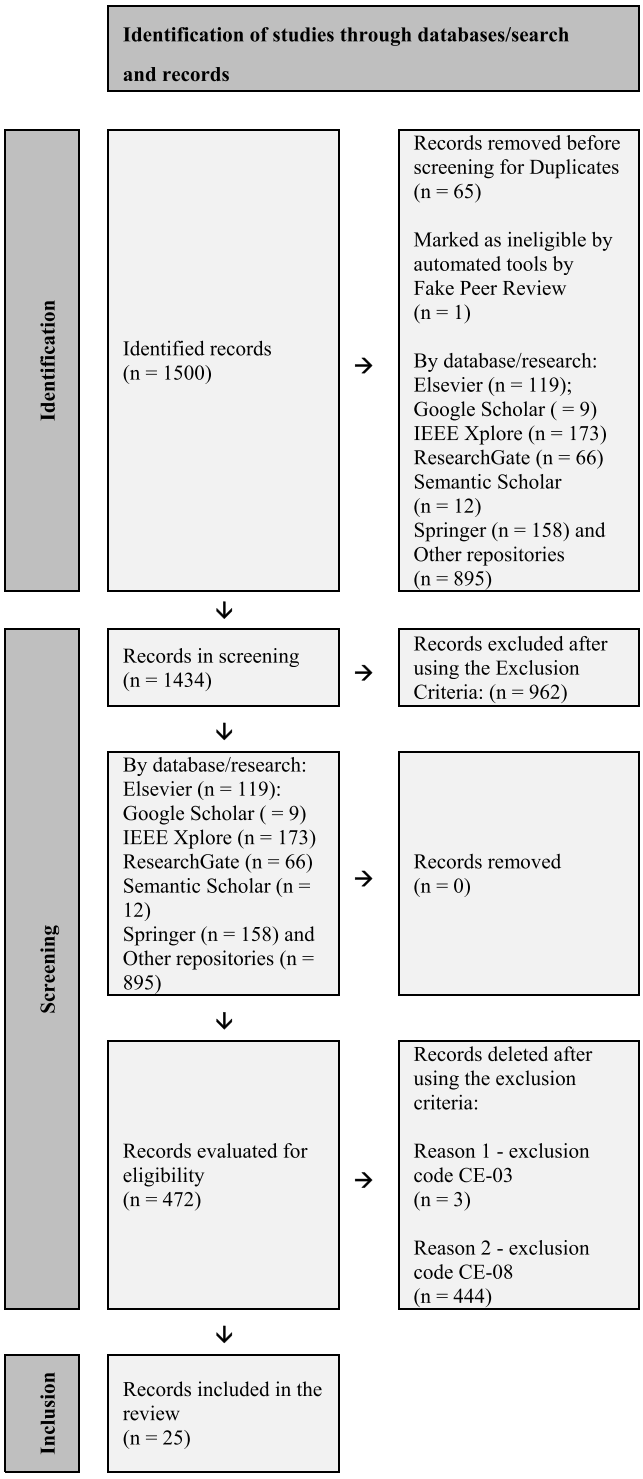

FIGURE 1. Prisma flowchart.

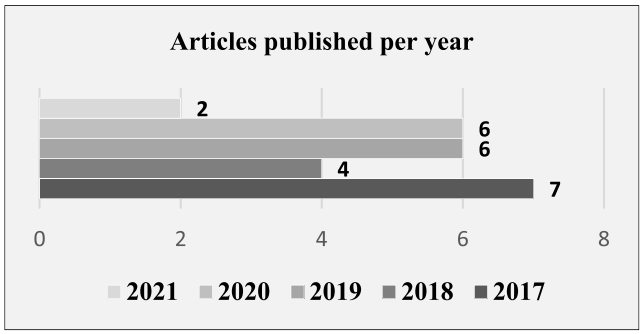

FIGURE 2. Listing of selected records by year of publication.

Training and Education:

- Teachers familiar with the benefits and operation of cloud computing are more likely to integrate these technologies into their teaching practices.
- Training programs that empower teachers to effectively use cloud solutions can increase the acceptance and adoption of these technologies.

Curricular Integration:

- Teachers can incorporate cloud-based tools into their lesson plans, making them an integral part of the educational process.
- Adopting cloud platforms for storage, collaboration, and content distribution can transform students' learning experiences.

Collaboration and Sharing:

- By encouraging online collaboration and sharing educational resources through cloud platforms, teachers can demonstrate how these technologies can improve efficiency and communication within the academic community.

Feedback and Assessment:

- Teachers can provide feedback on cloud solutions, identify improvement opportunities, and promote the selection of tools that best meet educational needs.

Gradual Adoption:

- Initiating cloud computing adoption gradually, with small pilot projects, allows teachers to become accustomed to new technologies before widespread implementation.

Security Awareness:

- Educating teachers about secure cloud computing practices is essential to ensure the proper protection of educational data.

It is important to note that technological advancement in cloud computing adoption is more evident in private universities than in public universities, as observed in the study conducted by [11]. Furthermore, cloud learning environments ensure more interactions between students and teachers, promoting creativity in learning. Consequently, cloud computing technology enables students to learn, collaborate, exercise flexibility, productivity, and creativity, and engage in self-organized activities, problem-solving, communication, and knowledge sharing through virtual peer review.

In the research conducted by [12], it was concluded that in developing countries, adopting cloud computing in education is an opportunity to achieve literacy goals and provide quality education throughout India with minimal investments.

TABLE 12. List of records for data extraction.

Author	Title	Publication
Abied, O., Ibrahim, O., & Mat Kamal, SN-I. (2021).	Proposing a conceptual model for Cloud computing adoption in the Libyan E-government	International Conference on Web Research (ICWR)
Alassafi, M.O., AlGhamdi, R., Alshdadi, A., Al Abdulwahid, A., & Bakhsh, S.T. (2019).	Determining factors to cloud security adoption framework in government organizations: an exploratory study	IEEE Explorer
Al-Badi, A., Tarhini, A., & Al-Qirim, N. (2018).	Risks in adopting Cloud computing: a proposed conceptual framework	Celtic 2018, London, UK
Alharbi, F., Atkins, A., & Stanier, C. (2017a).	Cloud Computing Adoption in healthcare organizations: a qualitative Study in Saudi Arabia	Transactions on Large-Scale Data- and Knowledge-Centered Systems
Alharbi, F., Atkins, A., & Stanier, C. (2017b).	Decision makers' views of factors affecting Cloud computing adoption in Saudi healthcare organizations	2017 International Conference, Brussels, Belgium
Al-Sharafi, M.A., AlAjmi, Q., Al-Emran, M., Qasem, YAM, & Aldheleai, Y.M. (2021).	Cloud computing adoption in higher education: An integrated theoretical model	Recent Advances in Technology Acceptance Models and Theories
Asadi, Z., Abdekhoda, M., & Nadrian, H. (2019).	Cloud computing services adoption among higher education faculties: development of a standardized questionnaire	Education and Information Technologies
Bhuyan, S., & Dash, M. (2018).	Exploring Cloud computing adoption in private hospitals in India: An investigation of DOI and TOE model	Journal of Advanced Research
Đorđević, D., Ćoćkalo, D., Bakator, M., Bogetić, S., Vorkapić, M., & Bešić, C. (2020).	A Cloud computing Model for achieving competitiveness of domestic enterprises	Proceedings of the 5th International Conference on the Industry 4.0 Model for Advanced Manufacturing
Gupta, H., & Kumar, D. (2019).	Security threats in Cloud computing	International Conference on Information and Communication Technology Convergence (ICTC)
Hassan, H. (2017).	Organizational factors affecting Cloud computing adoption in small and medium enterprises (SMEs) in the service sector	Procedia computer science
Hiran, K. K., & Henten, A. (2019).	An integrated TOE-DOI framework for Cloud computing adoption in the higher education sector: a case study of Sub-Saharan Africa, Ethiopia	International Journal of System Assurance Engineering and Management
Jaradat, MIRM, Ababneh, HT, Faqih, KM and Nusairat, NM (2020).	Exploring Cloud computing adoption in higher educational environments: an extension of the UTAUT model with confidence	International Journal of Sciences
Ngqondi, T., Kalipa, L., Mauwa, H., & Bembe, M. (2019).	A Cloud computing adoption model for the South African police services (SAPS)	Open Innovations Conference (OI)
Oredo, J., Njihia, J., & Iraki, X. (2019).	Institutional Pressures and Cloud computing: The moderating effect of organizational mindfulness	2019 IST-Africa Week Conference
Oredo, J., Njihia, J., & Iraki, X. N. (2017).	Cloud computing adoption in Kenya's financial sector: An institutional perspective	2017 IST-Africa Week Conference
Priyadarshinee, P., Raut, R. D., Jha, M. K., & Kamble, S. S. (2017).	A Cloud computing adoption in Indian SMEs: Scale development and validation approach	The Journal of High Technology Management Research
Rahman, M. M., Suhaimi, A., & Shah, A. (2018).	A model of factors influencing Cloud computing adoption among faculty members and students of higher educational institutions in Bangladesh	International Conference on Data Science and Advanced Analytics (DSAA)
Saleh, Abdulnoor (2019).	Cloud computing adoption model in higher education institutions	Universiti Tenaga Nasional (UNITEN)
Sayginer, C., & Ercan, T. (2020).	Understanding determinants of Cloud computing adoption using an integrated diffusion of innovation (DOI)-technological, organizational, and environmental (TOE) model	Humanities & Social Sciences Reviews
Shahzad, F., Xiu, G., Khan, I., Shahbaz, M., Riaz, M. U., & Abbas, A. (2019).	The moderating role of intrinsic motivation in Cloud computing adoption in online education in a developing country: a structural equation model	Asia Pacific Education Review
Singh, M., & Srivastava, V. M. (2018).	An analysis of key challenges for adopting Cloud computing in the Indian education sector	Advances in Computing and Data Sciences, 5th International Conference, ICACDS 2021
Sohaib, O., & Naderpour, M. (2017).	decision-making on the adoption of Cloud computing in e-commerce using fuzzy TOPSIS	IEEE International Conference on Communications (ICC)
Wan Mohd Isa, W.A.R., Hakim Suhaimi, A.I., Noordin, N., Fathiyah Harun, A., Ismail, J., & Awang Teh, R. (2019).	Cloud computing adoption reference model	Indonesian Journal of Electrical Engineering and Computer Science
Yang, H.-S., & Yoo, S.-J. (2015).	A study on smart work security technology based on the Cloud computing environment	Wireless Personal Communications

TABLE 13. Citations from the analyzed records.

