

Systematic Review of Cloud Computing Studies within Higher Educational Institutions in Saudi Arabia

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Abstract: *Cloud computing has emerged as a transformative technology with the potential to reshape the teaching, learning, and administrative functions within educational institutions. This systematic review explores the state of cloud computing studies within higher educational institutions (HEI) in the Kingdom of Saudi Arabia (KSA). KSA, a nation with a burgeoning higher education sector, has witnessed a growing interest in adopting cloud computing to enhance educational practices, research endeavors, and institutional efficiency. This review employs a rigorous methodology to assess the existing literature, analyzing several research articles, conference papers, theses, and reports published between 2018 and 2023. The primary objectives of this review are to identify the key themes, contributions, models, and methods employed in cloud computing studies within KSA's HEI and to highlight the impact of these initiatives on teaching, learning, and institutional operations. The findings of this systematic review provide a current snapshot of cloud computing research and offer insights and recommendations for future research directions and practical implications. Ultimately, this study contributes to the ongoing discourse on integrating cloud computing technologies to enhance the quality and efficiency of HEI in KSA and offers valuable insights that can inform policymakers, educators, and researchers in the region.*

Keywords: Cloud computing, Higher educational institutions, Kingdom of Saudi Arabia, Review

1. Introduction

The rapid advancements in information and communication technologies (ICT) have prompted HEI to enhance their learning and teaching methods [1], [2]. Various industries have widely adopted cloud computing for IT services, influencing people's daily lives [3], including its growing use in global education [4]. KSA is one of the pioneering Arab countries emphasizing cloud computing. Also, with the introduction of cloud systems by significant companies like Amazon, Google, and Microsoft, Saudi citizens and industries have begun adopting more cloud applications [5]. Cloud computing has emerged as a viable solution to meet the increasing need for high-performance, reliable, and cost-effective technology in education [6], [7], significantly enhancing e-learning and collaborative learning [8], [9]. Therefore, this study will examine and review the articles published on the scope of cloud computing within KSA's HEI within the last five years and highlight the gap in the literature. The first section covers the background of the study context, followed by the purpose of the study, methodology, findings, discussion, and conclusion. Cloud computing has become a firmly established infrastructure and a prominent research domain in KSA. It offers a wide range of applications and has notably simplified and enhanced e-learning, leading to substantial reductions in the costs associated with maintaining and developing learning resources [4]. Numerous well-known cloud service providers, including Google for Education, Amazon Education Cloud, and Microsoft Office in Education, have embraced the growing trend of utilizing cloud computing for educational purposes [6]. For instance, it allows the sharing of educational resources, scholarly articles, research

papers, and references utilizing cloud storage platforms such as Google Docs or Dropbox [6], [10].

Cloud computing offers numerous advantages to users, including enhanced availability, performance, scalability, and cost-effectiveness compared to traditional data centers [7]. It is now akin to a utility, similar to electricity, water, telephone, and gas, allowing users to utilize resources as needed and pay for their consumption accordingly [2]. Scholars have classified cloud computing into service and deployment models [1]. The service model comprises software as a service (SaaS), platform as a service (PaaS), and infrastructure as a service (IaaS). On the other hand, the deployment models include private, public, hybrid, and community clouds [1], [8].

Cloud computing has proven to be a viable solution for HEI facing financial constraints or struggling with technological complexity [11]. Known for its 'pay-as-you-go' approach, cloud computing allows clients to pay only for the resources they utilize, resulting in lower operating costs during periods of low service demand [12]. The National Institute of Standards and Technology (NIST) states that cloud computing allows on-demand access to a shared pool of configurable computing resources [13]. Furthermore, the appealing features of cloud computing encourage HEIs to integrate it into their systems and resources. For instance, monitoring devices and software updates have become more streamlined as vendors update systems automatically and replace damaged servers without additional costs through cloud server services [12]. Moreover, cloud computing develops IT quality and facilitates IT competencies while allowing educational administrators and managers to focus more on their institution's outcomes,

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reputation, research, and goals for attainment [3]. Also, it simplifies monitoring and enhances security, as vendors can oversee a single station instead of thousands of PCs owned by the HEI, making security testing more efficient [14].

