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Challenges and strategies in e-learning adoption in emerging economies: a scoping review

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ABSTRACT

This scoping review examines the critical factors influencing e-learning implementation in emerging economies. Using a comprehensive literature search across major databases, 191 records were screened, of which 127 were assessed for eligibility and 84 studies met the inclusion criteria. Our systematic approach revealed four key themes: critical success factors, critical failure factors, implementation recommendations, and future research directions in e-learning. The findings illuminate the nascent stage of e-learning adoption in emerging economies, highlighting both the potential for enhanced educational access and multifaceted challenges faced by these nations. Our analysis offers nuanced insights into the complex interplay of infrastructural, technological, and contextual factors that shape e-learning outcomes in diverse environments. This study provides a valuable resource for policymakers, technology providers, educators, and students, emphasizing the need for tailored strategies that address the unique characteristics of each learning ecosystem. This critical conclusion underscores the necessity of recognizing and accommodating diverse learning landscapes in emerging economies to ensure effective e-learning implementation. By synthesizing the current knowledge and identifying research gaps, this review not only enriches the existing literature but also charts a course for future investigations. It provides a foundation for developing adaptive, context-sensitive approaches to e-learning, potentially catalyzing educational transformation in emerging economies.

PUBLIC INTEREST STATEMENT

Access to quality education remains a pivotal factor in the development of emerging economies, and e-learning presents a promising avenue for expanding educational opportunities. The implementation of effective e-learning initiatives in these contexts, particularly in post-conflict regions, however, introduces unique and complex challenges. This scoping review seeks to map the current landscape of e-learning in such environments to provide valuable insights for policymakers, technology providers, educators, and students. We focus on recent advancements and best practices in e-learning to offer a comprehensive guide for harnessing the transformative power of digital education. Our analysis underscores the critical importance of creating equitable learning opportunities, particularly for marginalized communities in emerging nations. Addressing these challenges is not only beneficial. It is imperative to improve lives and unlock the vast potential of e-learning in fostering human development.

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1. Introduction

E-learning has fundamentally transformed the delivery of information, particularly for the younger generations (Aristovnik et al., 2023). It serves as a powerful tool for educators, enabling them to acquire new skills, introduce innovative pedagogies into the classroom, and enhance both collaborative learning and

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social interaction. Furthermore, e-learning plays a pivotal role in leveling the educational playing field by providing students in both urban and rural areas with equal access to quality education (Amutha, 2020). The World Economic Forum has identified 16 essential skills that 21st-century graduates must possess, which are categorized into three domains: foundational literacy, competencies, and character qualities. Foundational literacies encompass linguistic, numeracy, science, information communication and technology (ICT), financial, cultural, and civic literacies. Competencies include critical thinking, problem-solving, creativity, communication, and collaboration. Character qualities, on the other hand, encompass curiosity, initiative, persistence, grit, adaptability, leadership, and social and cultural awareness. Technology-based learning is instrumental in helping graduates develop essential employability skills (Group, 2016).

Higher education institutions typically implement one of three e-learning systems: traditional, blended, or virtual, with selection often reflecting the country's economic development level. Traditional e-learning, synonymous with computer-assisted learning. It utilizes software programs to disseminate knowledge, whereas blended learning merges face-to-face interactions with virtual discussions, thereby fostering a more collaborative learning environment (Tibaná-Herrera et al., 2018). The rise of the e-learning industry in the 1990s coincided with the rapid evolution of computer hardware, software applications, and internet accessibility. Today, online learning, enriched by a variety of technological tools, not only facilitates instructor-student interaction and course management but also significantly enhances students' research capabilities (Oyarzun & Martin, 2023). The integration of technology into education is, therefore, not merely a modernization of traditional learning environments. This integration equips learners with the critical skills necessary to succeed in a contemporary, knowledge-driven economy.

The pivotal role of technology in education is undeniable; however, its effectiveness depends on a complex interplay of factors. Successful integration requires a careful selection of ICT tools, adaptation of teaching methodologies, development of tailored curricula, and institutional preparedness. Equally important is the ICT literacy of stakeholders and necessary financial support (Aljaber, 2018). Despite the widespread recognition of its potential, many universities continue to face significant challenges. These challenges range from suboptimal outcomes owing to poorly conceived strategies to the prohibitive costs of ICT tools, resistance from users, and deficiencies in course delivery (Abbas & Ehsan, 2023).

While developed nations have made significant strides in integrating e-learning systems into higher education, emerging economies still face hurdles in seamlessly adopting these frameworks (Ndibalema, 2022). Institutions in these emerging contexts are trying to transition from conventional face-to-face setups to modern student-centric environments through e-learning initiatives (Ang et al., 2021). Attempts to emulate e-learning models from developed counterparts, however, often falter, underscoring the importance of contextual compatibility and cautious implementation considerations (Muhammad et al., 2017).

E-learning presents unparalleled opportunities for universities to more effectively achieve their educational objectives. Challenges, however, arise when program design overlooks user diversity, including nationality, gender, and learning preferences (Major et al., 2021). Given the divergent educational landscapes between developed and emerging contexts, recalibration of e-learning delivery models is imperative (Aristovnik et al., 2023). Recognizing e-learning as a linchpin of educational reform, institutions must prioritize understanding the attitudes of both educators and learners towards their adoption (Shams et al., 2022). Moreover, given the cultural, educational, and financial disparities between emerging and developed economies, a careful analysis is warranted to ensure the efficacy of e-learning implementation, particularly in previously unexplored contexts.

This review identifies several critical gaps in the existing e-learning literature. Notably, there is a pressing need for deeper exploration of the factors influencing students' adoption and use of e-learning systems. A nuanced understanding of students' perspectives and behaviors is essential for the design and implementation of more effective e-learning platforms. Additionally, the literature reveals a significant gap in instructional models tailored to mobile learning (m-learning) in emerging economies. The unique challenges posed by technological accessibility and infrastructure in these regions necessitate pedagogical strategies specifically adapted to these contexts. Moreover, the impact of e-learning on women's empowerment in emerging and post-conflict economies remains underexplored. Addressing this gap is crucial for advancing technology-enhanced learning in a manner that is both inclusive and responsive to

the diverse needs of all users. The following section presents a problem statement that aims to guide future research efforts in these critical areas.

1.1. Problem statement

E-learning has fundamentally transformed the way information is delivered, especially for the younger generations. The integration of e-learning into higher education, however, presents significant challenges, particularly in emerging economies. Although developed nations have made considerable progress in this area, emerging economies face substantial obstacles in implementing these systems effectively. This study investigated the factors that influence the success and limitations of e-learning initiatives, offering practical insights and strategies to assist universities in these contexts as they work to successfully deploy e-learning platforms.

1.2. Research objectives

The key objectives of this study are:

1. To identify and analyze the key factors that facilitate or hinder the successful implementation of e-learning initiatives in emerging economies. This analysis aimed to inform future research, guide policy development, and support the practical application of e-learning in these contexts.
2. To critically examine the existing body of research on e-learning in emerging economies with a focus on identifying significant gaps in both understanding and practice. This study sought to develop actionable strategies to address these gaps and enhance the efficacy and overall success of e-learning initiatives in these regions.

1.3. Research questions

The primary aim of this review was to examine scholarly papers on e-learning implementation in emerging economies. The following questions guide this study:

1. What are the essential factors influencing the successful implementation of e-learning as well as the potential pitfalls in emerging economies, and how do these factors inform future research directions, policy development, and practical applications?
2. Given the current body of research on e-learning in emerging economies, what significant gaps exist in both understanding and practice, and how actionable strategies can be developed to address these gaps, thereby enhancing the efficacy and overall success of e-learning initiatives in these regions?

This study aims to examine and dissect the trajectory of e-learning, focusing on delineating the critical factors underpinning its success and failure. These critical factors encompass a spectrum of parameters intrinsic to e-learning, whose fluctuations can significantly influence the efficacy of planned implementations and the realization of anticipated outcomes (Roy & Al-Absy, 2022). The significance of this research lies in its potential contribution towards aiding universities in emerging economies in navigating the complexities inherent in implementing e-learning systems. By illuminating these critical factors, this study provides institutions in emerging contexts with actionable insights and strategies to foster successful e-learning initiatives.