Author	Year	Citations
Hiran, K. K., & Henten, A. (2019).	2019	83
Priyadarshinee, P., Raut, R. D., Jha, M. K., & Kamble, S. S. (2017).	2017	79
Hassan, H. (2017).	2017	62
Asadi, Z., Abdekhoda, M., & Nadrian, H. (2019).	2020	53
Shahzad, F., Xiu, G., Khan, I., Shahbaz, M., Riaz, M. U., & Abbas, A. (2019).	2020	46
Sohaib, O., & Naderpour, M. (2017).	2017	26
Sayginer, C., & Ercan, T. (2020).	2020	26
Jaradat, MIRM, Ababneh, HT, Faqih, KM and Nusairat, NM (2020).	2020	25
Alharbi, F., Atkins, A., & Stanier, C. (2017a).	2017	18
Alharbi, F., Atkins, A., & Stanier, C. (2017b).	2017	15
Bhuyan, S., & Dash, M. (2018).	2018	13
Gupta, H., & Kumar, D. (2019).	2019	13
Wan Mohd Isa, W.A.R., Hakim Suhaimi, A.I., Noordin, N., Fathiyah Harun, A., Ismail, J., & Awang Teh, R. (2019).	2019	10
Al-Sharafi, M.A., AlAjmi, Q., Al-Emran, M., Qasem, YAM, & Aldheleai, Y.M. (2021).	2021	8
Yang, H.-S., & Yoo, S.-J. (2015).	2017	7
Alassafi, M.O., AlGhamdi, R., Alshdadi, A., Al Abdulwahid, A., & Bakhsh, S.T. (2019).	2019	7
Al-Badi, A., Tarhini, A., & Al-Qirim, N. (2018).	2018	7
Rahman, M. M., Suhaimi, A., & Shah, A. (2018).	2018	6
Oredo, J., Njihia, J., & Iraki, X. N. (2017).	2017	5
Oredo, J., Njihia, J., & Iraki, X. (2019).	2019	5
Đorđević, D., Ćoćkalo, D., Bakator, M., Bogetić, S., Vorkapić, M., & Bešić, C. (2020).	2020	4
Abied, O., Ibrahim, O., & Mat Kamal, SN-I. (2021).	2021	3
Singh, M., & Srivastava, V. M. (2018).	2018	2
Ngqondi, T., Kalipa, L., Mauwa, H., & Bembe, M. (2019).	2019	1
Saleh, Abdulnoor (2019).	2019	0

TABLE 14. Typification of analyzed records.

Author	Year	Typification
Alassafi, M.O., AlGhamdi, R., Alshdadi, A., Al Abdulwahid, A., & Bakhsh, S.T. (2019).	2019	Article for digital library
Priyadarshinee, P., Raut, R. D., Jha, M. K., & Kamble, S. S. (2017).	2017	Article for a scientific journal
Hiran, K. K., & Henten, A. (2019).	2019	Article for a scientific journal
Alharbi, F., Atkins, A., & Stanier, C. (2017a).	2017	Article for a scientific journal
Wan Mohd Isa, WAR, Hakim Suhaimi, A. I., Noordin, N., Fathiyah Harun, A., Ismail, J., & Awang Teh, R. (2019).	2019	Article for a scientific journal
Asadi, Z., Abdekhoda, M., & Nadrian, H. (2019).	2020	Article for a scientific journal
Jaradat, MIRM, Ababneh, HT, Faqih, KM and Nusairat, NM (2020).	2020	Article for a scientific journal
Bhuyan, S., & Dash, M. (2018).	2018	Article for a scientific journal
Hassan, H. (2017).	2017	Article for a scientific journal
Shahzad, F., Xiu, G., Khan, I., Shahbaz, M., Riaz, M. U., & Abbas, A. (2019).	2020	Article for a scientific journal
Sayginer, C., & Ercan, T. (2020).	2020	Article for a scientific journal
Đorđević, D., Ćoćkalo, D., Bakator, M., Bogetić, S., Vorkapić, M., & Bešić, C. (2020).	2020	Book chapter
Al-Sharafi, M.A., AlAjmi, Q., Al-Emran, M., Qasem, YAM, & Aldheleai, Y.M. (2021).	2021	Book chapter
Ngqondi, T., Kalipa, L., Mauwa, H., & Bembe, M. (2019).	2019	Conference paper
Rahman, M. M., Suhaimi, A., & Shah, A. (2018).	2018	Conference paper
Yang, H.-S., & Yoo, S.-J. (2015).	2017	Conference paper
Singh, M., & Srivastava, V. M. (2018).	2018	Conference paper
Oredo, J., Njihia, J., & Iraki, X. N. (2017).	2017	Conference paper
Alharbi, F., Atkins, A., & Stanier, C. (2017b).	2017	Conference paper
Sohaib, O., & Naderpour, M. (2017).	2017	Conference paper
Oredo, J., Njihia, J., & Iraki, X. (2019).	2019	Conference paper
Abied, O., Ibrahim, O., & Mat Kamal, SN-I. (2021).	2021	Conference paper
Al-Badi, A., Tarhini, A., & Al-Qirim, N. (2018).	2018	Conference paper
Gupta, H., & Kumar, D. (2019).	2019	Conference paper
Saleh, Abdulnoor (2019).	2019	University thesis

The study conducted by [23] was based on factors from the DOI (Diffusion of Innovation) and TOE (Technology, Organization, and Environment) models to investigate cloud computing adoption in online education in a developing country. Let's analyze these factors in each category:

Technological Factors:

- Relative Advantage: The perception that adopting cloud computing brings advantages over traditional approaches is a key factor. Advantages may include cost savings, scalability, and accessibility.
- Complexity: The complexity of implementing cloud computing is an important factor. If perceived as excessively complex, it can affect the adoption decision.
- Compatibility: Compatibility refers to the ability of existing systems and organizational practices to work well with cloud solutions. Incompatibility can be a barrier to adoption.
- Security: Data security is a critical concern in cloud computing adoption. The perception that data will be secure in the cloud is fundamental.

Organizational Factors:

- Organizational Readiness: The preparation and capacity of the organization to adopt the technology are significant factors. This involves the readiness

of internal processes, resources, and organizational culture.

- Organizational Size: The size of the organization can influence the ability to adopt cloud computing. Larger organizations may have additional resources for adoption.
- Top Management Support: Support from top management is crucial. Leadership and commitment from top management can affect the adoption decision.

Environmental Factors:

- Government Regulation: Government regulations and compliance with laws are important considerations in cloud computing adoption.
- External Pressure: External factors such as competition and market demands can influence the adoption decision.

In addition to these factors, the research also investigated the moderating role of intrinsic motivation in cloud computing adoption in online education. Intrinsic motivation refers to motivation that comes from within, based on interest and personal satisfaction. This motivation can influence the willingness to adopt technological innovations, such as cloud computing.

The combination of these factors and the investigation of the role of intrinsic motivation provide an in-depth view of the determinants of cloud computing adoption in online education in a developing country. This can help better understand the challenges and opportunities associated with this adoption and enhance implementation strategies.

Researchers [24] identified that the impact of cloud computing adoption at the organizational level has not been completely clarified. To address this issue, they proposed an integrated theoretical model comprising 14 factors influencing cloud computing adoption in Higher Education Institutions (HEIs). These factors are as follows:

- Task Relevance: The relevance of tasks related to the adoption of cloud computing in the operations of HEIs.
- Relative Advantage: The perception that cloud computing adoption offers advantages over other approaches.
- Compatibility: The ability to integrate cloud computing with the existing systems and processes of HEIs.
- Complexity: The perception of the complexity of adopting cloud technology.
- Security Concerns: Concerns related to the security of data and infrastructure.
- Adequacy of Cloud Computing: The assessment of the adequacy of cloud computing to meet the needs of HEIs.
- Technology Readiness: The preparation of the technological infrastructure of HEIs for cloud computing adoption.
- Cost Savings: The analysis of the economic benefits of adopting cloud technology.
- Top Management Support: The support and leadership of the top management of HEIs in the adoption decision.
- Cloud Knowledge: The level of knowledge and understanding of cloud computing within HEIs.
- Feasibility of Cloud Computing: The evaluation of the technical, organizational, and operational feasibility of cloud computing adoption.
- Coercive Pressures: External pressures forcing HEIs to adopt cloud computing.
- Normative Pressures: Standards and regulations in the education sector influencing the adoption decision.
- Mimetic Pressures: The influence of other HEIs that have already adopted cloud technology on the adoption decision.

These factors reflect the complexity of the decision to adopt cloud computing in HEIs and highlight the technical, organizational, economic, and regulatory elements that influence this choice. The integrated theoretical model proposed by the researchers provides a comprehensive framework for analyzing and understanding the factors impacting cloud computing adoption in higher education institutions.

b) Adoption of Cloud Computing for Research Purposes

The first research question, H1, asked whether it would be possible to stand for the process of adopting Cloud computing companies through a conceptual model that incorporated internal and external variables. The adoption of Cloud computing has established itself as a transformation of great relevance in the technological environment of companies, offering notable advantages in terms of scalability, flexibility, and operational efficiency [4].

Understanding this complex process more comprehensively requires the construction of a conceptual model that considers both internal and external variables, which could provide valuable insights. This model would have the potential to uncover the factors that influence the decision to adopt cloud technology, the pace of implementation, and the results obtained by companies that adopt this approach.

In this context, this research aimed to evaluate the feasibility of standing for the Cloud computing adoption process through a comprehensive conceptual model, incorporating internal elements of the organization and external factors from the technological and business environment. A thorough analysis of these variables can provide a holistic view of the strategic, operational, and cultural considerations that shape the cloud adoption journey.

The results obtained show that, without a doubt, it is possible to represent the process of adoption of Cloud computing by companies through a conceptual model

composed of internal and external variables. This model can help understand the factors that influence the adoption of Cloud computing and find the main variables involved in this process. Internal and external variables can interact and influence companies' decisions to adopt cloud technology.

It is essential to consider that the weight and relevance of each variable may vary according to the specific characteristics and needs of each company. Therefore, the model can be customized and adapted to meet the particularities of each business context, as mentioned in the article by [8].

In this study, in which 9 main variables are identified, of which 7 are independent variables, one is a mediating variable, and the other is a dependent variable, it is important to understand the role of the mediating variables. A mediating variable influences influence the relationship between the dependent and independent variables. In other words, it explains the relationship between the dependent variable and the independent variable, acting as an intermediate link between the independent causal factors and the results. A variable can be said to play the role of a mediator in explaining how external physical events acquire internal psychological meaning [25]. An indirect or mediated effect implies that the independent variable influences the mediator, which, in turn, affects the dependent variable [26].

The variables found in this context are Perception of IT security risk, Risk Analysis, Management Style, Trust, Technological Innovation, Use of Technology, Adoption of Cloud computing, and Business Performance.

According to [11], the Technology Acceptance Model (TAM), developed by [17], has been widely used by several researchers to examine the adoption of Cloud computing by students at higher education institutions in several countries. Some researchers have introduced additional variables that influence adoption, although most have used common variables such as Perceived Usefulness, Perceived Ease of Use, Trust, Risk, Attitudes, Behavioral Intention, and Actual Use of Cloud computing.

However, in the Technology Acceptance Model 3 (TAM3), developed by [18], the central variables that influence students' behavioral intention to adopt cloud services are Perceived Usefulness and Perceived Ease of Use. This model, although modified, neglected aspects related to Security and Privacy in the adoption of Cloud computing by students at higher education institutions in Saudi Arabia.

Therefore, in their study, the authors chose to incorporate the following variables: Electronic Trust, Skills Transferability, Social Influence, Facilitating Condition, Technophilia, Complexity, Risk Perception, and Technophobia. This conceptual model was developed based on existing literature and includes two independent variables adapted from UTAUT2 (Unified Theory of Technology Adoption and Use 2) and six other variables added to the model. The mediating variable is Behavioral Intention, while the dependent variable is Effective Use of Cloud computing.