The interest in cloud computing has significantly risen, with public cloud services end-users spending increasing from \$396 billion in 2021 to \$482 billion in 2022, marking a 21.7% growth within one year. According to Gartner's projections in 2021, this expenditure is expected to surge by approximately 45% by 2026. As a result, several studies stress the importance of integrating cloud computing into educational platforms to enhance the learning experience [7], [16], [17].

The COVID-19 pandemic has further fueled this interest in cloud computing within KSA. The pandemic created a rapidly changing environment that prompted HEI and experts to explore alternative technologies to face-to-face teaching methods for more successful outcomes and improved learning experiences[18]–[20].

While technology adoption is on the rise in KSA[4], there are challenges hindering progress on the backend, with resistance to rapid innovation still persistently [4], [21]. The technical education market in KSA is relatively underdeveloped, and its interaction with cloud technology is in the early stages [5], which hampers the smooth transition to a cloud-based environment [4].

A significant concern associated with the development of cloud computing in KSA is the lack of change effectiveness [4]. Furthermore, the absence of standards can impede clients from transferring their data between different cloud service providers [13]. Addressing these issues requires governments to ensure the proper enforcement of laws and regulations concerning cloud computing, especially concerning data protection, security, and cybercrimes [13].

2. Purpose of the Study

In recent decades, cloud migration into organizations has been of significant interest to scholars due to the development of innovative technologies. Although the literature widely explores this subject, little research has focused on KSA [5], specifically within the educational field, as most studies were in the health or business fields [22]. [1] highlighted that approximately 52% of universities in KSA are currently not utilizing cloud services, as adopting cloud services is a critical decision. Despite the rise of cloud-based solutions in university-level education, some argue that they primarily use the cloud as document storage rather than being fully harnessed as effective teaching aids. Several studies indicate that although college staff members in different locations use Learning Management Systems (LMS) to varying extents, a significant portion of them are unable to leverage the software's capabilities fully[23], concluding the available cloud-based computing is not used with all its functions [17], [24], lacking the users' training as one of the reasons[4]. Therefore, the need for such a review came.

This review aims to capture all the studies engaged with cloud computing and HEI in KSA and review them through content and thematic analysis. The contribution of this review is to support a more holistic picture for scholars interested in KSA. The study results are anticipated to impact the current body of knowledge substantially. This is because the study aims to pinpoint deficiencies and provide valuable perspectives on cloud technology within HEI in KSA.

[25] highlighted that reviewing the literature is a crucial exercise that enables evaluating the produced knowledge within a specific investigation area, identifying existing knowledge gaps, and anticipating potential future developments. Therefore, a review of 40 articles published between 2018 and 2023 was conducted, with the study aiming to address the following questions:

- 1) What are the different contributions, contexts, purposes, and domains investigated in cloud computing studies within KSA's HEI?
- 2) What theoretical methods or models are employed in cloud computing studies within KSA's HEI?
- 3) What research methods are employed in cloud computing studies within KSA's HEI?
- 4) What are the research gaps and directions for future research that can be identified through a systematic literature review?

3. Method

This study provides a systematic investigation, including a comprehensive literature search to analyze studies on cloud computing within HEI in KSA. The review adhered to the reporting checklist specified by the PRISMA extension Preferred Reporting Items for Systematic Reviews and Meta-Analyses[25]. PRISMA principles are utilized as a framework to search, identify, and select pertinent articles for inclusion in the study [26]. Furthermore, PRISMA facilitates the reading, extraction, and management of secondary data from the selected studies; thereby, the research ensures an unbiased and impartial synthesis of the gathered data[27]. Analyzing existing data also involved utilizing a qualitative deductive and inductive coding approach [28].

The review considers analyzing the articles published from 2018 to 2024. The study selected this timeframe due to the ongoing significance of cloud computing as a rapidly emerging technology in KSA. The study aimed to exclude outdated information and capture the latest developments by focusing on recent publications. The organization of this method section ensures complete transparency by providing comprehensive details about each of these methods as follows.