1.4. Emerging economies

Emerging economies are countries experiencing rapid development as they transition from low-income to middle-income status. Characterized by accelerating growth, expanding the middle class, and increasing integration into the global economy, these nations are predominantly located in Asia, Africa, and Latin America. Countries, such as China, India, Brazil, and Mexico exemplify this shift from agrarian-based

to industrialized economies. Similarly, post-conflict nations, such as Afghanistan, Sri Lanka, Uganda, Liberia, and Colombia are gradually transforming into emerging economies as they rebuild and move towards more stable and prosperous societies. Despite facing significant infrastructure and institutional challenges, many of these economies have embraced reforms and have made substantial investments in education and technology. As a result, these dynamic and rapidly growing economies are reshaping the global economic landscape and creating opportunities and complexities for businesses, investors, and the international community.

The remainder of this paper is structured as follows: The second section details the Scoping Literature Review methodology, including the search strategy, inclusion and exclusion criteria, and analysis. Section three presents the findings of the scoping review. Section four discusses the implications. Section five presents limitations, and future research directions, and section six concludes the study.

2. Methodology

A scoping literature review was conducted to provide a broad overview of the available information, distinguishing it from a systematic literature review that typically aims to answer a specific research question (Tricco et al., 2018). The researchers opted for a scoping review methodology to present a comprehensive perspective on the current state of research on e-learning in emerging economies, rather than focusing on a narrowly defined research question. This approach allowed the inclusion of a wide range of perspectives and challenges associated with the integration of e-learning initiatives in these settings. Our study involved a careful process of identifying the key elements that are critical for a comprehensive exploration of the chosen topic. We established transparent inclusion and exclusion criteria, and collected relevant articles based on these predefined parameters. This review systematically examines the existing literature to identify and analyze the obstacles faced by emerging economies in implementing e-learning programs, ultimately offering recommendations to address these challenges effectively.

Given the limited number of publications on e-learning in emerging countries, we also incorporated gray literature to enhance the comprehensiveness of our study. Gray literature plays a crucial role in literature reviews by mitigating publication bias, enhancing the comprehensiveness of the review, and offering a more balanced perspective on available evidence. This category of literature encompasses a diverse array of sources, including academic papers, theses, government reports, and conference proceedings, which often present data and insights that are absent from commercially published works (Paez, 2017). By including sources, such as government reports, theses, conference proceedings, and unpublished dissertations from reputable academic institutions, we ensured a more thorough examination of the topic and captured a broader range of perspectives. This inclusion of gray literature enriched the insights gained from the review, providing a more nuanced understanding of the experiences and perspectives of individuals involved in e-learning in emerging economies.

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines were used to ensure that the review process was systematic, well-documented, and transparent (Moher et al., 2015; Sohrabi et al., 2021). Additionally, validation of the study by the research ethics committee of Kabul Education University provided an extra layer of credibility and ethical oversight, further reinforcing the robustness of our findings.

2.1. Search strategy

To ensure a comprehensive collection of relevant academic literature, a search strategy was conducted using four reputable databases: SCOPUS, Web of Science, ScienceDirect, EBSCO, and gray literature published from 2014 to 2024 (*via* ResearchGate). The period from 2014 to 2024 witnessed a significant surge in the application of e-learning in countries, such as India, Indonesia, Kenya, and Afghanistan, owing to several key factors (Hennessy et al., 2022). The widespread adoption of mobile technology and increased Internet penetration have made education more accessible to remote and underserved populations. In India, initiatives, such as Digital India boosted online education, whereas in Kenya, programs, such as the Digital Literacy Program helped integrate e-learning into schools (Sindakis & Showkat, 2024). Afghanistan also saw the rise of e-learning platforms to overcome educational barriers caused by

conflicts. Governments and international organizations have recognized the potential of e-learning to bridge educational gaps, leading to substantial investments in digital infrastructure and online learning platforms. Additionally, the COVID-19 pandemic has acted as a catalyst, forcing educational institutions to transition rapidly to online modes of instruction. Advancements in digital tools have enabled localized content creation, making e-learning more relevant and effective in these regions (Dawodi & Baktash, 2023).

Central to this process is the identification and refinement of keywords that accurately capture the core focus of research. In our study, the keyword phrase 'Critical factors in the implementation of e-learning in emerging economies' was carefully formulated to encapsulate the key issues under investigation. To ensure a comprehensive search strategy, we employed a Scopus review approach to identify synonyms for pivotal terms, such as 'critical', 'factors', 'e-learning', and 'implementation'. Additionally, synonyms for modifiers like 'emerging' and 'countries' were identified to broaden the research scope and enhance the inclusivity of our search. The strategic use of logical operators, such as AND and OR allowed us to combine these keywords and their synonyms into a coherent and targeted search string. This approach refined and streamlined the search process, forming the foundation for a robust and exhaustive literature review. Through this keyword selection and search strategy, we aimed to ensure that our review captured the full spectrum of relevant literature, offering a thorough exploration of critical factors affecting e-learning implementation in emerging economies. Figure 1 summarizes our search strategy and the exclusion and inclusion approaches.

A total of 84 papers were included in the analysis, each contributing diverse perspectives on various aspects of e-learning implementation in emerging countries. The selected articles covered a wide range of topics, including definitions, critical factors, opportunities, challenges, research gaps, and recommendations, offering a comprehensive panorama of the multifaceted landscape of e-learning in these contexts. This extensive body of academic discourse provides a robust foundation for our analysis, enabling

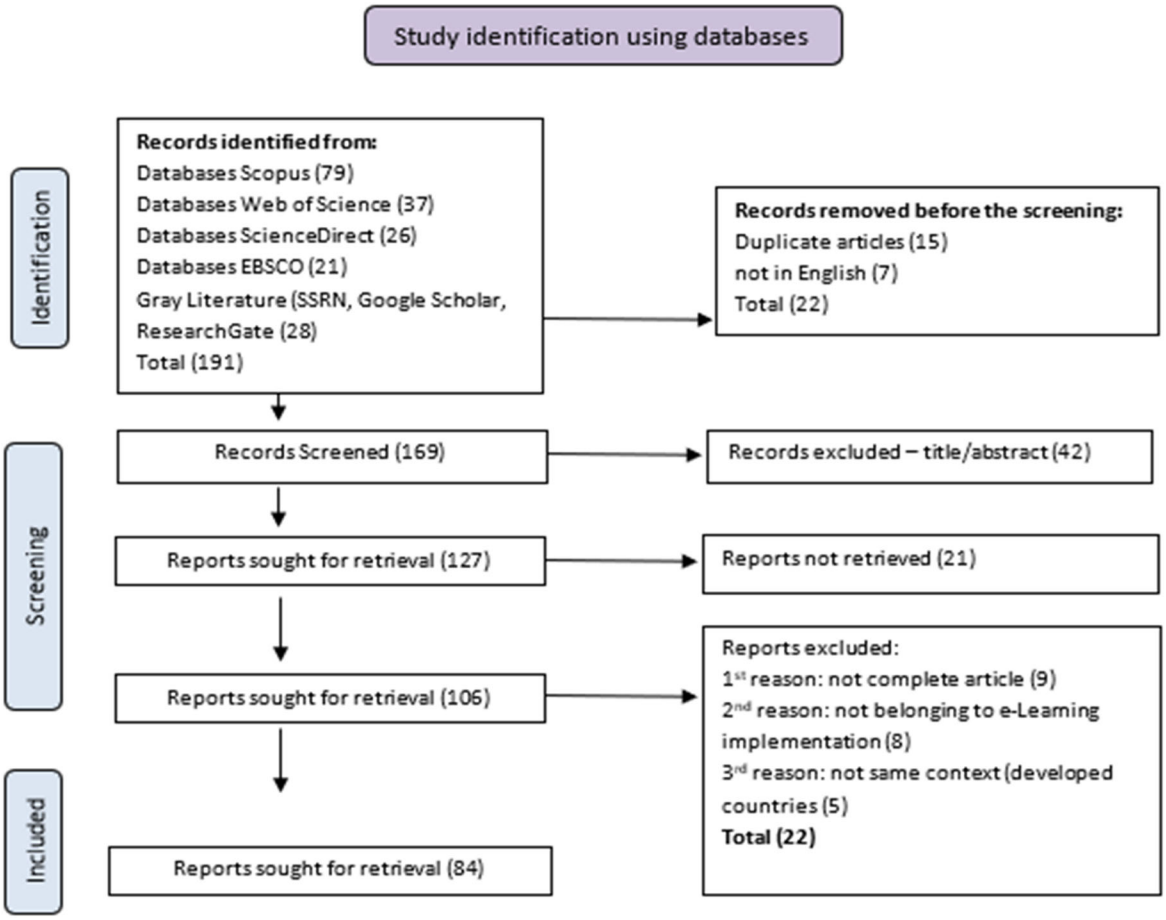

Figure 1. The research selection process using a standard PRISMA flowchart.

us to gain valuable insights and draw nuanced conclusions regarding the complexities and intricacies of e-learning implementation in emerging economies.