The study in question aimed to analyze the relevant variables in the adoption of Cloud computing systems in Higher Education institutions when the Diffusion of Innovation (DOI) and Technology, Organization, and Environment (TOE) models are combined. According to [13], the variables used in their study included Mimetic Pressures, Coercive Pressures, Normative Pressures, and the Adoption of Cloud computing itself.

In the study by [27], the objective was to evaluate the determinants of the adoption of Cloud computing in healthcare organizations in Saudi Arabia, and this was done through interviews with decision-makers in these organizations. This study identified five groups of factors and a total of twenty variables, both internal and external, that play important roles in this process. These variables were categorized as follows:

- Technology: Internet Connection, Compatibility, Relative Advantages, Integration, Infrastructure Readiness, Security and Testability.
- Organization: Senior Management Support, Resistance to Change, Lack of Knowledge in Cloud and Computing.
- Environment: Regulatory Compliance, Business Ecosystem Pressure, External Experience, Lack of Standardization and Accreditation Organization.
- Human: Innovation, Internal Expertise, and Previous Experience.
- Business: Cost and Rigid Financial Analysis, Strategy and Flexible Financial Analysis.

In the study conducted by [28], several variables and factors influencing the adoption of Cloud computing in public universities were identified. These factors were categorized into four domains: Technological, Organizational, Environmental, and Social. The following are the variables within each domain:

- Technological: Relative Advantage, Cost Reduction, Ease of Use, Complexity, Compatibility, Testability, Operational Requirement, Security, Nature of the System, Cloud Deployment Model, Sustainability and Technique.
- Organizational: Senior Management, Finance, Cost-Benefit Analysis, Infrastructure Readiness, IT Knowledge and Skill Set.
- Environmental: Cloud Service Provider, Service Level Agreement (SLA), Data Privacy, Geographic Location, Governance, Policy and Legal Guidance, and Law.
- Social: Reputation.

On the other hand, the research by [29] focused on the adoption of Cloud computing at the organizational level and investigated influencers from four different

perspectives: Technical, Security, Financial, and Legal. These perspectives were considered independent variables that influence technology adoption.

By examining these models and their main components, we can identify how factors such as Organizational Culture, Business Strategies, Technical Requirements, Regulations, Market Competition, and Customer Expectations interact to shape decisions and results related to the adoption of Cloud computing. This approach allows us to advance understanding of the crucial role that a conceptual model can play in guiding companies towards a successful implementation of web-based technologies, aligned with their specific goals and needs.

The second research question, H2, addresses the search for existing models and frameworks that are suitable for the adoption of web-based technologies. The adoption of web-based technology plays a key role in digital transformation, enabling businesses and organizations to harness the benefits of online applications and global connectivity. To facilitate this process, many technology adoption models and frameworks have been developed. These frameworks provide valuable guidance for planning, implementing, and optimizing the incorporation of web-based technologies in diverse business contexts.

In this study, we aim to analyze some of the prominent models and frameworks that can be adapted for the adoption of web-based technologies. These structures range from more comprehensive approaches, which consider organizational and cultural aspects, to more technical methodologies, focused on effective implementation and maximizing the benefits provided by technology. By understanding and applying these models, companies can successfully navigate the complexities of adopting web-based technologies, promoting innovation, competitiveness, and operational efficiency in an ever-evolving digital world.

The authors [11] based their conceptual model to measure the adoption of Cloud computing in Higher Education Institutions (HEIs) on the UTAUT2 model, which stands for ''Unified Theory of Acceptance and Use of Technology 2''. [18] developed this model and represents an evolution of UTAUT, which is the ''Unified Theory of Acceptance and Use of Technology'', created in 2000. UTAUT2 is more comprehensive, as it considers a wide range of factors that can influence the acceptance of technology.

In the study conducted by [13], identifying the significant factors for the adoption of Cloud computing in Higher Education, two fundamental theories were employed: the Diffusion of Innovation theory (DOI) and the TOE theory (Technology, Organization, and Environment).

The Diffusion of Innovation theory, developed by [16], is a model that describes how new ideas, products, technologies, or practices spread and are adopted in a population or market over time. This theory is widely used to understand how distinct groups and individuals adopt innovations.

The TOE theory, in turn, was initially proposed by [30]. It built on previous research into the implementation of Information Technology (IT) and has been applied in a variety of contexts, including business, government, and education. TOE theory aims to explain how organizations adopt and implement technologies, considering internal and external factors. It focuses on the interaction of three main elements.

- Technology: This involves understanding the characteristics of available technologies, how specific innovations can affect the organization's operations, and how decisions are made regarding technology adoption.
- Organization: Examines how an organization's structure, culture, internal processes, and capabilities influence its ability to adopt and adapt to new or emerging technologies.
- Environment: Considers the external context in which the organization operates, including regulatory factors, competition, market changes, and cultural influences. These factors can affect technology adoption decisions and an organization's ability to implement them successfully.

TOE theory is a valuable tool for analyzing how organizations respond to technological and environmental changes. It helps you understand why some organizations adopt and benefit from technologies more quickly than others, and how these decisions affect their performance and competitiveness.

In developing their theoretical models to measure the adoption of Cloud computing, both in Higher Education Institutions and in Private Hospitals, the authors incorporated well-established and recognized theories. Here is a description of the theories and models used by each group of authors:

To the authors [24] - Higher Education.

- TOE (Technology, Organization, and Environment): This framework considers how technologies are adopted and implemented in an organization, considering technical, organizational, and environmental factors.
- FVM (Fit Viability Model): This is an Information System analysis model that evaluates the technical, organizational, and operational feasibility of a proposed information system.
- DOI (Diffusion of Innovation): The Diffusion of Innovation theory describes how new ideas, products, or technologies spread and are adopted by different groups and individuals.
- IT (Institutional Theory): Institutional Theory is a sociological and organizational approach that explores

how institutions shape human behavior, organizations, and society, considering formal and informal norms and structures.

To the authors [31] - Private Hospitals.

- DOI (Diffusion of Innovation): The Diffusion of Innovation theory was also used in this study to understand how innovation, in this case, the adoption of Cloud computing, spreads and is adopted in private hospitals.
- TOE (Technology, Organization, and Environment): Once again, the TOE framework was applied to analyze how technologies are adopted in organizations, considering technological, organizational, and environmental factors.

Both groups of authors recognized the importance of considering established theories and models to understand technology adoption processes in their specific contexts, whether in higher education or healthcare. These theoretical frameworks provide a solid basis for analyzing and interpreting the factors that influence the adoption of Cloud computing.

The authors [32] chose to create a Cloud computing adoption model based on Trust Theory (TT), which is a field of study that explores the psychological, social, and behavioral aspects involved in the formation, maintenance, and breakdown of trust between individuals, groups, or institutions. This theory seeks to understand how people develop trust in each other, how this trust is maintained over time, and what factors can lead to the breakdown of this trust. Furthermore, they also incorporated the TOE (Technology, Organization, and Environment) framework into their conceptual model. The choice of Trust Theory was especially relevant, as the study was focused on an E-government environment, where trust in citizen service plays a fundamental role.

Likewise, the authors [33] used the Diffusion of Innovation (DOI) and TOE (Technology, Organization, and Environment) theories in their study, which aimed to investigate the internal and external factors that influence Cloud adoption decisions in computing in companies. These established theories have provided a solid framework for analyzing the factors that affect technology adoption.

It is important to highlight that the adaptation and personalization of these models are crucial to consider the specific characteristics of the technology in question and the needs of the organization. The combination of theories and frameworks can offer a comprehensive understanding of the factors that affect the adoption of Cloud computing in different contexts and sectors.

The third research question, H3, investigates the potential factors associated with the adoption process of Cloud computing by companies. The adoption of this technology has become a prominent trend in the business world, offering a flexible and innovative approach to managing information technology resources. A company's decision to adopt Cloud computing involves a series of factors that can influence the implementation strategy.

These factors cover a wide range of considerations, from technical and financial aspects to issues related to scalability, security, operational efficiency, and innovation capacity. In this investigation, we will carefully examine some of the key elements that can guide a company's decision to move to the cloud. We will highlight how this approach can potentially drive digital transformation, improve organizational agility, and optimize the use of technological resources.

In the records analyzed, according to the authors [9], important factors were identified in the process of adoption of Cloud computing by small businesses (SMEs). These factors include Security and Privacy, Organizational Risk, Sharing and Collaboration, Confidentiality and Integrity. These elements play a relevant role in the decision of SMEs to adopt Cloud computing, demonstrating the importance of considering these factors when evaluating the process of adopting this technology. In the Cloud computing adoption model developed by [11], his investigation identified a series of factors that influence the adoption of this technology. These factors include.

- Electronic Trust: Users' trust in technology and services offered in the cloud plays a crucial role in adoption.
- Skills Transferability: The ability to transfer existing skills and knowledge to the Cloud computing environment is a relevant factor.
- Social Influence: Social influences, such as peer opinions and recommendations, can impact adoption decisions.
- Facilitating Condition: The presence of facilitating conditions, such as easy access to Cloud computing infrastructure, can facilitate adoption.
- Technophilia: Enthusiasm and attraction to technology play a role in the willingness to adopt Cloud computing.
- Complexity: The perception of technology complexity can influence the decision to adopt the cloud or not.
- Perceived Risk: Assessing the perceived risks associated with the adoption of Cloud computing is a key factor.
- Technophobia: Irrational fear or aversion to new technologies can be a barrier to adoption.

Behavioral Intentions: Intentions to use technology play an important role in the adoption process, both by members of Higher Education Institutions (HEIs) and by students. On the other hand, the authors [12], when analyzing the challenges that affect the adoption of Cloud computing in the educational sector, identified the following factors.

- Privacy and Security Concerns: Data security and privacy are critical concerns when adopting cloud services in the education sector.
- Trust in the Service Provider: Trust in the cloud service provider plays a key role in the adoption decision, as educational institutions need to trust the provider's ability to ensure the security and smooth functioning of the services.

These factors highlight important challenges that educational institutions face when adopting Cloud computing, especially about security and trust in service providers.

The study carried out by the authors [13] when evaluating the impacts of Cloud computing adoption factors in Higher Education Institutions (HEIs) identified that technological, organizational, environmental, and sociocultural factors have a significant and positive influence on the intention to adopt services based in the cloud at IES. This suggests that these different aspects play an important role in the decision to adopt Cloud computing in the educational context.

In the qualitative study conducted by [27] in Saudi healthcare organizations, the following factors were identified that determine the adoption of healthcare computing.