3.1 Search Strategy

The study commences with identifying research articles to be incorporated into the study. The study parameters, including the research methods, theoretical methods or models, contributions to the literature, and key findings, are defined based on the research question. Subsequently, appropriate

databases and journals are chosen, and a Boolean search is formulated and executed across these sources. Once a collection of publications is retrieved through these searches, they undergo a thorough evaluation against pre-defined inclusion and exclusion criteria to decide which articles would be considered for the final analysis. The researcher extracted and methodically coded the relevant data related to the research questions from the selected studies.

The data retrieval process involved electronic and manual search methods [27]. Distinguished databases like Scopus, ACM, Springer, IEEE, and Google Scholar were utilized for

electronic search. A comprehensive full-text search was conducted within these databases, employing a Boolean search strategy tailored to the research topic and questions. The Boolean search terms were explicitly related to cloud computing, education, university, learning, and Saudi. While the Boolean search terms varied across the different databases, the complete list of the applied Boolean search is provided in Table 1. The filtering options took place during the investigation, depending on the availability of the database website within six years, education, and cloud computing research in the English language.

Table 1: Searching Terms.

Database	#	Search terms
Scopus	60	["Saudi" OR "KSA"] AND ["cloud"] AND ["education*" OR "Universit*"]
ACM	149	[[Abstract: 'cloud'] AND [Abstract: ['Saudi']] OR [Abstract: ['KSA']] AND [Abstract: ['learning']] OR [Abstract: 'universit*']] OR [Abstract: 'education*']] AND [E-Publication Date: Past 6 years]
Springer	66	Cloud Saudi Ksa Universi* Learning Education*
IEEE	72	("Abstract": cloud) AND ("Abstract": education*) OR ("Abstract": universit*) AND ("Abstract": Saudi)
Google	64	Cloud Saudi Ksa Universi* Learning Education*

3.2 Screening

During the systematic review process, 411 articles published between 2018 and 2023 were initially identified through keyword-based and manual searches. After removing duplicate entries (n=88), a total of 232 articles were excluded. Subsequently, the researcher conducted a thorough manual screening of the remaining articles, initially by assessing the titles and abstracts of each article. The researcher later examined the full text to ascertain its eligibility based on the inclusion and exclusion criteria. The exclusion criteria were as follows: articles discussing educational mobile cloud computing (n=5), unrelated to the higher educational sector (n=13), not primarily and purely focusing on cloud computing

(n=30), or not directly related to the academic industry - such as health or organizational sectors- (n=18), articles that did not exclusively pertain to KSA (n=48) or were irrelevant to the study's focus (n=169) were excluded (N=48), and all articles not pure related (n=169). All the previous articles were excluded. Figure 1 illustrates the articles' identification screening, including and excluding criteria.

Consequently, 40 articles were compiled in an MS Excel spreadsheet, incorporating the relevant data required for efficient data management. This process stage encompasses information on the included studies' research methodologies, theories or models, participants, purposes, and contributions. Thus, the analyzing process will be more straightforward.