2.2. Inclusion and exclusion criteria

The inclusion and exclusion criteria were carefully designed to ensure the thoroughness and relevance of the selected research articles. In the fourth phase, the inclusion criteria were as follows: articles that contained specific search terms in the title, abstract, and keywords published in English; provided full-text access; and met academic standards. Following the inclusion criteria, the exclusion criteria focused on filtering out articles that were not written in English, were incomplete, lacked contextual relevance to emerging markets, or did not meet academic standards. This rigorous selection process was designed to ensure that only high-quality relevant academic articles were included in the review, to ensure the integrity and robustness of the research findings. Table 1 summarizes the exclusion and inclusion criteria for the research articles.

A total of 191 articles were identified using our search approach. Of these, 15 were duplicates, and seven were not written in English, leaving 169 papers for further consideration (191–15–7). We excluded 42 papers based on their titles and abstracts, as they were not relevant to our research focus. This left 127 papers of which 21 were not retrieved. Out of 106 papers, 22 were further excluded because they were incomplete, bringing the total number of included papers to 84 (106–22). These 84 papers formed the basis of our study, providing the foundation for our analysis of the intricacies involved in implementing e-learning in emerging economies (see Figure 1).

2.3. Analysis

This scoping review examined e-learning implementation in emerging economies through an exhaustive analysis of 84 distinct research studies. Employing a scoping review methodology, we synthesized findings from a diverse array of geographical and educational contexts, providing a comprehensive landscape of e-learning in these settings. The systematic exploration of the literature across prominent databases yielded four salient themes, each offering critical insights into the factors influencing e-learning success and failure. This granular approach unveils nuanced patterns and trends that might elude narrower analyses, offering the perspective of challenges and opportunities in e-learning adoption. By bridging the gap between individual studies and overarching trends, this review established a robust foundation for evidence-based strategies. It serves as an invaluable resource for policymakers, providers, educators, students, and researchers, illuminating pathways for effective e-learning implementation in the unique context of emerging economies.

3. Findings

After comprehensive data review, three themes emerged. The themes were critical success factors, critical failure factors, and recommendations for the successful implementation of e-learning in emerging economies. This review also highlights the need for future research on e-learning in emerging economies.

Table 1. Inclusion and exclusion criteria for research articles.

I/E	Criteria explanation
Inclusion	Article with any of the search terms contained in the title, abstract, and keywords
	Articles in English language
	Articles with full-text access
	Academic articles (including articles from gray literature, such as white papers, working papers, theses, government, and industrial reports)
Exclusion	Articles not in English language
	Incomplete articles
	Articles out of the context of emerging economies
	Non-academic articles
	Duplicate articles

3.1. Theme one: The critical success factors of e-learning implementation in emerging economies

Some aspects, such as critical success factors (CSFs), play a decisive role in successfully implementing e-learning programs. Ubaid (2023) defines CSFs are defined as 'the limited number of areas in which satisfactory results ensure the successful, competitive performance of the individual, department, or organization'. These factors must be controllable, measurable, and focused upon. For institutions seeking to launch e-learning programs, it is advantageous to examine the experiences of institutions that have already implemented such programs in similar contexts. Learning from these experiences can provide valuable insights and lessons essential for ensuring the success of new initiatives.

CSFs for e-learning, as identified across various studies, underscore the need for a multifaceted approach to enhance educational outcomes. These factors span from technological infrastructure to instructional design, incorporating elements that are crucial for the effective facilitation of e-learning across diverse socioeconomic contexts. Technological considerations are a consistent theme within CSFs, with numerous researchers highlighting the importance of stable and high-quality technological infrastructure as a foundational element for the success of e-learning initiatives. Yaqubi (2021) in Afghanistan and Almaiah et al. (2020) in emerging economies have underscored the critical need for robust e-learning infrastructure, including stable electricity, high-speed Internet, and appropriate hardware and software, as essential foundations for the successful implementation of e-learning. These findings are further supported by Alhabeeb and Rowley (2017) in Saudi Arabian universities and (Madni et al., 2022) in developing countries, stressing the importance of infrastructure readiness, ease of use, and support of faculty members and students.

Mahboobi (2021) identified governance and institutional support as critical, with planning, collaboration, and partnerships forming the backbone of effective e-learning systems. The successful implementation of e-learning programs depends on certain key factors, namely education policy, online classroom management, and online learning systems (Songkram et al., 2023). Education policy concerns guidelines that improve the quality of education and teacher performance. Online classroom management via learning management systems (LMS) includes the quality of lessons and techniques that teachers use to strengthen the interaction between student teachers and student students. An online learning system involves transparent operational processes, manuals, and steps. Training methods that effectively assist teachers and students in using e-learning-related activities are key. Arthur-Nyarkoa and Kariuki (2019) extended this to support the institution's provision of resources, such as access to ICTs, electricity, the Internet, and policy development. Haffar et al. (2023) reinforced this aspect of Jordanian higher education by focusing on university commitment. Pedagogical and content-development considerations are also central. Instructional design factors include clear objectives, quality of content, and learning strategy (Alhabeeb & Rowley, 2017), while Kisanga and Ireson (2015) noted the importance of correct teaching methodologies in Tanzania. A study by Mahboobi (2021) on emerging economies underscores the necessity of modern pedagogy, active teaching, dynamic content, and the creation of an interactive learning environment.

Prior research has frequently mentioned the human dimension, particularly pertaining to instructors and students. For instance, Almaiah et al. (2020) and Prougestaporn et al. (2015) discussed the importance of self-efficacy, mastery experience, and instructor skills. Similarly, Al-Araibi et al. (2016) focused on learner and teacher characteristics in Malaysia, including attitudes toward e-learning, computers, and ICT skills. Support factors are, therefore, essential. Kisanga and Ireson (2015) and Salloum et al. (2019) acknowledged the need for technical, professional, and evaluative support to ensure effective learning and continuous system usage. Gopal et al. (2021) further illustrated the importance of internet access, browsing speed, and interactive support mechanisms in e-learning systems.

Cultural and ethical factors are highlighted by Almaiah et al. (2020), who stress cultural aspects, such as e-society integration and ICT literacy, and by Kisanga and Ireson (2015), who note the importance of considering social, political, cultural, and legal issues in the e-learning context. Almaiah et al. (2020) raised trust and security concerns, indicating the importance of system security, privacy and reliability. This aligns with (El-Sabagh, 2021), who advocated various pedagogical approaches to accommodate diverse learning styles and increase students' engagement in the learning process. Synthesized research

from multiple authors and geographies presents a comprehensive framework of CSFs for e-learning. This underscores the intertwined nature of technology, human factors, institutional support, governance, pedagogy, content development, and cultural considerations when constructing effective and sustainable e-learning ecosystems. When harmonized, these factors create a conducive environment for learners and educators, ensuring that educational objectives are met and that the benefits of e-learning are fully realized. Table 2 summarizes the CSFs for e-learning.

The implementation of e-learning across different regions, particularly in emerging economies, presents a complex array of challenges that must be carefully navigated to ensure its success. Instructor factors are paramount, focusing on the need to enhance teaching skills, master e-pedagogy, and adapt to rapidly evolving technology. Instructors in regions, such as Ethiopia and Saudi Arabia, for instance, face significant difficulties in acquiring the necessary technical competencies and sustaining motivation. Similarly, in countries, such as Afghanistan and Tanzania, there is a critical need for comprehensive training and adaptability to use ICT tools effectively. Student factors are equally diverse, encompassing issues related to digital literacy, motivation, and access to essential technology. In regions, such as Oman and Ghana, students' ICT and language skills, coupled with their attitudes toward e-learning, pose substantial barriers to effective engagement. Moreover, in emerging economies, the challenge of ensuring adequate ICT literacy among students remains a persistent concern, impacting their ability to benefit fully from e-learning platforms.