- Relative Advantages: The perception that adopting cloud technologies offers advantages over traditional solutions plays a crucial role.
- Technological Readiness: The preparation of the organization's technological infrastructure for the adoption of Cloud computing is a crucial factor.
- Compatibility: The ability to integrate cloud technology with existing systems and organizational processes is a relevant element.
- Security: Data and infrastructure security is a critical concern, especially in the healthcare sector.
- Capacity for Innovation: The adoption of cloud technologies is seen to drive innovation in the provision of healthcare services.
- Internal Experience: Internal experience and knowledge about cloud technologies can influence the adoption decision.
- Experience: Past experiences with cloud technology play a role in the adoption decision.
- Solid Financial Analysis: A solid financial analysis that demonstrates the economic benefits of adoption is a relevant factor.
- Flexible Financial Analysis: The ability to adapt financial analysis according to needs and circumstances is important.
- Regulatory Compliance: Compliance with healthcare industry regulations and standards is critical.
- Pressure from Ecosystem Partners: Influence and pressure from healthcare ecosystem partners can also impact the adoption decision.
- External Experience: External experience and knowledge of cloud technologies is relevant.
- Support from Senior Management: Support from the organization's senior management is a critical factor in the adoption decision.
- Attitude Towards Change: The willingness of the organization and its members to embrace change is important in adopting cloud technologies.

These factors highlight the complexity of adopting Cloud computing in the healthcare sector, where technical, financial, regulatory, and organizational aspects play a fundamental role in the decision to adopt this technology.

Researchers [24] identified that the impact of adopting Cloud computing at the organizational level has not yet been completely clarified. To address this issue, they proposed an integrated theoretical model that comprises 14 factors that influence the adoption of Cloud computing in Higher Education Institutions (HEIs). These factors are as follows.

- Related Tasks: The relevance of tasks related to the adoption of Cloud computing in HEI operations.
- Relative Advantage: The perception that adopting Cloud computing offers advantages over other approaches.
- Compatibility: The ability to integrate Cloud computing with the HEI's existing systems and processes.
- Complexity: The perception of the complexity of adopting cloud technology.
- Security Concerns: Concerns related to the security of data and infrastructure.
- Adequacy of Cloud computing: Assessment of the suitability of Cloud computing to meet the needs of the HEI.
- Technology Readiness: The preparation of the HEI's technological infrastructure for the adoption of Cloud computing.
- Cost Savings: The analysis of the economic benefits of adopting cloud technology.
- Senior Management Support: The support and leadership of the HEI's senior management in the adoption decision.
- Cloud Knowledge: The level of knowledge and understanding about Cloud computing within the HEI.
- Feasibility of Cloud computing: Assessment of the technical, organizational, and operational feasibility of adopting Cloud computing.
- Coercive Pressures: External pressures that force the HEI to adopt Cloud computing.
- Normative Pressures: Education sector standards and regulations that influence the adoption decision.
- Mimetic Pressures: The influence of other HEIs that have already adopted cloud technology on the adoption decision.

These factors reflect the complexity of the decision to adopt Cloud computing in HEIs and

highlight the technical, organizational, economic, and regulatory elements that influence this choice. The integrated theoretical model proposed by the researchers offers a comprehensive framework for analyzing and understanding the factors that impact the adoption of Cloud computing in higher education institutions.

The studies of [28] and [34] provided valuable insights into the factors affecting the adoption of cloud-based services, focusing on higher education institutions (HEIs). According to [28], factors that affect the adoption of cloud-based services include:

- Proper Planning and Adoption Analysis: Performing proper adoption analysis and proper planning based on the identified factors can help organizations choose the appropriate deployment, service model, and cloud provider. This contributes to an informed and effective decision to adopt Cloud computing.
- Unsustainable Operating Cost: Understanding resource capacity in terms of IT knowledge and skill set, budget and financial level, and performing cost-benefit analysis can help reduce the unsustainable operating cost associated with adopting Cloud computing.
- Data Privacy Issue: Data privacy concerns are a crucial factor that needs to be addressed in cloud adoption. Implementing appropriate security measures and privacy policies is essential to address this challenge.

On the other hand, the authors [34] identified the following five factors that affect the adoption of Cloud computing services in HEIs.

- Attitude Towards Using Cloud Computing Services: Users' cheerful outlook towards using cloud services plays a key role in adoption. When users have a favorable attitude, they are more likely to adopt the technology.
- Perception of Privacy/Security: The perception that cloud services are secure and protect data privacy is a key factor. Security and privacy are critical concerns when adopting Cloud computing.
- Perception of Behavioral Control: The perception that users have control over the use of cloud technology is important. Users want to feel like they have control over their data and operations in the cloud.
- Intention to Use Cloud Computing Services: Users' intention to adopt and use cloud services is a significant indicator of adoption. A willingness to use technology is a crucial step toward effective adoption.
- Subjective Norms: Subjective norms, that is, social norms and group influences, can affect the adoption decision. The opinion of colleagues and social groups plays a key role.

These factors reflect the importance of considering not only technical issues but also user attitudes, security concerns, and social influences when adopting cloud-based services in higher education institutions. This more comprehensive understanding of the factors involved in the adoption decision can guide effective strategies for the successful implementation of cloud technologies in HEIs.

The factors identified by [27] that can influence the adoption of Cloud computing in healthcare organizations and the findings of [1] related to E-commerce highlight the importance of considering multiple factors in different technology adoption contexts. Here are the main factors identified in both studies:

Factors in the Adoption of Cloud Computing in Healthcare Organizations [27].

- Infrastructure: Existing infrastructure plays a key role in cloud adoption. The organization needs to have an infrastructure compatible with Cloud computing.
- Readiness: An organization's readiness refers to its willingness and ability to adopt cloud technology effectively.
- Security: Security is a critical concern in cloud adoption, especially in healthcare organizations that manage sensitive information.
- Compatibility: Compatibility with existing systems and processes is a key factor in a smooth transition to the cloud.
- Environmental Peer Pressures: Environmental and peer influences and pressures can influence the adoption decision.
- Availability of External Expertise: The availability of external experts can be crucial to successful cloud implementation.
- Top Management Support: Top management support is essential for the approval and implementation of technology adoption projects.

The impact of the Adoption of Cloud computing in E-commerce is divided into three main factors according to [1].

Technological Factors:

- Relative Advantage: The perception that cloud adoption provides comparative advantages in terms of cost, efficiency, and performance.
- Complexity: The complexity of the technology and its integration with existing operations.
- Compatibility: The compatibility of the technology with existing systems and processes.
- Security and Privacy: Concern about data security and privacy is fundamental.
- Reliability: Cloud reliability is critical as outages can negatively impact operations.
- Organizational Factors:
- Organizational Readiness: The organization's willingness and ability to adopt technology.
- Company Size: Company size can influence adoption as needs and resources vary.
- Top Management Support: Top management support is a key factor in successful approval and implementation.

Environmental Factors:

- Competitive Pressure: Competition in the market can influence the adoption decision.
- Business Partner Pressure: Business partners and their needs can also be a factor.
- Government Regulatory Environment: The regulatory environment and government policies play a key role in adoption.

These studies emphasize that the adoption of Cloud computing is influenced by a variety of factors, including technical, organizational, and environmental considerations. Organizations need to evaluate these factors holistically when considering the adoption of cloud technologies in their respective industries. Understanding the nuances and differences between contexts, such as healthcare organizations and E-commerce, is essential for successful implementation.

The findings of studies conducted by [35] in the government context and by [2] in the educational environment highlight the importance of specific factors in the adoption of Cloud computing in different sectors. Here are the key findings from each study.

Study on the Adoption of Cloud Computing in Government Organizations [35].

- Security as a Priority: The study emphasizes that security is the top priority in government organizations when adopting Cloud computing services. Ensuring adequate security is essential to ensure that services are dependable and acceptable to users.

Study on the Adoption of Cloud Computing in the Educational Environment according to [2].

- Behavioral Factors: The study in the educational environment identifies behavioral factors that affect cloud adoption. These include performance expectancy, which relates to the expectation that the cloud will improve performance and efficiency, as well as effort expectancy, which considers the effort required to adopt the cloud.
- Social Influence: Social influence is also a key factor, suggesting that the opinions and influences of peers, teachers, and other individuals can affect the intention to adopt the cloud in the educational context.
- Trust: Trust is another significant factor. Users need to trust the cloud technology and service to adopt it successfully.

These studies demonstrate that the adoption of Cloud computing is affected by different factors in different contexts. In government organizations, security is a critical priority, while in the educational environment, behavioral and social factors play a key role in the adoption decision. Understanding these specific factors is essential for successfully implementing cloud technology in each context.

The findings of studies carried out by [31] in private hospitals and [36] in small and medium-sized enterprises (SMEs) in the service sector highlight specific factors that influence the adoption of Cloud computing in different business contexts. Here are the key findings from each study.

Study on the Adoption of Cloud Computing in Private Hospitals [31].

- Relative Advantages: The relative advantage, that is, the perception that the adoption of Cloud computing will bring significant benefits, is an important factor for adoption in private hospitals. Healthcare managers consider the benefits before adopting cloud technologies.
- Complexity: The complexity of cloud adoption is also a key factor. Complexity may involve technical, integration, or operational issues that need to be considered before adoption.
- Compatibility: Compatibility with existing processes and systems is another critical factor. The cloud must be compatible with the practices and systems in use in private hospitals.
- Technological Readiness: Technological readiness refers to the organization's preparedness in terms of infrastructure and resources to adopt the cloud. The organization needs to be ready to implement the technology.
- Top Management Support: Top management support plays a key role in the adoption decision. When the organization's leadership supports cloud adoption, it is more likely to be successful.
- Organization Size: The size of the organization is also a factor that influences cloud adoption. Larger organizations may have different resources and capabilities compared to smaller organizations.
- Competitive Pressure: Competitive pressure in the private healthcare sector can drive cloud adoption. The need to remain competitive can drive the search for innovative technological solutions, such as the cloud.

Study on the Adoption of Cloud Computing in SMEs in the Service Sector [36].

- IT Resources: The study highlighted that IT resources play a fundamental role in the adoption of Cloud computing in SMEs. The allocation of adequate resources is essential to obtain the benefits of the technology.
- Top Management Support: Contrary to the study in private hospitals, top management support was not considered a significant factor in this context of service SMEs. This may suggest that, in SMEs, other factors, such as IT resources, are more preponderant.
- Employee Knowledge: Similarly, employee knowledge was not found to be a significant factor. This may reflect the specific needs of SMEs compared to larger organizations.

These studies highlight the importance of considering the context and specific characteristics of each

type of organization when analyzing the factors that influence the adoption of Cloud computing. Factors such as relative advantages, complexity, compatibility, technology readiness, senior management support, and competitive pressure play varying roles in the adoption decision depending on the organization's context. This understanding is essential for successful cloud adoption planning.

The conceptual model proposed by [32] for the adoption of Cloud computing in e-government is a valuable contribution, especially in a context in which the use of cloud technology in government services is growing. The authors used the TOE (Technology, Organization, and Environment) model as a basis to identify key factors that influence the adoption of Cloud computing in e-government. Here is a breakdown of the key factors included in the model and how they affect adoption.

Technological Factors:

- Relative Advantage: This refers to the perception that Cloud computing offers significant benefits compared to traditional approaches. In the context of e-government, organizations can perceive the cloud as an effective way to improve the accessibility, scalability, and efficiency of online services.
- Complexity: The complexity of cloud adoption involves technical issues, integration with existing systems, and challenges in data migration. Managing complexity is essential for a successful implementation.
- Compatibility: Compatibility refers to the ability of Cloud computing to integrate with existing systems and processes in e-government. Compatibility is critical to ensuring the transition to the cloud is smooth and effective.
- Security: Security is a critical concern in e-government, where sensitive data and personal information of citizens are frequently manipulated. Ensuring data security in the cloud is vital for building trust and complying with regulations.