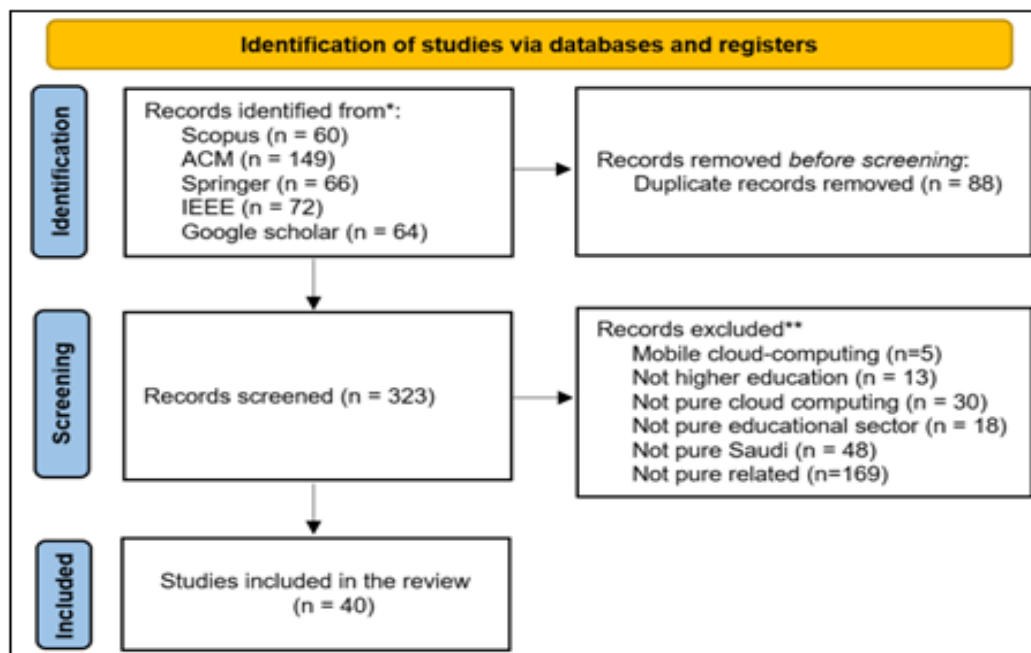


Figure 1: Article identification and screening

3.3 Coding

The 40 articles were coded using grounded coding methodology [29] and were selected for this study to analyze and synthesize the findings from multiple research studies systematically. Rather than simply summarizing the literature, using grounded theory in a literature review article allows scholars to identify patterns, themes, and theoretical insights that emerge directly from the data presented in the reviewed studies. This approach offers a comprehensive and insightful understanding of the topic under investigation. The grounded coding process entailed extracting information about the utilization of cloud computing technology in KSA's HEI from the articles.

4. Findings and Discussion

This study's findings and discussion section are structured around the four guiding questions, providing organization and coherence to the content. The first three questions offer contextual information on cloud computing within KSA's HEI research, and the final question highlights the gap in the literature and offers new domains to investigate.

RQ1: What are the different contributions, contexts, purposes, and domains investigated in cloud computing studies within KSA's HEI?

The literature concerning cloud computing within KSA's HEI encompasses various contexts, as outlined in Table 2. These contexts include studies exploring technology acceptance and usage, technology efficiency, challenges and opportunities in the adoption process, the proposal or development of frameworks, teaching strategy models, prototype development, instrument evaluation, and literature reviews. The forthcoming discussion will address these contexts and their corresponding articles, answering the research question.

Table 2: Different Contexts Covered in the Literature

Context	#	Articles
Technology Acceptance	12	[16], [19], [21], [22], [30]–[37]
Technology Efficiency	9	[4], [23], [38]–[44]
Challenges and Opportunities	3	[1], [2], [45]
Propose a Theoretical Model	1	[3]
Propose a Framework	2	[46], [47]
Develop a Framework	1	[6]
Propose A Teaching Strategy Model	2	[48], [49]
Prototype Developing	1	[50]
Validate Instrument	1	[51]
Literature Review	8	[5], [13], [14], [20], [52]–[55]

Technology Acceptance

Referring to the previous Table 2, 12 articles in the literature primarily focus on exploring the acceptance and usability of cloud computing in HEI. These studies employ various theories and methodologies, which will be further discussed in this study. Within this category, Most of the studies within this category focus on the perception of students [21], [30], [34],

[36], [37]. Justifying this emphasis on student perception is their role as the primary users of cloud computing in HEI, which makes investigating their acceptance and usability of this technology crucial. Apart from Alanazy (2021), who included both teachers and students in their study, and Gollapalli et al. (2023), who specifically focused on teachers to address a gap in the literature, some scholars did not mention the population of their research [22], [32], [33], [35]. Additionally, all the studies in this context utilized quantitative methodology to collect participant data.