The theme of infrastructure factors recurs across these studies, highlighting the importance of stable electricity, high-speed Internet, and robust technical support as foundational elements for successful e-learning initiatives. In countries, such as Saudi Arabia, India, and Afghanistan, the demand for reliable ICT infrastructure, including efficient LMS and secure systems, is critical to the sustained success of e-learning programs. Institutional management factors further complicate the landscape, emphasizing the need for streamlined administrative procedures, continuous support, and commitment to delivering high-quality services. In regions, such as Jordan and Afghanistan, institutional commitment, along with strategic governance, planning, partnerships, and financial backing, plays a crucial role in sustaining and scaling e-learning initiatives.

Finally, contextual challenges reflect broader social, cultural, and geopolitical factors that influence the adoption and effectiveness of e-learning. These challenges include varying cultural attitudes toward technology, the necessity for empathy and clarity in content delivery, and the critical need to adapt courses to local languages, particularly in countries, such as Afghanistan and Palestine. Addressing these interconnected challenges with a holistic and context-sensitive approach is essential for enhancing the efficacy and inclusivity of e-learning across diverse educational settings (Figure 2).

3.2. Theme two: The critical failure factors of e-learning implementation in emerging economies

The implementation of e-learning programs in emerging economies is a complex endeavor influenced by a multitude of factors collectively known as critical failure factors (CFF). Taherdoost and Keshavarzsaleh (2016) posited that these substantial contributing elements if left unchecked, can significantly impede the success of a project, initiative, or endeavor. To ensure effective adoption of e-learning systems, institutions must proactively identify and address both critical success and failure factors (Almaiah et al., 2020). When a university seeks to launch an e-learning program, it is imperative to scrutinize the experiences of institutions that have already traversed this path within similar contexts. By examining the lessons learned from these predecessors, particularly regarding instances of failure, universities can preemptively mitigate potential pitfalls during their implementation process. This approach fosters a well-informed decision-making process and significantly increases the chance of successful program deployment.

In emerging economies, e-learning advancement faces an intricate web of critical failure factors across the technological, infrastructural, pedagogical, contextual, and individual domains. Research across diverse regions has revealed multifaceted barriers, highlighting the need for a nuanced, culturally attuned approach to implementation and support. Institutions should adopt a holistic perspective, integrating both technical aspects and sociocultural nuances that influence the acceptance and effectiveness of e-learning. By recognizing the interconnected nature of these factors, stakeholders can develop robust

Table 2. Critical success factors for e-learning implementation in emerging economies.

Researchers	Location	Instructor	Student	Infrastructure	Institutional management	Contextual
Abich and Eriku (2023)	Ethiopia	Enhancing teaching skills and quality	Improving students' technology skills and meeting their expectations	Technological advancement	Simplifying administrative procedures	N.A.
Al-Araibi et al. (2016)	Malaysia	N.A.	Computer and ICT skills	Quality of ICT setting and system	N.A.	N.A.
Alhabeeb and Rowley (2017)	Saudi Arabian universities	e-Learning and teaching skills; and flexibility and motivation	Computer skills; attitude and commitment; learning speed; motivation; and socio-demographics	Technical infrastructure and LMS	Cooperative learning; clear objectives and quality content; and strategy and assessment	N.A.
Almaiah et al. (2020)	Emerging economies	Technical skills	N.A.	Technical support System security and reliability	e-Learning system quality (ease of use, adoption)	Cultural aspects (e-Society, social media, ICT literacy)
Aristovnik et al. (2023)	Emerging economies	e-Pedagogy	ICT literacy	ICT Infrastructure	Support (technical, professional, and financial)	Empathy and clarity
Arthur-Nyarkoa and Kariuki (2019)	Ghana	Pedagogy and training	Access to electricity	Internet (accessibility, connectivity)	Affordable ICT devices	N.A.
Nzomkunda et al. (2022)	Oman/emerging economies	e-Learning knowledge On-spot feedback	ICT and language skills and e-Learning attitudes	ICTs and the Internet access; and System functionality	e-Learning workshops and training; and flexibility in programs	Course design and content
El-Sabagh (2021)	Saudi Arabia	Create effective e-courses	Learning styles	Technical support	Design and develop an adoptive e-learning environment	Culture of self-learning
Gopal et al. (2021)	India	Course design	Prompt feedback	N.A.	N.A.	Engaging content
Haffar et al. (2023)	Jordanian higher education	Continuous support	Learners' participation and engagement	Technical support	Institution commitment	Culture (geopolitical context)
Kisanga and Ireson (2015)	Africa	Pedagogy	N.A.	Infrastructure Hardware and application	Content management and system care	Social, political, cultural, geographical, and legal issues
Lwoga (2014)	Tanzania	ICT skills and adaptability	N.A.	System facilities	Service quality	Perceived usefulness and user satisfaction
Madni et al. (2022)	Emerging economies	Developing online environment skills	ICT skills	e-Learning infrastructure; stable electricity; and high-quality internet	e-Learning system quality (ease of use)	Positive attitude
Mahboobi (2021)	Afghanistan	e-Pedagogy and LMS training; active teaching and dynamic content	Computer skills MOOC usage and access	Technical assistance Quality internet and e-learning tools	Governance: planning, collaboration, partnerships	Adapting courses in local languages
Mahmoud and Hamdan (2020)	Palestine	e-Learning literacy, good content design, and familiarity with e-pedagogy	Computer skills, interaction	ICT infrastructure	Administrative support	Positive attitude, cultural awareness (newly added from ResearchGate)
Prougestaporn et al. (2015)	Thailand	Online teaching skills	Learners' readiness	Technology tools for interaction	Course development and structure	Social program delivery
Saleem et al. (2022)	Pakistan	Instructor support	Learners' readiness, motivation, and financial state	Suitable infrastructure and facilities	University support	N.A.
Salloum et al. (2019)	UAE	Virtual expertise	Computer competency; and collaboration activities	System quality	Innovation; knowledge sharing; system and content quality	N.A.
Yaqubi (2021)	Afghanistan	Training	ICT skills	Stable electricity; and high-speed internet	Financial support and governmental policy	N.A.

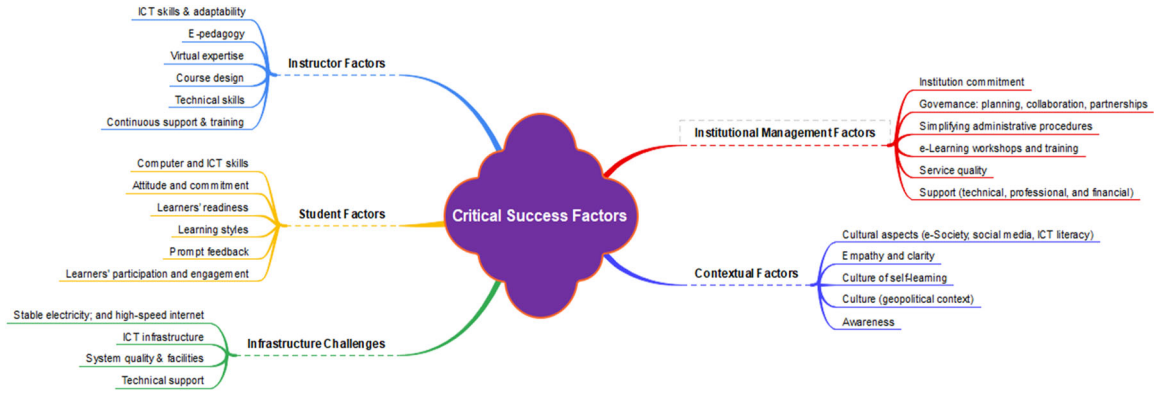

Figure 2. Summary of the critical success factors.

adaptive strategies that are responsive to local contexts and unique challenges. This comprehensive approach enables institutions to create e-learning environments that are technologically sound, pedagogically effective, and culturally resonant (Table 3).

The implementation of e-learning in emerging economies faces a complex array of challenges across the five CFF domains. These interconnected factors create a multifaceted landscape that demands careful consideration and strategic interventions. Instructor factors are a significant barrier to e-learning adoption. In countries, such as Ethiopia, Yemen, and Iraq, educators grapple with inadequate ICT knowledge, poor language skills, and resistance to a paradigm shift from traditional to digital learning methods. This reluctance is often compounded by insufficient motivation and a lack of robust administrative and technical support structures, which hinders the smooth transition to e-learning platforms. Students in these regions faced formidable obstacles equally. In Jordan, Afghanistan, and Tanzania, for instance, learners contend with poor technological skills, low motivation, and resistance to change. The pervasive issues of inadequate ICT literacy, technophobia, and a dearth of self-motivation further impede students' ability to effectively engage with e-learning systems. These challenges create a significant barrier between the potential of e-learning and its practical realization in these contexts.