Organizational Factors:

- Organizational Readiness: Organizational readiness involves preparing the organization to adopt Cloud computing. This includes training employees, defining appropriate policies and procedures, and allocating resources.
- Organizational Size: The size of the government organization plays a role in the adoption process. Larger organizations may have more resources to invest in the cloud, but they may also face more complex challenges.
- Senior Management Support: Senior management support is crucial to the success of the adoption. Leadership must demonstrate commitment to change and technological innovation.

Environmental Factors:

- Government Regulation: Government regulations play a key role in the adoption of Cloud computing in e-government. Government policies and regulations can promote or inhibit the use of the cloud to ensure data security and privacy.
- External Pressure: External pressure refers to the influences and expectations of external stakeholders such as citizens and other organizations. These pressures may encourage the government to adopt the cloud to improve service delivery and transparency.

The model proposed by the authors considers a variety of technological, organizational, and environmental factors that can influence the adoption of Cloud computing in e-government. These factors are essential to understanding how cloud technology can be successfully implemented in government organizations, enabling effective and secure delivery of electronic services to citizens.

The critical factors identified by the authors [29] in their proposed conceptual framework cover several important dimensions that can affect the adoption of Cloud computing. They categorized these factors into three groups: legal, technical, and operational. Let's look at each of these categories in detail:

Legal Factors:

- Data Privacy: Data privacy is a key consideration when adopting Cloud computing, especially when it comes to sensitive data. Issues such as data storage, protection, and access can be influenced by privacy regulations.
- Compliance and Regulations: Organizations must comply with specific regulations related to data security and privacy. This includes government laws and regulations that may vary by industry and geographic location.

Technical Factors:

- Bandwidth: Network bandwidth is crucial to the performance of cloud services. The availability of sufficient bandwidth is critical to ensuring an efficient connection to cloud services.
- Data Integration: Data integration refers to the ability to integrate existing systems and data with cloud services. Compatibility and interoperability with internal systems are critical factors.
- Security: Security is a key factor, involving protective measures to ensure that cloud data and systems are resistant to cyber threats and unauthorized access.
- Vendor Lock-in: Excessive dependence on a single cloud service provider can pose a risk. The ability to migrate to another provider or platform is important to avoid lock-ins.

Operational Factors:

- Loss of Control over Services: Adopting the cloud can mean that an organization loses some direct control over its services and infrastructure. This may be an operational concern.

- Lack of Equipment and Knowledge: Lack of resources, equipment, or internal knowledge to manage the transition to the cloud is an operational challenge. Organizations may need to acquire new skills or resources.
- Business Continuity and Disaster Recovery: Business continuity and disaster recovery strategies are critical to ensuring the availability and resilience of cloud services, especially in outage situations.

These factors reflect the complexities involved in adopting Cloud computing. They highlight the importance of addressing legal, technical, and operational considerations to ensure an effective transition to the cloud. Furthermore, they demonstrate the need for thorough analysis and careful planning before migrating to the cloud, considering the associated challenges and benefits.

The research conducted by the authors [23] was based on factors from the DOI (Diffusion of Innovation) and TOE (Technology, Organization, and Environment) models to investigate the adoption of Cloud computing in online education in a developing country. Let us analyze these factors in each category.

Technological Factors:

- Relative Advantage: The perception that adopting Cloud computing brings advantages over traditional approaches is a key factor. Advantages can include cost savings, scalability, and accessibility.
- Complexity: The complexity of implementing Cloud computing is a crucial factor. If it is perceived as overly complex, this may affect the adoption decision.
- Compatibility: Compatibility refers to the ability of existing systems and organizational practices to work well with cloud solutions. Incompatibility can be a barrier to adoption.
- Security: Data security is a critical concern when adopting Cloud computing. The perception that data will be secure in the cloud is fundamental.

Organizational Factors:

- Organizational Readiness: The organization's preparedness and ability to adopt technology are significant factors. This involves the readiness of internal processes, resources, and organizational culture.
- Organizational Size: The size of the organization can influence the ability to adopt Cloud computing. Large organizations may have additional resources for adoption.
- Top Management Support: Top management support is essential. Senior management leadership and commitment can affect the adoption decision.

Environmental Factors:

- Government Regulation: Government regulations and compliance with laws are important considerations in adopting cloud computing.
- External Pressure: Pressure from external factors, such as competition and market demands, can influence the adoption decision.

In addition to the benefits of access portability, flexibility, and resource availability [50], cloud computing offers agility in application hosting by eliminating the need to develop applications compatible with each operating system. Instead, a single application is designed to work across all web operating systems [69]. The concept of Vendor Lock-In or Portability refers to the difficulty faced by cloud customers when switching from one provider to another, considered a significant risk in cloud computing adoption [57], [75], [76]. Switching between providers can be costly and time-consuming, with customizing solutions for a specific provider requiring rework when migrating to another [56]. Reverting the service to an internal environment, including data and applications, is a challenging task [70]. Although migration and service portability have historically been challenging, efforts are being made to establish standardization and initiatives that promote interoperability and portability between clouds [84].

The implementation of cloud computing in Higher Education Institutions (HEIs) alleviates concerns related to maintenance, positively affecting the educational process [63], [85], by removing obstacles such as installation and network issues. Additionally, cloud computing enables educators to easily present course complexity to students [81], [85].

Portability in cloud computing involves the ability of applications and data to be transferred between different platforms with minimal discrepancies. To be considered portable, the cloud must allow for efficient migration of data to a new platform while maintaining connected functionality. The distinction between portability and interoperability is crucial; while interoperability refers to accessing services from all platforms, portability involves transferring data and applications between platforms as needed [5]. However, challenges persist, such as the lack of a standard API among different providers, closed architecture, and exclusivity of cloud service applications, making transitioning between them a complex task for adopters [59], [76].

Therefore, the text highlights the disadvantages of cloud computing, such as portability difficulty; on the other hand, it reports the ability of flexibility and resource availability. However, it underscores the significant challenge of ''Vendor Lock-In'' or lack of portability between providers, a crucial factor in decision-making for adopting this technology. The complexity associated with switching providers, along with issues of lack of standardization and interoperability, underscores the ongoing need for efforts to seek solutions that promote effective portability in cloud computing.

Furthermore, it is seen how the implementation of this technology in Higher Education Institutions can optimize the educational process by eliminating maintenance-related concerns and offering greater flexibility to educators. Adoption of Multi-Cloud: Using more than one cloud service provider to distribute risk and avoid exclusive dependence or Developing a strategy that allows the execution of Workloads in different cloud environments, adapting to specific requirements. The distinction between portability and interoperability is crucial for understanding the ability to transfer data and applications between platforms, highlighting the importance of common standards and initiatives that help this mobility.

In addition to these factors, the research also investigated the moderating role of intrinsic motivation in the adoption of Cloud computing in online education. Intrinsic motivation refers to motivation that comes from within, based on personal interest and satisfaction. This motivation can influence the willingness to adopt technological innovations, such as Cloud computing.

The combination of these factors and the investigation of the role of intrinsic motivation provide an in-depth look at the determinants of cloud computing adoption in online education in a developing country environment. This can help you better understand the challenges and opportunities associated with this adoption and improve implementation strategies.

The authors [33] conducted a study focused on identifying internal and external factors that affect the adoption of Cloud computing in companies. These factors were analyzed based on two conceptual models widely used in research on technology adoption: the DOI (Diffusion of Innovation) and the TOE (Technology, Organization, and Environment). Let us review these factors in each category, according to both models.

From the DOI Model:

- Relative Advantage: Refers to the perception that the adoption of Cloud computing brings significant advantages over traditional approaches, such as cost savings, efficiency, and access to advanced technological resources.
- Security and Privacy: Data security and privacy are critical factors in the adoption of Cloud computing. Companies want to be confident in the security of their data when stored in the cloud.
- Cost Savings: Cost savings are one of the main motivators for adopting Cloud computing, as it can lead to a more efficient allocation of financial resources.
- Complexity: The perceived complexity of adopting cloud technology is also considered. If it is seen as overly complex, it may affect the adoption decision.
- Compatibility: Compatibility with existing systems and practices in companies is a crucial factor. Incompatibility can make adoption difficult.

From the TOE Model:

- Technological Readiness: The company's technological preparation, including infrastructure and technical resources, influences the adoption of Cloud computing.
- Top Management Support: Top management support is essential. Organizational leaders who endorse and promote adoption can increase the likelihood of success.
- Organizational Size: The size of the organization plays a role in adoption. Larger companies may have more resources to implement complex technologies.
- Regulatory Support: Regulatory conditions and the legal environment can influence the adoption decision.
- Competitive Pressure: Competitive pressure in the market is another environmental factor that can drive adoption. Companies can adopt Cloud computing to remain competitive.

Research by [33] examined these factors in companies to better understand the drivers and barriers to cloud computing adoption. Understanding how these internal and external factors affect the adoption decision is fundamental to the successful implementation of this technology in organizations.

H4 is the fourth research question and asks about the potential factors that can positively impact the successful adoption of Cloud computing by companies. It is essential to ensure that organizations make the most of the benefits of this technology [37], [38].

The implementation of Cloud computing has become a transformation of great relevance in the business scenario, enabling organizations to access scalable, flexible, and efficient IT resources [37], [38]. However, achieving success in this transition is not just restricted to the adoption of the technology itself, but also to the meticulous consideration of several interrelated factors that can positively influence the outcome. In this investigation, we will examine the potential factors that play a crucial role in the successful adoption of Cloud computing by companies. These factors cover a wide range of areas, from organizational strategy to technical execution.

- Aligned Organizational Strategy: An organizational strategy that is aligned with business objectives is essential. Cloud technology must be adopted in a way that supports and enhances the company's strategic objectives.
- Leadership and Senior Management Engagement: Senior management support is critical. Leaders who demonstrate commitment to cloud adoption can positively influence the organization and overcome challenges.

- Human Resources Training: Having personnel with knowledge and skills in Cloud computing is essential for success. Investing in employee training and development is important.
- Change Management: Change management is essential to ensuring the transition to the cloud is successful. This includes preparing employees for change and communicating effectively.
- Selection of Reliable Cloud Providers: Choosing reliable cloud providers that are compatible with the organization's needs is crucial. Cloud provider reliability directly affects the quality of cloud services.
- Information Security: Information security is a critical consideration. Implementing effective security measures is critical to protecting company data and ensuring regulatory compliance.
- IT Governance and Service Management: Having an effective IT governance and service management system in place helps ensure operational efficiency and alignment with business needs.
- Continuous Monitoring and Optimization: The ability to monitor performance and optimize cloud resources is essential to maximizing the value of cloud computing adoption.
- Cost Savings: While cost reduction is often a goal, it is important to understand the long-term financial implications of cloud adoption and how savings can be achieved.
- Clear Documentation and Policies: Having clear documentation and well-defined policies for cloud use helps avoid problems and misunderstandings.
- Integration with Existing Systems: Ensuring that cloud systems integrate seamlessly with existing systems is critical to avoiding disruptions to business processes.
- Internal Customer Satisfaction: Assessing the satisfaction of internal customers, such as employees and departments, is important to ensure that cloud technology meets the organization's needs.