Technology Efficiency

In the literature, cloud computing's efficiency was discussed in 9 articles. Three articles used experimental study methods, four used quantitative methods, and two did not specify their method. [23] conducted an experimental study with 60 teachers to explore the suitability of cloud computing services for e-learning and their potential benefits in ensuring high-quality educational practices. [43] employed a quasi-experimental approach with 32 participants from King Khalid University, revealing significant improvements in cloud computing application skills and knowledge economy skills among university students in a participatory e-learning environment based on communication theory. [41] used a semi-experimental method with participants from Tabuk University, demonstrating the efficacy of cloud computing in enhancing mathematical achievement and related skills. [39] focused on Social Constructivism Theory and explored how cloud computing can enhance teaching and learning in KSA universities through the perspective of 84 Deans and Vice Deans. [40] investigated efficient cloud computing e-learning with 20 participants. [4] analyzed the effectiveness of cloud computing in the education sector in KSA, using a quantitative method with 130 staff and students. [38] examined the impact of cloud-based collaborative writing on English class students' writing quantity and quality, involving 21 Imam Abdulrahman Bin Faisal University participants. [42] confirmed that distributed computing environments, especially cloud computing, offer a viable framework for creating efficient, resilient, and high-performance e-learning tools in a study conducted at Taibah University. [44] studied academic staff's experiences utilizing e-learning systems, with 55 participants in their research. Overall, all the articles converge on a similar conclusion, emphasizing the importance of integrating cloud computing technology and its applications more extensively within higher educational institutions (HEI) to achieve enhanced outcomes in teaching and learning systems.

Challenges and Opportunities

Three articles examined the impacts, challenges, and significant issues associated with adopting cloud computing in HEIs. For instance, [1] investigated the key features and the prospective advantages of adopting cloud services. This study employed a quantitative questionnaire completed by 71 participants to explore aspects such as cost-effectiveness, flexibility, capability, accessibility, openness, collaborative work enhancement, and accountability in cloud computing. On another note, [45] employed a mixed-method approach and utilized the Technology-Organization-Environment (TOE)

theory to investigate emerging security and privacy concerns alongside the relevant legislation on adopting cloud computing in the KSA education system. Additionally, [2] conducted a preliminary study to explore challenges faced by 207 students, teachers, and staff from 35 HEIs across KSA. The investigation focused on the use and awareness of virtual learning environments and cloud computing in these institutions.

Proposed and Developed Frameworks, Theoretical Methods, or Prototypes

Several articles proposed and developed frameworks, theoretical methods, or prototypes to support and enhance the efficiency of cloud computing within Saudi HEIs. For instance, [47] used a mixed method with the support of 28 staff members from Jazan University to propose a framework focused on knowledge sharing, enabling end-users and other universities to access and share knowledge through role-based access, with data processing time reduced by synchronizing with the source data for real-time knowledge availability. [46] proposed a framework with the help of 20 IT engineers, 250 staff, and 890 students from Prince Nourah bint Abdulrahman University. Inspired by the ISOLIEC 9126 model, their quality framework aimed to evaluate and rank proprietary, open-source, and cloud-based LMS based on specific quality criteria.

Furthermore, in 2018, [6] proposed and developed a comprehensive cost-benefit analysis framework for cloud computing adoption. The study participants agreed that the cost-benefit tool is feasible and valuable for educational purposes and analysis.

In a similar context, [3] proposed a theoretical model combining SERVQUAL, DeLone and McLean, UTAUT, and TAM theories to study the service quality factors affecting students' cloud e-learning acceptance. The study included 474 participants and conducted comprehensive empirical testing on all aspects, concluding that the proposed model was appropriate for assessing the quality of cloud-based e-learning services.

On the other hand, two articles proposed teaching strategy models. [48] conducted a quasi-experimental study with 12 participants to assess the efficacy of a cloud computing-based training program in enhancing reflective practices and self-efficacy among mathematics teachers. [49] applied a quantitative study on some students of Al-Qassim University and proposed teaching strategies using cloud computing while teaching writing skills, highlighting no significant difference in writing skills between genders and encouraging further investigation by other scholars.

Furthermore, [51] validated the Cloud Migration Readiness Assessment, an instrument designed to assess the readiness of three selected cases planning to implement cloud computing

services in HEI. In addition, [50] aimed to create a prototype system called the Learning Service Platform, which was implemented in KSA universities with existing smart class setups. The study developed three main apps: slide service-based, Smartboard service-based, and question and answer service-based apps, comprising various atomic services. The performance evaluation indicated that the benefit level was not always directly correlated with their scores.