Infrastructure is a ubiquitous hurdle in emerging economies. Countries, such as Saudi Arabia, Afghanistan, and Libya struggle with poor ICT infrastructure, unreliable electricity supply, low bandwidth, and weak Internet connections. The scarcity of the necessary hardware, software, and technical support exacerbates these issues, creating a tenuous foundation for sustainable e-learning initiatives. This technological instability undermines the potential for the consistent and effective delivery of digital education. Institutional management factors further complicate e-learning. In regions, such as Bangladesh and Pakistan, insufficient financial support, inadequate technical assistance, and poor course design hamper implementation. The absence of well-structured policies and comprehensive planning creates an operational vacuum, leaving e-learning programs without a necessary framework for success. This lack of institutional readiness significantly impedes the integration of digital learning into the existing educational systems.

Contextual factors add another layer of complexity to the implementation of e-learning. These challenges reflect the broader social, cultural, and geopolitical issues unique to each region. In post-conflict settings, such as Iraq and Afghanistan, low awareness and negative attitudes towards e-learning coupled with language barriers and pervasive insecurity create a challenging environment for digital education initiatives. These contextual factors necessitate a nuanced, culturally sensitive approach to e-learning implementation that addresses the distinct societal influences shaping its adoption and efficacy. The interplay of these five critical factors (instructor, student barriers, infrastructure limitations, institutional management issues, and contextual obstacles) underscores the multifaceted nature of e-learning implementation in emerging economies. This complex landscape demands comprehensive adaptive strategies that address each domain while recognizing their interconnectedness. By developing holistic approaches that tackle these challenges concurrently, stakeholders can pave the way for more successful and sustainable e-learning outcomes in diverse and dynamic educational environments (Figure 3).

Table 3. Critical failure factors for e-learning implementation in emerging economies.

Researchers	Location	Instructor challenges	Student challenges	Infrastructure challenges	Institutional management challenges	Contextual challenges
Abich and Eriku (2023)	Ethiopia	Low ICT knowledge	Poor technology skills and resistance to change	Poor infrastructure	Lack of expertise in e-learning	Low awareness and attitude towards e-learning, new culture
Ahmed and Zaini (2022)	Yemen	Poor technology and language skills	Lack of motivation and lack of trust	Infrastructure and shortage of electricity	Course design and support	Social and cultural issues
Al-Azawei et al. (2016)	Iraqi universities	Poor e-learning skills and low motivation	Poor computer skills, lack of awareness	Poor infrastructure; low-quality communication networks; necessary supporting learning applications; and computer labs	Insufficient financial support; shortage of electricity; and the inexistence of rigorous law to protect copyright	Insecure conditions in Iraq (conflicts, war, and corruption)
Alfallaj (2020)	Saudi Arabia	Language barriers, resistance to switching from traditional to e-learning	Poor awareness		Low technical support and management issues	Cultural concerns
Alkhawaja and Halim (2019)	Jordan	Adoption from traditional to e-learning systems	Computer illiteracy, lack of self-motivation, and poor time management	Low bandwidth and weak internet connection		
Fatima (2020)	Oman	Adaptability of computer-assisted instruction	Poor computer literacy, low motivation	Poor network connection	Technical issues and insufficient financial support	
Haidari et al. (2021)	Afghanistan	Language barriers; and lack of administrative and technical support	Lack of motivation; poor ICT literacy; low individual economy; and technophobia	Unstable electricity; poor access to internet; lack of technical experts; lack of required ICT equipment; and high maintenance cost	Development of new curriculum; and pedagogical e-learning models	Poor financial support; lack of experience; and poor policies, rules, and regulations
Hennig and Nazarkulova (2019)	Central Asian countries	Language skills	Computer resources and internet connectivity	Lack of necessary hardware and software and low broadband internet infrastructure		The majority of learners have sufficient Russian skills and limited English skills
Kenan et al. (2014).	Libya	Inadequate support, absence of structure, and poor communication		Infrastructure, access cost, and power supply	Lack of proper planning and resources	Cultural challenges: values, attitudes, language
Kisanga and Ireson (2015)	Tanzania	Impropriate LMS design	Absence of ICT and language skills	Poor professional and technical assistance		
Owen (2020)	Indonesia	Low ICT skills	Poor computer skills	Poor infrastructure and access to the internet	Low funding	Lack of technical support
Quadri et al. (2017)	Pakistan and Saudi Arabia	Poor ICTs and English skills; unwillingness to change; and lack of e-pedagogy and motivation	ICT illiteracy, unfamiliarity with e-learning, and language barriers	Poor e-learning setting, low internet speed, and poor technical support	Poor financial support, unappropriated policies, and lack of e-learning training and instructional design	
Rahman et al. (2023)	Bangladesh	Low online pedagogy awareness and ICT skills	Low computer literacy, lack of self-confidence using computers, and lack of awareness	Poor ICT infrastructure; internet connection and bandwidth issues	Lack of training facilities (absence of special e-learning training)	High cost of internet
Tarus et al. (2015)	Kenya and emerging economies	Lack of interest and technology skills	Poor ICT skills	Insufficient e-learning infrastructure	Lack of operational policy and financial support	Poor technical and professional skills
Zarei and Mohammadi (2022)	India	Poor knowledge of e-pedagogy and assessment	Unequal access to computers, poor computer literacy, and resistance to change	Lack of technological infrastructure		

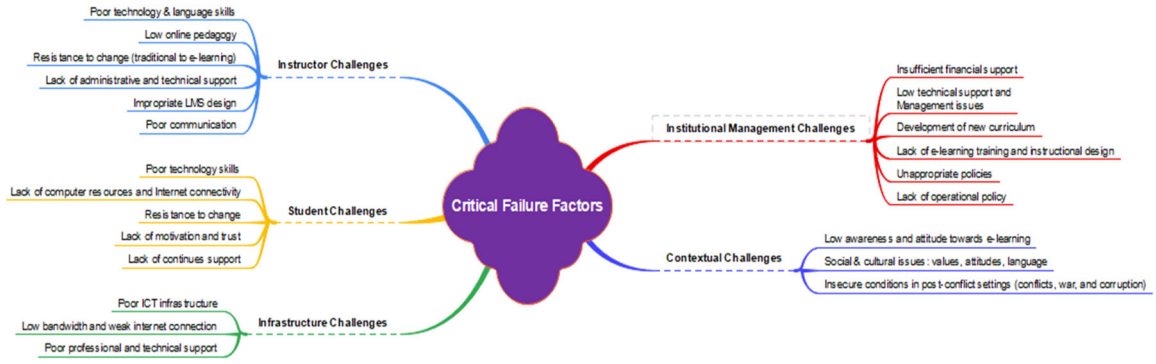

Figure 3. Summary of the critical failure factors.

3.3. Theme three: The recommendations for successful implementation of e-learning in emerging economies

In the landscape of e-learning systems within emerging economies and the least developed countries, a comprehensive synthesis of scholarly research has illuminated both significant challenges and promising opportunities for the effective implementation of these systems. This study synthesizes recommendations from studies conducted in diverse geographical and socioeconomic contexts, including Namibia (Kaisara & Bwalya, 2020), various emerging economies, such as Ghana, Kenya, Iraq, Pakistan, and other least-developed economies (Al-Azawei et al., 2016; Hennig & Nazarkulova, 2019; Makokha & Mutisya, 2016; Whitelock et al., 2024). These recommendations collectively underscore the critical need for contextual adaptation, capacity building, technological infrastructure, pedagogical innovation, and policy support for e-learning.

A common theme across these studies is the need for the contextual adaptation of e-learning. Kaisara and Bwalya (2020) emphasize the importance of considering Namibia's local cultural, political, and economic conditions. This view is echoed by Hennig and Nazarkulova (2019), who recommended blended learning methods that combine face-to-face interactions with online learning to gradually familiarize learners in emerging economies with new learning modes. James (2021) highlighted the need to improve language and computer skills among students in the least-developed countries. These recommendations highlight a crucial research gap in understanding and integrating local contexts and capacities into e-learning designs and implementations.