These factors are interconnected and play a critical role in the successful adoption of Cloud computing. Companies that carefully consider these aspects can improve their chances of successfully transitioning to the cloud and reaping the benefits associated with this technology.

In the records examined, several authors have identified factors that have a positive impact on the adoption of cloud services. According to [9], their results highlighted that Social Influence, Trust and Technology Availability exerted a positive influence on the adoption of Cloud computing. On the other hand, research into [13] also demonstrated that the adoption of Cloud computing in government sectors is positively affected by factors such as Indirect Benefits of the Cloud, Type of Industry, Cost, Reliability, and Feasibility.

The studies analyzed reveal factors that have a positive impact on the adoption of cloud services, the authors [9] identified the following factors:

- Social Influence: Refers to the influence of contacts, networks, or opinions of other individuals or organizations on the decision to adopt Cloud computing.
- Trust: Involves belief in the security and effectiveness of cloud services, which can increase willingness to adopt them.
- Availability of Technology: Availability of suitable technology and infrastructure can facilitate the adoption of cloud services.

On the other hand, the study by [13] pointed out that the adoption of Cloud computing in government sectors is positively affected by the following factors:

- Indirect Benefits of the Cloud: Benefits that are not immediately obvious, such as long-term cost savings or efficiency improvements, can positively influence the adoption decision.
- Type of Industry: The sector or industry in which the organization is located can influence the decision to adopt the cloud due to the specific needs of that sector.
- Cost: The total cost of ownership and financial benefits of moving to the cloud can be key drivers of adoption.
- Trust: Again, trust in this context involves belief in the security, privacy, and effectiveness of cloud technology.
- Feasibility: The assessment of the feasibility of adopting cloud services, considering the specific needs and resources of the government sector.

In the study conducted by [27], several factors were identified that could influence the adoption of Cloud computing in healthcare organizations. Here are some of those factors:

- Senior Management Support: This is a critical factor, seen ambivalently by interviewees. Some perceive support from senior management as a positive factor that influences the adoption of Cloud computing, while others consider that support can negatively affect the decision. This highlights the key role of leadership in determining adoption success.
- Peer Pressure in the Healthcare Environment: The pressure exerted by the successful implementation of Cloud computing in other hospitals is seen as a positive factor that influences the adoption decision. Observing positive experiences in similar environments can encourage technology adoption.
- Availability of IT Vendors: The presence of IT vendors that can supply successful Cloud computing implementations is perceived as a positive factor driving adoption. Having access to specialized resources can make the transition to the cloud easier.

Therefore, in the context of this study, Senior Management Support is an ambivalent factor, as its impact can vary depending on the specific circumstances

of the organization. Peer Pressure in the Healthcare Environment and the Availability of IT Suppliers are considered factors that tend to positively influence the decision to adopt Cloud computing, as they are successful experiences and valuable resources that can support the transition to the cloud.

In the study carried out by [24], several factors were identified as having a positive impact on the adoption of Cloud computing. Here are these factors.

- Related Tasks: The relationship between an organization's tasks and the adoption of Cloud computing is a crucial factor. Adapting tasks and processes to cloud technology can positively influence adoption.
- Relative Advantage: When organizations realize that adopting Cloud computing offers significant comparative advantages over traditional approaches, this can drive the adoption decision.
- Compatibility: Compatibility between existing infrastructure and cloud technology plays a crucial role. Harmonization between these elements can facilitate adoption.
- Adequacy of Cloud computing: The perception that Cloud computing adequately meets the needs of the organization and the tasks performed is a positive factor.
- Technology Readiness: When the organization is technically ready to adopt Cloud computing, including having the necessary infrastructure and skills, this can positively influence the decision.
- Cost Savings: Cost savings are often seen as a benefit of moving to the cloud. When organizations realize that Cloud computing can save financial resources, it can drive adoption.
- Senior Management Support: Senior management support is a critical factor in successful adoption. When organization leaders are aligned on the transition to the cloud, it can positively influence the decision.
- Cloud Knowledge: Understanding and knowledge of Cloud computing technology within the organization can facilitate adoption.
- Feasibility of Cloud computing: The perception that Cloud computing is a viable option for the organization is a positive factor.
- Coercive Pressures: External or regulatory pressures that force the organization to adopt Cloud computing can positively influence the decision.
- Regulatory Pressures: Industry expectations or industry norms that favor the adoption of Cloud computing can have a positive impact.
- Mimetic Pressures: Observing other similar organizations successfully adopting cloud technology can encourage imitation, which is a positive factor.

These factors indicate the complexity involved in the decision to adopt Cloud computing and how multiple elements interact to positively influence this decision.

In the thesis prepared by [39], several factors were identified as having a positive impact on the adoption of Cloud computing. Here are the factors identified:

Top Management Support: Top management support and motivation positively affect the behavior of subordinates to the adoption and use of Information Technology.

- Relative Advantage: When organizations perceive significant advantages in adopting Cloud computing compared to other approaches, this positively influences the decision.
- Perceived Ease of Use: The perception that technology is easy to use can have a positive impact on adoption.
- Compatibility: Compatibility between cloud technology and existing processes can positively influence the decision.
- Traceability: The ability to track and monitor usage and performance in the cloud is seen as a positive factor.
- Observability: Visibility and the ability to observe how Cloud computing works can positively affect the decision.
- Security: The perception that Cloud computing offers adequate levels of security is an important factor.
- Company Size: The size of the organization can also positively affect the adoption of cloud technology.
- Global Scope: When Cloud computing meets the needs of a company on a global scale, it can positively influence the decision.
- Financial Costs: The perception that adopting the cloud is financially advantageous is a positive factor.
- Satisfaction with Existing Information Systems (IS): When organizations are not satisfied with their current information systems, this can drive cloud adoption.
- Intense Competition: Competitive pressure can positively influence the decision to adopt Cloud computing.
- Regulatory Environment: The regulatory environment can also have a positive impact on the decision.
- Interoperability: The ability of systems and technologies from different origins to work together is seen as a positive factor.
- Core Focus: When cloud technology allows the organization to focus on its core activities, it can positively influence the decision.
- Business Processes: Cloud computing's ability to improve business processes is a positive factor.
- Greater Organization: The increased organization and efficiency provided by the cloud can have a positive impact.
- Service: The quality and effectiveness of customer service can be improved by adopting Cloud computing, which is positive.

- Standards: Compliance with industry standards can positively influence the decision.
- Environmental: Environmental considerations, such as reducing energy consumption, can positively impact adoption.
- Transparency of Process Standards: Clarity and transparency to process standards can be seen as positive.
- Bureaucracy: The reduction of bureaucracy through Cloud computing is seen as a positive factor.
- Political Issues: Political considerations can positively influence the decision.
- Legal Issues: Legal considerations can also have a positive impact on the decision to adopt Cloud computing.

These factors cover a variety of areas and illustrate the complexity involved in the decision to adopt Cloud computing, with multiple interrelated elements that positively influence the decision.

In the study carried out by [27], several factors were identified as positively influencing the adoption of Cloud computing in the healthcare context. Here are the factors identified.

- Experimentation with the Use of Cloud Computing Solutions: The willingness of organizations to experiment with Cloud computing solutions was seen as a factor that can positively affect the decision. However, the effectiveness of this factor depends on the innovation capacity of Information Technology leaders in organizations.
- Top Management Support: Top management support was identified as a crucial factor for the adoption of Cloud computing. Most respondents considered this support to positively influence the decision, although some may have differing opinions.
- Peer Pressure in the Healthcare Environment: Peer pressure, that is, the influence exerted by other hospitals or healthcare institutions that have already implemented Cloud computing, was seen to have a positive impact on the adoption decision. Most respondents considered that successful implementation elsewhere would positively affect their decision
- Availability of Information Technology Suppliers: The availability of Information Technology suppliers capable of providing a successful implementation of Cloud computing for healthcare organizations has been identified as a factor that positively influences adoption.

These factors illustrate the complexity involved in the decision to adopt Cloud computing in the healthcare context, with internal and external influences that may vary between organizations. Support from senior management, the experience of colleagues, and the availability of dependable suppliers are considered positive elements that can influence the adoption decision.

The empirical study carried out by [2] identified a series of factors that positively affect the adoption of Cloud computing. Here are the main factors and their conclusions.

- Social Dimension: The social dimension, which encompasses factors such as social influence and trust, was highlighted as one of the main determinants that positively impact people's intentional behavior in the technology adoption process. This suggests that the influence of social networks and trust in sources play a fundamental role in the decision to adopt Cloud computing.
- Performance Expectation: The expectation that the use of Cloud computing will lead to better or more effective performance is a positive factor in the intention to adopt this technology. This indicates that people are motivated to adopt Cloud computing due to the perception that it will improve their efficiency or productivity.
- Effort Expectation: The perception that using Cloud computing will require less effort or difficulty is another factor that positively influences adoption intention. This suggests that the ease of use of the technology plays a key role in the decision to adopt it.
- Social Influence: The influence exerted by social interactions and recommendations from others has been identified as a positive factor. This means that the opinions and experiences of colleagues and social contacts play a role in the decision to adopt Cloud computing.
- Enabling Conditions: Enabling conditions, which include supporting infrastructure and resources that make adoption easier, have been determined to have a positive and highly significant impact on the effective use of cloud computing.

These conclusions highlight the importance of the social dimension, perceived ease of use, and performance and effort expectations in the adoption of Cloud computing. Furthermore, they highlight the role of facilitating conditions in the effectiveness of the adoption of this technology.

The study carried out by [31] identified a series of factors that positively impact the adoption of Cloud computing in the context of healthcare organizations. Here are the main factors and their conclusions.

- Compatibility: Compatibility refers to the degree of adjustment of Cloud computing to the existing infrastructure. If Cloud computing can be easily integrated into the healthcare sector's existing IT infrastructure, it will positively impact adoption. In other words, the ability of technology to align with existing systems and processes is a positive factor.
- Top Management Support: Top management support is crucial in the adoption of Cloud computing. Top managers play a key role in identifying the potential

benefits of technology, allocating human and financial resources, and making budgetary decisions. This positively influences adoption, as senior management leadership is critical.

- Technical and Financial Resources: Larger healthcare organizations, that have substantial technical and financial resources, are better prepared to adopt Cloud computing. They can cover investment risks in the event of failure and can implement this technology more effectively. In contrast, smaller organizations may lack the resources necessary to support the risk associated with adopting cloud computing.
- Competitive Pressure: Competitive pressure also positively influences the adoption of Cloud computing. Competition in the healthcare sector can motivate organizations to adopt innovative technologies, such as Cloud computing, to remain competitive and meet market demands.

These conclusions highlight the importance of compatibility with existing systems, senior management support, available technical and financial resources, and competitive pressure in the process of adopting Cloud computing in the healthcare sector. These factors play a key role in determining the success of adopting this technology.