Literature Review

Out of the 40 articles, eight articles conducted a literature review focusing on various domains. These domains encompass protection and security-related aspects [14], [53], organizational factors affecting adoption [13], efficiency aspects, opportunities and barriers to using cloud computing [20], [52], [54], [55], as well as the historical and current status of cloud computing in the educational sector within KSA [5]. In conclusion, none of the previous studies in the literature have undertaken a comprehensive investigation combining all the different contexts and domains of knowledge, similar to what this current review is presenting.

RQ2: What theoretical methods or models are employed in cloud computing studies within KSA's HEI?

Scholars utilize various theoretical methods to investigate trending technology and assess its efficiency [32]. In this review, presented in Table 3, scholars have employed 11 different theories or models to achieve their study objectives. Interestingly, some scholars have even utilized multiple theories in one study. For instance, [32] combined four theories, namely the Technology Acceptance Model (TAM), the Technology Organization Environment (TOE), the Institutional (INT), and the Diffusion of Innovation (DOI), to identify the factors driving community cloud adoption in HEIs that have not yet adopted such technology. [30] employed both the TAM and motivational theory to assess the acceptance and usability of cloud computing within HEIs. On the other hand, [3] proposed a theoretical method using the SERVQUAL model, DeLone and McLean, TAM, and the Unified Theory of Acceptance and Use of Technology (UTAUT) in the same study. Furthermore, [22] combined UTAUT and Social Exchange Theory to assess the acceptance and usability of cloud e-learning in public universities in KSA.

In summary, the most commonly used theories within the literature were the technology acceptance and usability theories, TAM and then UTAUT, with frequencies of 8 and 3 times, respectively. This prevalence can be attributed to cloud computing being a recent trend in KSA and not yet fully stable [3]. Consequently, scholars are investigating its effectiveness and efficiency while seeking new ways to enhance its adoption and acceptance.

Table 3: Theories and Models Used in the Literature

Theory / Model	Frequency
INT	1
DOI	2
TAM	8
TOE	3
Motivation theory	1
ISOLIEC 9126 model	1
DeLone and McLean	1
UTAUT	3
Social Exchange Theory	1
Communication Connectivism	1
Social Constructivism Theory	1

Table 4 provides a summary of the factors utilized in the studies. As mentioned earlier, most studies in the literature focus on technology acceptance. Consequently, a significant portion of the factors in the table are associated with assessing acceptance, perceived use, and security aspects.

Table 4: Theories and Factors Used in the Studies

Article	Theory/Model	Factors
[30]	Motivation Theory, TAM	PEOU, Availability, Collaboration, Intrinsic Motivation, Extrinsic Motivation
[16]	TAM	PE, PEOU, PS, Perceived benefit, Perceived accessibility
[31]	Social Constructivism Theory	Self-assessment, Teaching competencies
[35]	UTAUT2	PE, EE, SI, FC, HM, PV, PS, Awareness, Perceived internet speed
[21]	TAM3	PU, PEOU, Output quality, Job relevance, Result demonstrability, Self-efficacy, Anxiety, Perceptions of external control, Playfulness, Perceived enjoyment, Subjective norm, Image, Trust
[36]	TAM3	PU, PEOU, BI, Experience, Anxiety
[37]	TAM	PU, PEOU, BI, Trust
[34]	TAM, DOI	PU, Assignments, Time, Effort, Quality, Productivity, Performance, Attitudes
[43]	communication Connectivism	Innovation and creativity, Cooperative and collective action, Application of technology, Critical thinking, Problem-solving and decision-making
[3]	SERVQUAL, DeLone and McLean, UTAUT, TAM	PEOU, SI, Information Quality, Reliability
[45]	TOE	Technology, Organization, Environment
[32]	TOE, TAM, DOI, INT	Security, Technology, Organization, Human, Environment
[22]	UTAUT/ Social Exchange Theory	PE, EE, SI, FC, Security, Privacy, Trust
[13]	TOE	Technology, Organization, Environment
[46]	ISOLIEC 9126 Model	Functionality, Reliability, Usability, Efficiency

PU: perceived usefulness, PEOU: perceived ease of use, BI: behavioral intention, PE: Performance expectancy, EE: Effort expectancy, SI: Social Influence, FC: Facilitating conditions, HM: Hedonic motivation, PV: Price value, PS: Perceived security

RQ3: What research methods are employed in cloud computing studies within KSA’s HEI?