Capacity building for educators and learners is another vital area. Makokha and Mutisya (2016) suggest the importance of training educators in e-learning, content development, and e-pedagogy. Al-Azawei et al. (2016) recommended integrating e-learning theories into teaching-method courses in Iraq. Furthermore, Dille and Røkenes (2021) emphasize the establishment of e-learning support centers to aid teachers in content development and pedagogical strategies. These recommendations highlight a research gap in professional development and support systems for educators in e-learning environments. Technological infrastructure is a critical aspect, as highlighted in several studies. Makokha and Mutisya (2016) advocated prioritizing funding for ICT infrastructure in Kenya, whereas Kanwal and Rehman (2017) suggested establishing national e-learning centers in Pakistan to coordinate development activities. Makokha and Mutisya (2016) recommend the use of Open-Source Software (OSS) as a cost-effective solution. This research gap is evident in the need for sustainable and accessible technological solutions tailored to emerging economies.

Innovative pedagogical approaches and learning-engagement strategies are crucial. Makokha and Mutisya (2016) and Schwab and Somerville (2022) emphasized the need for interactive and effective e-learning practices, including rewards and incentives for active participation. Similarly, Hennig and Nazarkulova (2019) suggest leveraging mobile technologies given their extensive use in emerging nations. This area reveals a research gap in exploring and validating innovative and culturally sensitive instructional strategies for enhancing learners' engagement and retention in e-learning. Policies and quality assurance (QA) are essential components. Karam et al. (2021) have called for the establishment of quality assurance systems and policy frameworks to support e-learning initiatives. This involves

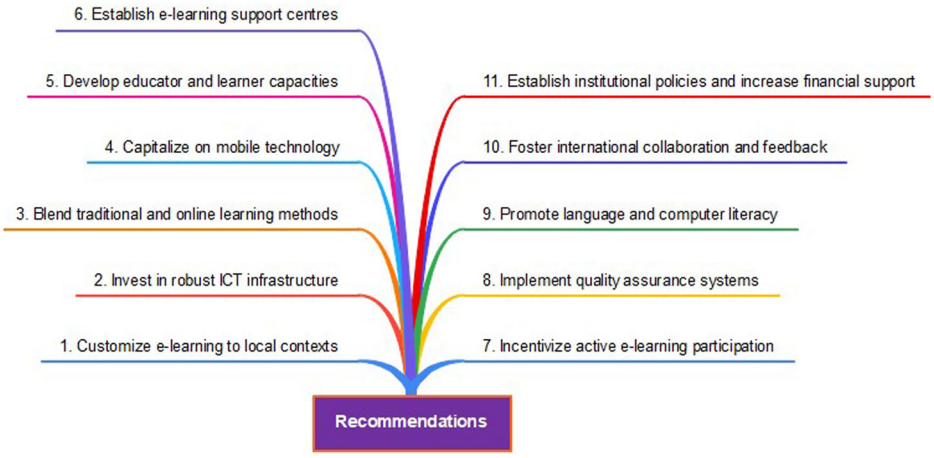

Figure 4. Summary of the recommendations.

collaboration among the ministries of education, higher education institutions, and other stakeholders to establish standards and strategies for e-learning implementation. The research gap lies in understanding the policy environments of emerging economies and developing frameworks that align with the local educational goals and resources.

The synthesis of these studies reveals significant research gaps in e-learning implementation in emerging economies and the least developed countries. These gaps span contextual adaptation, capacity building, technological infrastructure, pedagogical innovation, and policy support. Addressing these gaps requires a multifaceted approach involving localized research, educator training, technological investments, innovative teaching methods, and supportive policy frameworks. Future research should focus on these areas to develop robust, sustainable, and culturally relevant e-learning systems that cater to the diverse needs of the learners in these regions. Figure 4 presents a summary of these recommendations (Table 4).

3.4. Theme four: Future research studies in e-learning implementation in emerging economies

The rapid evolution of e-learning, particularly during the COVID-19 pandemic, has led to several significant research gaps. These gaps, identified by various researchers across different geographical locations, emphasize the need for a more comprehensive understanding of digital learning platforms. This essay synthesizes these gaps, focusing on their implications in emerging economies and specific countries, such as Namibia, Turkey, Pakistan, and Uganda.

Beginning with the work of Kaisara and Bwalya (2020) in Namibia, a critical gap was identified in understanding the experiences of students who were already familiar with e-learning platforms. This perspective is essential for delving deeper into the advanced challenges and opportunities of e-learning. Furthermore, their emphasis on investigating the reasons behind student dropouts in e-learning programs opens another research dimension. Understanding these reasons is crucial for addressing underlying issues in e-learning delivery and design. Almaiah et al. (2020) noted the nascent state of research in emerging economies on students' willingness to engage in e-learning systems. Their work suggests a crucial need for studies that further explore the factors influencing students' acceptance and use of e-learning, which are key determinants of a system's success and sustainability. This highlights a broader theme in e-learning research: Understanding the end-user's experience and attitude is as important as the technological sophistication of learning platforms.

Similarly, Bilgiç and Tuzun (2020) advocated for a comparative approach, suggesting that analyzing the issues found in Turkish higher education with those in other countries could reveal universal e-learning challenges. They also highlighted the importance of including academic staff in future research to provide a more comprehensive understanding of e-learning ecosystems. Kanwal and Rehman (2017) identified a crucial gap in the alignment of users, developers, and policymakers in e-learning in Pakistan. This misalignment suggests a communication breakdown that can lead to ineffective e-learning strategies,

Table 4. Recommendation for successful implementation of e-learning in emerging economies.

Recommendation	Key insights from research
Customize e-learning to local contexts	Adapt e-learning models to align with the region's specific cultural, political, and economic conditions (Kaisara & Bwalya, 2020).
Invest in robust ICT infrastructure	Prioritizing funding for ICT development and exploring cost-effective options like OSS (Mahmoud & Hamdan, 2020; Makokha & Mutisya, 2016).
Blend traditional and online learning methods	Use blended learning approaches to ease the transition to digital platforms (Hennig & Nazarkulova, 2019).
Capitalize on mobile technology	Leverage widespread mobile phone usage for e-learning accessibility (Hennig & Nazarkulova, 2019).
Develop educator and learner capacities	Train educators in e-learning methodologies and develop e-contents and e-pedagogies (Hashemi, 2021).
Establish e-learning support centres	Set up support centers with necessary technical and pedagogical resources (Pedro & Kumar, 2020).
Incentivize active e-learning participation	Introduce reward systems for actively participating educators and learners (Makokha & Mutisya, 2016).
Implement quality assurance systems	Establish and maintain quality assurance standards and policies (Karam et al., 2021).
Promote language and computer literacy	Enhance English and computer skills among instructors and learners (James, 2021).
Foster international collaboration and feedback	Encourage global partnerships and incorporate feedback into e-learning design (Jurs & Spehte, 2021; Whitelock et al., 2024).
Establish institutional policies and increase financial support	Establish policies and increase financial support to help appropriately and systematically implement e-learning (Mahmoud & Hamdan, 2020).

underscoring the need for integrated models that harmonize the needs and perspectives of all stakeholders. Addressing a similar theme, Makwambeni et al. (2023) highlight the issue of user participation in the development of e-learning systems, particularly in emerging economies. Lack of user involvement often disconnects developed systems from actual user needs. This calls for a more inclusive development process that involves end users and ensures that e-learning solutions are contextually relevant and user-centric.

Further emphasizing the importance of context, Chigbundu and Oluwabiyi (2023) noted that there is a paucity of research on students' perceptions of computer literacy in emerging economies has drawn attention. Understanding this aspect is crucial because it directly influences the effectiveness of e-learning systems and students' ability to engage with them. Instructors' perspectives also play a pivotal role (Ahmed et al., 2023). Research exploring instructors' views can lead to more effective implementation of e-learning systems, as they are integral to the learning process. Broader inclusion of different stakeholder perspectives is essential for a holistic understanding of e-learning dynamics. Further research is needed to understand the barriers to e-learning adoption, particularly in emerging economies (Kanwal & Rehman, 2017). Addressing these barriers requires tailoring e-learning systems to meet specific regional and contextual needs, a challenge often overlooked in existing research.

Kaisara and Bwalya (2022) and Uther (2019) pointed to an underexplored area of mobile learning (m-learning) in emerging economies. They suggest a growing need for research on pedagogical models suitable for the effective deployment of m-learning, a trend that resonates with the increasing prevalence of mobile technology. Similarly, Hakimi et al. (2024) requested further research to determine the impact of e-learning on women's empowerment in developing countries. These research gaps collectively underscore the need for a more nuanced, inclusive, and context-sensitive approach to e-learning. A key theme of these studies is the importance of understanding and integrating the perspectives of all stakeholders including students, instructors, developers, and policymakers. Additionally, the evolving nature of e-learning with a growing focus on m-learning calls for adaptive and forward-thinking research strategies. Addressing these gaps is crucial for enhancing the quality and effectiveness of e-learning systems and ensuring their relevance and sustainability in an ever-changing educational landscape (Table 5).