In the study carried out by [36] to understand the determinants of the adoption of Cloud computing in Taiwan, some hypotheses were proposed to evaluate the factors that impact the adoption of this technology. Here are the proposed hypotheses and study results.

- H1: Top Management Support is positively correlated with the adoption of Cloud computing.
- Result: According to the study, senior management support was not significantly correlated with the adoption of Cloud computing. In other words, senior management support did not have a significant impact on the decision to adopt this technology.
- H2: Information Technology Resources are positively correlated with the adoption of Cloud computing.
- Result: Information Technology resources were considered significant for the adoption of Cloud computing. This indicates that the availability of IT resources such as hardware, software, and infrastructure played a positive role in the decision to adopt cloud technology.
- H3: Employee Knowledge is positively correlated with the adoption of Cloud computing.
- Result: According to the study, employee knowledge was not significantly correlated with the adoption of Cloud computing. This means that employees' level of knowledge about cloud technology did not have a significant impact on their decision to adopt this technology.

Therefore, of the three hypotheses, only the second hypothesis (Information Technology Resources) was considered significant for the adoption of Cloud computing. This indicates that the availability and adequacy of Information Technology resources play a crucial role in organizations' decisions to adopt cloud technology, while senior management support and employee knowledge had less significant impacts in this specific context.

In the study by [32], the following conclusion was reached:

- Relative Advantage: Relative Advantage, which refers to the perception that cloud technology offers significant benefits over existing solutions, plays a fundamental role in the decision to adopt Cloud computing in e-government. Organizations often evaluate the advantages an innovation brings before making adoption decisions, and this relative advantage is one of the main factors influencing the decision to adopt cloud technology.
- Organizational Readiness: Organizational Readiness refers to the organization's capacity in terms of available Information Technology human resources and necessary infrastructure to adopt Cloud computing. When an organization is financially and technologically prepared to adopt a technology, it is said to have organizational readiness. This readiness is crucial to enabling organizations to leverage the real benefits of Cloud computing.
- Organizational Size: The size of the organization has also been identified as a significant factor in the adoption of innovations. In previous studies, it was found that the size of the organization plays an important role in the decision to adopt innovative technologies. Organizations of different sizes can have different approaches to adopting new technologies, and the size of the organization is one of the key components in adopting innovation.

Therefore, according to the study, Relative Advantage, Organizational Readiness, and Organizational Size are critical factors that positively impact the adoption of Cloud computing, especially in the context of e-government. These factors play an important role in organizations' decision to adopt this innovative technology.

The benefits of adopting Cloud computing are broad and impactful. Among these advantages, substantial cost savings stand out. Companies can significantly reduce spending on physical infrastructure, as the cloud eliminates the need for investments in hardware and data center maintenance. Furthermore, the ability to adjust resources according to demand makes it possible to optimize operational costs, paying only for what is used.

Operational agility is another notable result. The cloud empowers companies to launch products and services more quickly, speeding up the development cycle and

shortening the time to market. Development teams can leverage on-demand development and testing environments, allowing greater flexibility for experimentation and innovation.

Additionally, improved collaboration and accessibility are also significant outcomes. Adopting the cloud allows teams to work in an integrated manner, regardless of their geographic locations. This promotes communication and cooperation, expanding opportunities to share knowledge and collaborate.

By understanding how these factors interact and influence each other, companies can make more informed and strategic decisions when adopting cloud technologies. This integrated approach allows organizations to make the most of the benefits of Cloud computing, improving agility, innovation, and operational efficiency. This, in turn, contributes to creating a more competitive and resilient business environment.

Studies on the benefits of adopting cloud computing, in the context of operational efficiency, scalability, and agility, reveal valuable insights. Scalability appears as a vital factor, requiring cloud providers to expand their resources to meet the growing requirements of adopters, encompassing storage, processing, and connection bandwidth [48], [66]. Cloud computing provides services to end-users with agility, elasticity, reliability, speed, and creativity [64]. The relative advantage, related to the belief that innovation is more beneficial, is highlighted by the ability to respond to business requirements and reduce costs [73].

Furthermore, scalability in Cloud Computing is a strong point, offering significant opportunities for companies to dynamically adjust their infrastructure in response to changing requirements [15], [48]. Cloud computing offers a range of benefits such as cost reduction, increased mobility, shared resources, flexibility, and scalability [15]. The growing popularity of cloud computing highlights benefits such as scalability, availability, and cost savings, providing a competitive advantage to adopting organizations [49]. At the organizational level, its importance lies in the ability to efficiently provide computational resources at a lower cost, bringing location independence, device independence, and agility [88]. Service quality becomes a crucial criterion for users and providers [52]. In the educational sphere, cloud computing is seen as a tool to increase efficiency, relying on advantages such as mobility and pay-per-use scalability [58], [65], [82]. Technical benefits drive the adoption of cloud computing, with scalability identified as a key factor in various research studies [51], [53], [61], [75]. Cloud computing, a technology that offers dynamic scalability of computing resources, storage, and applications, positively influences various sectors [45]. Its advantages include shared resources, higher performance, cost reduction, simplified maintenance, massive scalability, rapid deployment, sustainability, and integration with Internet technologies [77].

For most organizations, the most significant reward of adopting cloud computing is cost reduction and productivity improvement [43]. Cloud production offers ample options in terms of scalability, adaptability, and reconfiguration of production processes, integrating the Internet of Things, service-oriented technologies, and virtualization [71]. In sub-Saharan countries, awareness of the importance of the cloud is driving policy development to accelerate information exchange in the underdeveloped world [60].

The benefits of adopting cloud computing are vast and impactful across different sectors, highlighted by the operational efficiency, scalability, and agility offered. Scalability appears as a key element, enabling dynamic expansion of resources as needs evolve. Cloud computing not only provides technical and organizational advantages such as cost reduction, mobility, and flexibility but also positively influences education, driving efficiency in educational institutions. Furthermore, the cloud plays a vital role in transforming production processes, offering advanced options, and integrating innovative technologies. In a global scenario, awareness of the importance of the cloud is driving policies to help information exchange in less developed regions. Thus, cloud computing appears as a strategic tool, conferring competitive advantage, efficiency, and innovation to adopting organizations.

IV. DISCUSSION

Cloud computing is a revolutionary approach to delivering Information Technology services that has transformed the way individuals and organizations manage, store, and access data and applications. This technology offers a series of benefits and challenges that deserve further discussion. One of the main reasons for this popularity is the wide range of benefits that Cloud computing offers. This technology not only transforms the way companies operate but also provides a range of advantages, from cost savings to improved operational efficiency and innovation capacity.

It is important to understand the benefits of Cloud computing and explore the many ways in which it is driving digital transformation in companies and organizations around the world. By exploring these benefits, it is possible to understand why Cloud computing has played a vital role in the evolution of information technology and in the way, companies approach the management of technological resources. Therefore, the benefits of Cloud computing are:

- Cost Savings: One of the most obvious advantages of Cloud computing is cost reduction. Companies can eliminate

the need to purchase and maintain physical infrastructure, which includes servers, hardware, physical space, and maintenance teams. This results in saving money and resources.

- Scalability: The ability to quickly scale resources is fundamental in Cloud computing. Companies can increase or decrease resources according to their needs, without large initial investments. This is especially useful for dealing with seasonal demand spikes.
- Accessibility: The cloud allows access to data and applications from anywhere with an Internet connection. This offers flexibility and mobility, allowing people to work remotely and access information at any time.
- Automatic Updates: Cloud providers automatically manage software and security updates. This eliminates the workload of keeping your software up to date and protected from threats.
- Disaster Recovery: Most cloud services include backup and disaster recovery options, ensuring that critical data is safe and recoverable in the event of a failure.

However, behind the promises of efficiency, scalability, and accessibility that Cloud computing offers, lie a series of crucial challenges that organizations need to face to make the most of this technology. These challenges cover a variety of areas, from data security and internet connection availability to issues related to migration and compatibility with existing systems. The importance of understanding and addressing these challenges, providing an overview of the critical issues surrounding Cloud computing, and outlining the need for innovative solutions to meet these constantly evolving demands, therefore, the challenges of Cloud computing are:

- Security: Data security is a major concern. Trusting third parties to store sensitive information raises questions about privacy and vulnerabilities to cyber threats. Ensuring robust security measures is essential.
- Connectivity: Dependence on a reliable internet connection is a disadvantage. When connectivity is lost, access to applications and data is interrupted, which can negatively impact operations.
- Privacy and Compliance: Companies need to comply with regulations and compliance standards, such as the General Data Protection Regulation (GDPR). This can be challenging when data is stored on servers outside the organization's authority.
- Complex Migration: Migrating existing systems and data to the cloud can be complex and expensive. It requires careful planning and consideration of the organization's specific needs and requirements.
- Dependency on Suppliers: When adopting Cloud computing, companies become dependent on their cloud service providers. This can limit the flexibility and portability of data and applications.

Cloud computing is a transformative technology that is being adopted across the world due to its significant benefits. However, cloud adoption requires a deep understanding of its challenges and implications. Companies must carefully evaluate how cloud computing fits into their operations and develop solid security strategies to protect their digital assets. As technology continues to evolve, organizations need to stay organizations with best practices and relevant regulations.

Information security has been a critical factor in technological evolution, especially in the context of cloud computing. Before migrating to the cloud, it is crucial for clients to carefully read the terms and conditions to avoid potential legal issues. Several studies emphasize the importance of this approach:

1. Cloud computing, being a relatively young technology, lacks specific government rules and regulations to define limits and laws related to data storage by companies in shared third-party facilities, potentially violating old regulations regarding privacy, access, and location of business data [66].
2. Despite many countries having regulations on the physical location of business data, cloud providers cannot guarantee the exact location of the data, some even hide this information from end-users. Companies seek to solve this problem to comply with local regulations, considering compliance as a real risk in cloud solution adoption [15].
3. KPMG's global cloud research found adoption challenges such as data loss, lack of visibility over future costs, legal compliance, and interoperability [68].
4. Internap Network Services Corporation's research revealed challenges and risks faced by cloud customers, including security, compliance, cost escalation, service reliability, and limited configuration [62].

In addition to technical issues, there are non-technical factors that affect cloud computing adoption, such as legal concerns, hidden costs, resistance to change, and lack of specialized resources. Legal and regulatory compliance was highlighted as a significant challenge for organizations planning to adopt cloud solutions, cited by 46% of respondents in studies [68].

Security and trust need to be shared between clients and service providers, with cloud providers taking responsibility for the transferred data. Diversity in data protection laws between countries is a challenge, creating inconsistencies in protecting generated and stored data [54], [55], [76], [89]. Compliance and regulations are considered significant barriers to cloud migration, especially for organizations with confidential data. To ensure a secure and compliant migration, IT managers must validate whether cloud service providers offer adequate measures in key areas, including risk management, access control, data encryption, infrastructure security, resilience, and disaster recovery, as well as deep knowledge of specific industry regulations, and promote ongoing training and awareness for the team.