The data provided in Table 5 indicates that the quantitative research method was predominantly utilized for their investigations in the majority of the articles. Specifically, 1

article employed the qualitative method, two studies adopted a mixed-method approach, and four relied on experimental study methodologies. In contrast, three articles conducted literature reviews; surprisingly, nine did not mention the methods used in their investigations.

Table 5: Research Methodologies Used in the Literature

Research method	#	Article
Mixed	2	[45], [47]
Qualitative	1	[6]
Quantitative	20	[1], [4], [16], [19], [21], [30]–[37], [39], [40], [44], [46], [49]–[51]
Experimental study	4	[23], [41], [43], [48]

RQ4: What are the research gaps and directions for future research that can be identified through a systematic literature review?

A systematic literature review is a rigorous and comprehensive approach to synthesizing existing research on a specific topic or research question. Analyzing and critically evaluating the

collective body of knowledge makes it possible to identify areas where knowledge is lacking, known as research gaps [25]. Additionally, this process can shed light on promising directions for future research. In this study, based on a comprehensive analysis of 40 articles, several research gaps should be addressed in future studies.

- 1) Lack of cloud computing e-learning requirements elicitation studies, as the current review highlighted several articles investigating challenges. However, none of the studies developed a model and evaluated its prototype relying on the users' needs and requirements.
- 2) The educational sector in KSA is actively pursuing sustainable development to achieve one of the key goals outlined in KSA Vision 2030 [1]. This development aligns with the educational culture and religious restrictions that are affected by it, making such a topic a constant consideration. Consequently, a noticeable gap exists in the literature concerning the intersection of recent educational culture and cloud computing within the context of KSA.
- 3) Older studies may lose their relevance or accuracy as research progresses, making updated investigations necessary. This becomes especially crucial when dealing with rapidly advancing technologies like cloud computing, where researchers must ensure that the information remains up-to-date, considering the rapid pace of development in KSA. The current review identified backdated information in the articles, which do not accurately represent the recent technology acceptance and development stage. Therefore, it is essential to consider the rapid technological advancements within the country to ensure the validity and currency of the findings.
- 4) In most studies, the focus is on the perception of students or teachers. However, there is a lack of research to consider the viewpoints of IT decision-makers, including IT developers and administrators, researchers, and even professors who possess experience within the educational sector, to determine the requirements for an efficient cloud computing model suitable for implementation within HEI in KSA, especially as a developing country.

5. Conclusion

The literature review concluded a growing interest and a significant impact on various aspects of the educational landscape within KSA. A considerable number of studies have focused on technology acceptance and usability, with students being the primary subjects of investigation. Cloud computing has shown great potential in enhancing teaching and learning experiences, with studies highlighting its positive effects on educational practices and student outcomes. Efficiency has been a critical concern in several studies, and the evidence suggests that cloud computing can offer a viable framework for creating resilient and high-performance e-learning tools. However, challenges remain, particularly in technological adaptation and change effectiveness, where resistance to rapid innovation persists in some instances.

The existing literature calls for a more holistic research approach, encouraging investigations integrating various contexts and knowledge domains within cloud computing adoption in HEI. There is a need to consider the perceptions and experiences of not only students and teachers but also IT decision-makers, administrators, and educational leaders to

develop efficient cloud computing models tailored to the unique needs of a developing country like Saudi Arabia. Overall, the literature review underscores the importance of continued research and thoughtful integration of cloud computing technology in HEI settings. By addressing challenges, exploring new possibilities, and leveraging the potential of cloud computing, Saudi Arabia's higher education sector can pave the way for a more innovative, inclusive, and effective learning environment in the years to come.

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