4. Discussion and implication

The integration of ICT across various sectors has been significantly amplified, particularly following the COVID-19 outbreak, which affected educational systems worldwide. Palvia et al. (2018) highlight this

Table 5. Future research areas in e-learning implementation in emerging economies.

Future research areas	Potential research questions
1. E-learning adoption and user experience	• How do students with varying familiarity with e-learning platforms perceive their learning experience? • What are the perception gaps among users, developers, and policymakers regarding e-learning?
2. Dropout and engagement challenges in e-learning	• What are the primary reasons for students dropping out of e-learning programs? • What factors contribute to student frustration and dissatisfaction with e-learning?
3. Comparative analysis of e-learning systems	• How do the challenges in e-learning in various countries compare with each other? • What specific barriers exist to using LMS in different economic contexts?
4. Critical factors influencing e-learning system usage	• What critical factors influence students' willingness to use e-learning systems in different economies? • What are learners' specific priorities and views regarding e-learning in various contexts?
5. Instructor and academic staff perspectives on e-learning	• What are instructors' perceptions and challenges regarding e-learning?
6. Technology and infrastructure in e-learning	• What role does students' computer literacy play in the effectiveness of e-learning in emerging economies? • How can technological infrastructure be improved to support effective e-learning?
7. Development and integration of e-learning models	• How can a comprehensive model be developed to identify the relationship among critical adoption drivers of e-learning? • What pedagogical models are effective for deploying and utilizing mobile learning objects?
8. User participation in e-learning development	• How can user participation be effectively integrated into developing e-learning environments? • What approaches can be taken to involve users more in developing digital education systems?
9. Impact of e-learning on educational processes	• What are the practical impacts of e-learning on the education process in different educational contexts? • How does e-learning affect teaching methodologies and learning outcomes in various economies?
10. e-Learning adoption and continuous use in emerging economies	• What are the key issues and obstacles in adopting and continuously using e-learning in emerging economies? • How can institutions in emerging economies overcome barriers to implementing e-learning?
11. Impact of e-learning on women empowerment	• What are the long-term impacts of digital literacy programs on women's socioeconomic empowerment? • What is the role of e-learning in bridging the digital gender gap and promoting women's participation in the STEP field?

widespread influence, noting the transformative effect of technology across spheres of life. Over a billion students globally were impacted by school closures due to the pandemic as of as of July 2020 (UNESCO & UNICEF, 2021). This emergent situation has led to a rapid shift from traditional classroom settings to online classes, reflecting growing reliance on e-learning models. This shift is not just a response to immediate needs but also aligns with the increasing demand for ICT-trained personnel in a digitally driven global economy.

McDaren (2021) underscored the scale of this transition, noting that universities are adopting diverse e-learning models that aim to facilitate education for all and train millions of workers by 2030. The success of these initiatives, however, varies. Almaiah et al. (2020) provided a stark reality check, indicating that a significant proportion of e-learning projects in emerging contexts have either failed or only partially succeeded. This finding echoes Wani and Mahdi (2021) assertion that technology, while essential, is insufficient on its own for the success of e-learning and that human and cultural factors play equally critical roles. The difference in the efficacy of e-learning between developed and emerging economies is a point of contention. Tarus et al. (2015) argued that it is imprudent to directly transplant e-learning models from developed to emerging contexts, citing the need to consider local contextual factors for successful implementation. This sentiment is reinforced by Kanwal and Rehman (2014), who cautioned against assuming the applicability of successful models from regions, such as the United Kingdom to countries, such as Pakistan given their distinct economic, educational, and cultural landscapes.

Kundi and Nawaz (2014) further elaborated on the challenges that emerging economies face, noting issues, such as inadequate technological infrastructure, weak project execution, low tool usage, inappropriate content, and poor training. These challenges underscore the need for a robust technological

backbone and more effective transition strategies from traditional to modern e-learning methods (Farid et al., 2018). Despite these challenges, the adoption of e-learning in regions, such as China, Singapore, Malaysia, Gulf, and South Africa is increasing (Kumar et al., 2017). In contrast, countries, such as Nigeria, Tanzania, and Uganda face significant hurdles in effective e-learning implementation owing to economic constraints, infrastructural deficiencies, and skill gaps (Makokha & Mutisya, 2016). This disparity extends to other emerging contexts, such as Indonesia and Bangladesh. Anggraeni and Sole (2018) identified specific barriers in Indonesia, including limited internet accessibility, technical skill deficits, and inadequate administrative support. Similarly, Alam et al. (2023) highlight the struggle in Bangladesh, particularly in rural areas, due to weak ICT infrastructure, financial support, and digital gaps. Oyerinde (2014) encapsulates this by distinguishing the challenges emerging economies face, predominantly infrastructural, technological, and contextual, from those of developed countries that primarily grapple with the individual dimensions of e-learning.

While e-learning offers transformative potential for global education, its successful implementation, particularly in emerging economies, demands a nuanced understanding of local contexts, tailored strategies, and emphasis on holistic infrastructure and capacity building. Disparities in readiness and resources between developed and emerging economies necessitate a more context-sensitive approach to e-learning strategies, underlining the need for tailored solutions that address specific challenges in each region. This study's analysis has significant implications for policymakers, LMS developers, teachers, and students. The implications of this result are summarized in Table 6.

Table 6. Summary of study implications.

Implications	Policymakers	LMS providers	Educators and students
Digital access	Prioritize investments in digital learning resources, stable power grids, community tech hubs, and affordable data plans to address digital equality.	Optimize LMS platforms for low-cost devices, integrate with local messaging apps, and ensure compatibility with regional technologies for seamless adoption.	Cultivate self-directed learning skills, manage time effectively, and engage in virtual collaborations.
Training and development	Offer comprehensive training and ongoing professional development for educators to effectively utilize digital tools.	Embed capacity-building tools, including interactive tutorials, simulations, and micro-learning modules for educators and administrators.	Develop digital literacy, participate in continuous professional development, and acquire troubleshooting skills.
Policy frameworks	Implement adaptive policies with regular reviews, inclusive digital literacy programs, and advisory boards for diverse insights.	Tailor LMS solutions to emerging market needs, incorporating community collaboration features, low-bandwidth optimization, and culturally sensitive modules.	Adapt to new assessment methodologies, participate in peer/self-assessment, and embrace project-based learning.
Funding models	Explore public-private partnerships, education technology bonds, and allocate budget percentages for sustainable e-learning initiatives.	Introduce flexible pricing models, such as pay-as-you-grow, freemium offerings, and consortium pricing to make platforms accessible.	N.A.
International collaboration	Foster cross-border partnerships for knowledge exchange, global consortium participation, and leveraging expertise.	Enhance data analytics with predictive models, learning pattern analyses, and dashboards for tracking progress to support decision-making.	Develop intercultural communication skills, navigate diverse cultural contexts, and engage in global cross-cultural learning.
Data privacy and security	Establish comprehensive data privacy and cybersecurity standards for educational institutions.	Ensure robust system design with error handling, distributed content delivery networks, and battery-efficient mobile apps for reliability in challenging environments.	Cultivate understanding of digital ethics, online safety, and develop strategies to mitigate digital fatigue and isolation.
Cultural contextualization	Support development of culturally relevant digital content and multilingual platforms to respect local cultural nuances.	Incorporate accessibility features like screen reader compatibility, voice navigation, and simplified interfaces to accommodate users with limited digital literacy.	Engage in virtual teamwork, develop online collaboration skills, and effectively manage shared digital workspaces.
Incentives and assessment	Create incentives for schools investing in e-learning, including tax breaks and recognition programs, and establish continuous assessment mechanisms.	Design LMS features that foster collaborative learning in low-bandwidth environments, including peer assessment modules and gamification elements for engagement.	Adapt to hybrid teaching models that blend online and offline materials to ensure equitable access, especially for disadvantaged students.

4.1. The implication to policy makers

This study underscores the need for policymakers in emerging economies to adopt a multifaceted approach to fostering e-learning ecosystems. This strategy demands prioritizing investments in programs that enhance digital learning resource accessibility while providing comprehensive training and ongoing professional development for educators (Rahimi & Oh, 2024; Wei, 2023). The focus should be on the effective utilization of digital tools and the creation of high-quality, contextualized educational content.