Technological evolution, especially around cloud computing, has brought crucial challenges related to information

security and compliance to the forefront. The lack of specific regulations, coupled with the diversity in data protection laws between countries, highlights the need for a cautious approach to cloud migration. Legal and regulatory compliance, along with technical and non-technical issues, represent significant barriers, requiring organizations to adopt comprehensive measures, including regular audits, robust access controls, effective encryption, infrastructure security, and disaster recovery strategies. Ongoing awareness and team training are essential to address emerging challenges and promote a culture of robust security in the era of cloud computing.

Even in the face of promising results, the implementation of Cloud computing presents challenges and critical considerations. Data security emerges as a central concern in this scenario. When delegating the management of cloud services to external providers, organizations must ensure that robust measures to protect confidential information are effectively implemented. This involves maintaining constant vigilance over issues such as access control, identity management, and compliance with applicable regulations.

Dependence on internet connectivity emerges as a prominent issue. Despite the benefits in terms of flexibility and mobility that Cloud computing provides, the absence of a reliable internet connection can lead to disruptions in operations. Additionally, migrating to cloud environments can prove to be a complex and challenging endeavor, especially for companies that operate legacy systems or have adopted highly customized processes. The issue of compatibility and integration with already established systems often becomes crucially relevant.

Cloud computing provides a variety of advantages, ranging from cost savings to improving operational agility and fostering collaboration. However, thinking about this transformation also encompasses crucial considerations such as security, connectivity, migration, and dependence on external suppliers. Understanding and properly addressing these aspects play an essential role in maximizing the benefits of the cloud while minimizing the inherent risks.

Furthermore, research into Cloud computing is fundamental to understanding how this technology affects different sectors, from healthcare and education to government and business. This research helps customize cloud implementation to meet the specific needs of each industry, ensuring successful integration and optimizing cloud benefits.

Finally, Cloud computing is constantly evolving, with new technologies, service models, and trends emerging regularly. Continuous research in this area allows professionals and organizations to stay up to date and adopt best practices to take advantage of cloud innovations, addressing the benefits and challenges is important for companies and organizations.

Therefore, research into Cloud computing is extremely important as it influences the way companies and organizations operate, impacts data security and regulatory compliance, and drives technological innovation. It is essential to understand how the cloud is shaping the present and future of information technology.

The successful implementation of cloud computing demands substantial changes in culture and organization, making it crucial to explore theories and frameworks that can guide this process. The Technology-Organization-Environment (TOE) Framework, derived from the Diffusion of Innovations theory, stands out for encompassing technological, organizational, environmental, and sociocultural factors, influencing the perception and adoption of technological innovations [47].

A qualitative exploratory study by [42] revealed that, in the technological context, factors such as data backup, social media, remote access, and ease of use affect the adoption of cloud computing. Organizational elements such as knowledge management, Customer Relationship Management (CRM), and document collaboration also play a significant role. The study highlighted the importance of awareness, user training, and external challenges such as electricity shortages.

Various Cloud Computing Decision Support Systems (DSSs) have been proposed to automate decision-making processes related to cloud migration. CloudGenius, presented by [73]), focuses on provider selection and application migration, while [44] offers a model centered on technical aspects of migration. Reference [91] developed a Knowledge Management-Based Cloud Computing Adoption Decision Making Framework (KCADF), highlighting the need to include organizational factors in the migration process.

The TOE framework, by offering a comprehensive taxonomy with three dimensions to investigate innovation adoption at the organizational level, stands out in the literature, addressing psychological and social aspects and supporting empirical and theoretical research in Information Systems (IS) [46]. Additionally, the Unified Theory of Acceptance and Use of Technology (UTAUT), integrating various adoption theories/models such as TAM and the Theory of Reasoned Action, appears as an established framework for investigating the adoption of information technologies in organizational contexts [88].

Several theories, such as Diffusion of Innovation, Theory of Planned Behavior, Technology Acceptance Model (TAM), and Technology-Organization-Environment (TOE), among others, have been employed in evaluating factors associated with Cloud Computing Services (CCSs), highlighting the complexity and diversity of theoretical approaches in this field [40], [80], [81], [84], [87].

In summary, the successful implementation of cloud computing is a complex endeavor that requires substantial changes in culture and organization. Several theories and frameworks have been explored to guide this process, with the Technology-Organization-Environment (TOE) Framework and the Unified Theory of Acceptance and Use of Technology (UTAUT) standing out as consolidated tools

in the investigation of technological innovation adoption in organizational environments.

The study highlighted the importance of technological, organizational, environmental, and sociocultural factors in accepting and implementing cloud computing. The literature emphasizes the relevance of the TOE Framework, providing a comprehensive taxonomy, and the UTAUT approach, integrating multiple theories, as fundamental to understanding the challenges and opportunities associated with this transformation.

Furthermore, investigations into Cloud Computing Decision Support Systems (DSSs) reinforce the pursuit of more automated provider selection and application migration-oriented approaches. However, it is clear that the field is still evolving, with the need to enhance frameworks, consider organizational factors more comprehensively, and adapt to the dynamic landscape of cloud computing. Ultimately, understanding these theories and consciously applying frameworks is crucial for organizations to successfully navigate the era of cloud computing.

V. CONCLUSION

The adoption of Cloud computing has brought impressive discoveries related to operational efficiency, scalability, and agility for companies. Many organizations realized they could significantly reduce their infrastructure costs by opting for cloud services, eliminating the need to invest significant amounts in hardware and data centers. Additionally, adjusting resources according to fluctuations in business demands provided greater flexibility and optimization of available resources.

Another notable finding concerns improved collaboration and innovation. The ability to access data and applications from anywhere, at any time, has created a favorable environment for remote work and collaboration between globally distributed teams. This has resulted in a significant increase in productivity and creativity, driving innovation in previously unimaginable ways.

Over time, organizations have gained valuable conclusions about adopting Cloud computing. One of these findings is that migration to the cloud transcends the purely technical scope, also encompassing changes of a cultural and organizational nature. Collaboration between IT, development, and operations teams has become essential for successful cloud implementation. Automation and adopting agile practices have proven to be fundamental to optimizing the benefits provided by the cloud.

Furthermore, it has become evident that security and compliance are crucial issues in the cloud adoption journey. Companies have concluded that responsibility for security is shared between the cloud service provider and the customer, requiring a comprehensive approach to ensuring data protection and regulatory compliance. Identity management, access control, and encryption strategies have become essential components of cloud operations.

VI. LIMITATIONS AND FUTURE DIRECTIONS

Despite the numerous advantages, adopting Cloud computing also presents some significant limitations. One of them is the dependence on a stable internet connection, as interruption of the connection can substantially impact operations and access to cloud resources. Additionally, latency and performance concerns may arise, especially in applications that require instantaneous responses.

Another crucial limitation is the risk of lock-in, which refers to excessive dependence on a single cloud service provider. This can make migrating to another provider a complex task in the future. This highlights the importance of adopting a flexible cloud strategy that allows for the portability of applications and data, thus ensuring the ability to choose different cloud providers or models as the organization's needs evolve.

The cloud computing adoption journey has been characterized by exciting discoveries, valuable lessons, and limitations to be carefully weighed. Cloud computing has profoundly transformed how companies conduct business, providing numerous notable benefits while presenting substantial challenges. Understanding these aspects is essential to make informed decisions and make the most of the resources offered by Cloud computing.

Reviewing limitations in the existing literature related to cloud computing highlights several crucial issues warranting consideration. One of the primary limitations is the potential for bias in study selection. Most of the available research may be based on specific datasets or contexts, which can limit the generalizability of findings. Additionally, the rapid evolution of technology in the field of cloud computing may mean that older studies may not reflect current practices and challenges.

Another significant limitation is the lack of consensus in terms of definitions and metrics used to assess different aspects of cloud computing. This can hinder comparison between studies and the attainment of robust conclusions. Furthermore, the multifaceted nature of cloud computing, spanning from technical aspects to security and governance issues, may result in literature fragmentation and a lack of a holistic view of the field.

The need for continued research in Cloud computing is highlighted, highlighting its fundamental role in understanding the impact of this technology on various sectors. Customizing cloud implementation to meet the specific needs of each industry is highlighted as a crucial element in ensuring successful integration and optimizing cloud benefits.

Cloud computing, a technological evolution that offers services over the Internet, has received little academic attention about the factors influencing its adoption in developing countries. The lack of sufficient investigations highlights the need for deeper analyses to understand these factors [2].

Researchers are urged to examine the relationship variables between companies and other specific business capabilities,

TABLE 15. Abbreviations and letter symbols for units.

Unit or Term	Abbreviation
Adoption Maturity Model	MMA
Artificial Intelligence	AI
Behavioral Intention	BI
Cloud computing	CC
Cloud Computing Decision Support Systems	DDSs
Cloud Computing Services	CCSs
Customer Relationship Management	CRM
Diffusion of Innovation	DOI
Fit Viability Model	FVM
General Data Protection Regulation	GDPR
Higher Education Institutions	HEIs
Information Systems	IS
Infrastructure as a Service	IaaS
Institutional Theory	IT
Knowledge Management-Based Cloud Computing Adoption Decision Making Framework	KCADF
Platform as a Service	PaaS
Preferred Reporting Items for Systematic Reviews and Meta-Analyses	PRISMA
Return on Investment	ROI
Service Level Agreement	SLA
Small and medium-sized enterprises	SMEs
Software as a Service	SaaS
Systematic Literature Review	SLR
Technology Acceptance Model	TAM
Technology Acceptance Model 3	TAM3
Technology, Organization, and Environment	TOE
The Financial, Information, and Communication Technology	ICT
Theory of Planned Behavior	TPB
Trust Theory	TT
Unified Technology Acceptance and Use Model	UTAUT
Unified Technology Acceptance and Use Model 2	UTAUT2

ensuring the consistency of their theoretical models. It is crucial to explore the perceptions of students and faculty members regarding the adoption of cloud computing in Higher Education Institutions, encouraging new studies in diverse educational contexts [13]. In the area of cloud-based e-commerce, a greater focus is recommended, considering its impact on the strength of e-commerce and the ease of consolidation between companies and cloud providers [1].

Researchers and cloud providers must develop strategies to address the challenges of e-government in developing countries, where there is a shortage of studies on cloud computing in the context of governmental governance [32].

Developing countries, especially in the educational sector, are in the initial stages of adopting innovations such as Cloud Computing. Socioeconomic and political issues may limit the investment capacity in information systems, requiring more research on policy implementation by educational institutions [11], [78].

The systematic literature review identified the constant evolution of Cloud computing, with the frequent introduction of new technologies and trends. The importance of ongoing research is emphasized to keep professionals and organizations up to date and adopting best practices, enabling them to take advantage of cloud innovations and face ever-changing challenges. It is concluded that research in Cloud computing is vital, influencing not only business and organizational operations, but also data security, regulatory compliance, and technological innovation, thus shaping the present and future of information technology.

Therefore, key areas that require further research include advanced cloud security, energy efficiency and sustainability, AI and machine learning integration, Edge Computing, privacy and ethics in the cloud, quantum computing, and interoperability. These trends and challenges reflect areas of continued interest in cloud computing research.

LIST OF ABBREVIATIONS

See table 15.

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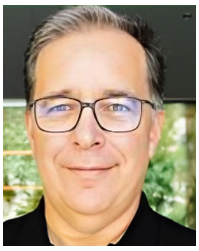

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