Central to this approach is the development of robust technological infrastructure beyond mere internet connectivity (Singh et al., 2024). Policymakers must create a holistic digital ecosystem that includes stable power grids, community-tech hubs in rural areas, and partnerships with telecom providers for affordable educational data plans. These measures are crucial in addressing digital equality and ensuring equitable access to e-learning. To remain responsive to technological advancements, policymakers should implement adaptive policy frameworks with regular reviews possibly every two to three years. Establishing diverse advisory boards comprising educators, technology experts, and students can provide valuable insights into policy decisions. Additionally, inclusive digital literacy programs should cater to various age groups, incorporate modules for individuals with disabilities, and include gender-specific initiatives to bridge the digital divide.

Sustainability of e-learning initiatives requires innovative funding.[1] Policymakers should explore public-private partnerships, education technology bonds, and the allocation of fixed percentages of education budgets to e-learning. Cross-border collaborations, such as e-learning knowledge exchange programs with developed countries and participation in global e-learning consortiums, can leverage international expertise. As digital platforms have become integral to education, robust data privacy and security frameworks have become essential.

Policymakers should develop comprehensive guidelines for handling student data and establish stringent cybersecurity standards for educational institutions.[2] Cultural contextualization is crucial to support the development of culturally relevant digital content and multilingual e-learning platforms. To accelerate adoption, policymakers should create incentive structures for educational institutions and educators, such as tax breaks for e-learning infrastructure investments, and recognition programs for innovative practices. Finally, continuous assessment and improvement mechanisms, including regular impact assessments and feedback loops involving all stakeholders, are vital to ensure that policies remain effective and responsive to evolving needs.

4.2. The implication to LMS providers

The COVID-19 pandemic has thrown LMS with unprecedented prominence in global educational ecosystems. This shift presents LMS providers with opportunities and complex challenges, particularly in addressing the disparity in e-learning readiness between the developed and emerging economies. To address the unique hurdles faced by institutions in emerging markets, LMS providers must develop adaptive technological solutions. These should include AI-driven content delivery adjusting to individual learning paces, automatic bandwidth optimization, and robust offline modes with seamless synchronization (Martin et al., 2020; Thompson et al., 2023). These features ensure continuity of learning in areas with unreliable connectivity.

Localization strategies must go beyond language translation and incorporate local teaching methodologies, culturally relevant case studies, and indigenous assessment methods (Haidari et al., 2021). This approach enhances platform relevance and fosters user ownership, which is crucial for its widespread adoption. The architectural foundation of an LMS platform should embody its modularity and scalability. A microservice architecture allows for easy feature customization, whereas the API-first approach enables integration with local tools. Cloud-native solutions with edge computing can enhance performance in areas with limited infrastructure.

Enhanced data analytics tailored to emerging markets provide crucial insights. Predictive models for dropout risks, learning pattern analyses that consider socioeconomic factors, and comprehensive dashboards for policymakers can drive continuous improvements in educational outcomes. LMS providers should develop robust collaborative learning features, including low-bandwidth virtual study groups,

culturally sensitive peer assessments, and gamification elements, to foster community engagement. Accessibility and inclusivity must be prioritized with features, such as screen-reader compatibility, voice navigation, and simplified interfaces for users with limited digital literacy. Integration with local technologies, such as optimizing low-cost devices and supporting region-specific payment gateways, is essential for widespread adoption.

Embedded capacity-building tools, including interactive tutorials and microlearning modules, can address the skill gaps in emerging economies. The system design must prioritize resilience and reliability with robust error handling, distributed content delivery networks, and battery-efficient mobile apps. Finally, flexible pricing models aligned with the economic reality are crucial. Pay-as-you-grow models, freemium offerings, and consortium pricing make advanced e-learning platforms accessible to a broad range of institutions.

4.3. The implication to teachers and students

The shift to online learning has catalyzed a profound transformation in education, necessitating the reimagining of pedagogical approaches and digital competencies for both educators and learners (Rahimi & Oh, 2024; Thompson et al., 2023; Wei, 2023). This transition demands a fundamental reevaluation of teaching and learning in virtual environments. For educators, evolving teaching methodologies are paramount. The move from traditional lecture-based approaches to more facilitative, student-centered methods requires not only a mindset shift but also new skill acquisition. Teachers must master creating engaging multimedia content, moderating online discussions, and orchestrating virtual group work to foster collaboration.

Meanwhile, students must cultivate robust, self-directed learning skills (Wei, 2023). The asynchronous nature of e-learning demands advanced time management, the critical evaluation of online resources, and active engagement in virtual collaborative projects. These skills are crucial not only in e-learning spaces but also in the increasingly digitized global workforce. Teachers need continuous professional development in e-tech tools and emerging technologies, whereas students must develop proficiency across digital platforms, understand digital ethics and online safety, and acquire basic troubleshooting skills.

Data analytics in education opens avenues for personalized learning pathways. Teachers can use learner analytics to identify individual needs, create tailored materials, and implement adaptive assessments. This data-driven approach empowers students to set personal learning goals and receive immediate feedback, thereby fostering more engaging and effective learning experiences (Martin et al., 2020). E-learning transitions may, however, exacerbate this digital divide. Teachers may need to adopt hybrid models that blend online and offline materials to ensure equitable access. Students from disadvantaged backgrounds face the challenges of limited device or Internet access while balancing increased household responsibilities.

The psychological impact of e-learning is significant. Educators must be attuned to signs of digital fatigue or isolation among students, incorporating well-being check-ins, and balancing synchronous and asynchronous activities. Students need strategies to maintain their mental well-being, including creating dedicated learning spaces and establishing clear boundaries between school and personal time.

Virtual classrooms present unique challenges and opportunities in terms of their cultural sensitivity. Teachers must navigate diverse cultural contexts online, while students have unprecedented opportunities for cross-cultural learning and the development of intercultural communication skills. The assessment of e-learning requires reimagining. Educators must design authentic project-based assessments and implement peer- and self-assessment methodologies. Students must adapt to learning through diverse digital artifacts and engage in continuous assessments. Finally, collaborative skills in virtual environments are critical. Teachers must design effective online group projects and foster a sense of community, whereas students must develop virtual teamwork skills and navigate the challenges of asynchronous collaboration.

5. Limitation and future research

It is essential to recognize the limitations of this study. Examining the challenges and opportunities in e-learning implementation is highly context-specific and may not encompass the diverse and unique nuances of all emerging economies. Additionally, the findings of this study are subject to change as

technological advancements and educational landscapes continue to evolve. Future research should focus on exploring adaptive strategies to address these growing challenges, assessing the long-term impact of e-learning on academic outcomes, and examining the effectiveness of specific interventions in overcoming infrastructure-related barriers in various emerging contexts.

6. Conclusion

E-learning represents a significant opportunity for universities to fulfill their educational objectives efficiently. It provides an accessible and cost-effective educational solution that is available anytime and anywhere. As a key source of information, e-learning fosters interactive learning environments that benefit students and enhance teachers' technical and professional skills, specifically in e-pedagogy, while also strengthening the e-capacities of institutions. Several critical factors influence the implementation of e-learning in emerging economies, including electricity availability, internet bandwidth, ICT infrastructure, language and computer literacy, funding, policies, objectives, local research, and awareness. The success of e-learning programs in these contexts hinges on carefully considering the diverse and crucial factors.

The COVID-19 pandemic underscored the importance of e-learning, as it became the primary means of connecting instructors and students during the closure of educational institutions worldwide. While developed countries faced challenges primarily related to the individual aspects of e-learning, emerging economies, such as Afghanistan, encountered significant infrastructural, technological, and contextual obstacles. These challenges, including unstable electricity, slow internet connectivity, budget limitations, inadequate ICT infrastructure and literacy, resistance to change, and management difficulties, have impeded the adoption and effectiveness of e-learning in these nations. Addressing these issues requires comprehensive planning and targeted strategies to facilitate the successful implementation of e-learning in emerging economies.

Notes

1. https://www.undp.org/news/undp-launches-innovative-e-learning-programme-sustainable-finance.
2. https://dataqualitycampaign.org/wp-content/uploads/2021/05/DQC-Safeguarding-Student-Data-in-Higher-Ed_May-2021.pdf.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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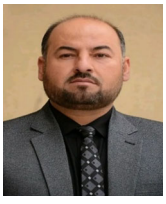

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