RESEARCH ARTICLE

RESEARCH ON ADVANCING THE DIGITAL TRANSFORMATION OF HIGHER EDUCATION IN CAMEROON

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ABSTRACT

Technological innovation has rapidly transformed the global business and education landscape in recent years. Digital transformation strengthens not only companies' economic positions, benefits society and the environment but also brings about social and cultural changes. As a result, businesses are training their employees in digital skills to keep up with new trends, and higher education institutions (HEIs) must adapt their teaching methods to meet changing labor market demands. This paper examines the challenges facing Cameroon's higher education system in terms of digital transformation, focusing on the University of Maroua and the Universities of Yaounde I and II. The research methods used include questionnaires, interviews, and observation. The Strategic Approach of Digital Transformation theory is applied to facilitate the successful promotion of educational technology in Cameroon's higher education system. The study reveals that Cameroon's higher education faces several challenges in digital transformation, including a lack of digital infrastructure and internet access, and insufficient university budgets. The root cause of these challenges is the central government's lack of funding, lack of international cooperation, and poor governance. To address these issues and advance digital transformation in Cameroon's higher education sector, the study recommends increasing investment in digital infrastructure and internet access, strengthening international partnerships, and improving investment and governance for lifelong learning in the digital age. And finally, the authors draw insights from international experience to enhance digital transformation in Cameroon's higher education.

INTRODUCTION

Over the years, the advancement of technology has brought about significant changes in various industries, including the education sector. In Africa, including Cameroon, the use of Information and Communication Technologies (ICT) in higher education has been identified as a critical tool to improve education quality and increase student learning opportunities. Cameroon also has formed various international relationships, both bilateral and multilateral, to enhance its higher education sector's use of ICT. In 2005, Cameroon signed the Libreville Declaration, which emphasized the importance of ICT in achieving the higher education goals of the Central African Economic and Monetary Community (CEMAC) sub-region. Since then, The Ministry of Higher Education (MINESUP) in Cameroon has initiated several programs and projects to promote the use of ICT in higher education, including the COMETES project, funded by the French government and implemented in collaboration with MINESUP, the Association of Francophone Universities (AUF), the Panthéon-Sorbonne University in Paris (France), and CFA Stephenson (France). The project aims to make Cameroonians more "professional" through training and distance learning, with the establishment of standard distance training platforms and training tutors (supervisors) to handle distance training courses.

Moreover, the COMETES project has achieved several milestones, including the establishment of standard distance training platforms, the training of tutors to handle distance training courses, and the establishment of a university network with UNESCO. All universities and technical schools in Cameroon have established Multimedia Resource Centers (MRCs) to provide access to remote training resources. Furthermore, Cameroon has established other similar initiatives supporting e-learning resources, including the Francophone University Association (AUF) project and the Commonwealth Learning ICT and Literacy Program. These initiatives are geared towards making education programs easier to use and eliminating poverty and other challenges through the use of ICT as a development tool. According to a report by the United Nations Educational, Scientific and Cultural Organization (UNESCO,2020), Cameroon has made significant progress in the use of ICT in education in recent years. The report states that the country has achieved a high level of connectivity and has established a comprehensive legal framework to support the development of ICT in education. The report also highlights the government's commitment to improving access to education through the use of ICT. The Cameroon 2020 Digital Strategy Plan is another significant initiative implemented by the government to strengthen the use of ICT services to eliminate poverty

by creating employment opportunities and accelerating national economic growth. The plan focuses on developing human capital and digital leadership, encouraging national education and training, and promoting the digital economy. However, according to Tchoffo et al. (2019), the lack of adequate infrastructure, including power supply and internet connectivity, is a major hindrance to the adoption of digital technologies in higher education. Nguegang et al. (2020) also found that limited funding and low levels of digital literacy among students and faculty are also significant challenges. There is still much to be done to ensure that all students have access to quality education, and the digital transformation of higher education in Cameroon should remain a priority for policymakers and educators in the country. Therefore, the focus of this study is to examine the real challenges facing Cameroon higher education in the digital transformation process and to identify the reason behind these challenges. Finally, the study intends to advance digital transformation in Cameroon by submitting some relevant strategies and insights that could help the institution to grow its digital transformation.

Theoretical Framework on Strategic Approaches for Digital Transformation: A strategic approach to digital transformation in higher education involves developing a comprehensive digital transformation strategy that aligns with the institution's overall strategic objectives. It includes identifying the assessment of the institution's digital maturity and developing a roadmap for the implementation of digital technologies. To this end, several studies have emphasized the importance of a strategic approach to digital transformation in higher education, with Smita and Swamy (2021) and Al-Sharrah and Al-Qatawneh (2019), emphasizing the importance of stakeholder engagement, organizational culture, and change management as critical success factors. According to Bates and Sangra (2011), digital transformation in higher education involves a strategic and systematic approach to using digital technologies to support teaching, learning, and research. This approach requires institutions to consider the broader implications of digital transformation, including changes in pedagogy, curricula, and student support services. Institutions that take a strategic approach to digital transformation can create new opportunities for learning, enhance student engagement and success, and increase institutional efficiency and effectiveness. Khan and Khan (2021) also argue that higher education institutions should adopt a strategic approach to digital transformation to maximize its benefits fully. The authors also think that a strategic approach should include developing a clear digital transformation strategy, assessing the institution's current digital readiness, identifying potential digital opportunities, and developing a digital culture that supports the implementation of digital technologies. Additionally, strategic approaches for digital transformation should focus on effective leadership and governance, robust infrastructure, curriculum and instruction, student engagement, and partnerships and collaboration.

Institutions need to consider several strategic approaches to successfully implement digital transformation in higher education. According to a study by Alshammari and Wanous (2021), institutions need to establish clear leadership structures and governance frameworks to ensure effective decision-making and resource allocation. Wang et al. (2021) suggest that institutions need to invest in the development of a comprehensive digital infrastructure that is flexible, scalable, and adaptable to changing needs. Tondeur et al. (2020) argue that institutions need to provide faculty with training and support to effectively integrate digital technologies into their teaching. Yang et al. (2021) suggest that institutions need to prioritize student engagement and provide students with access to digital resources that enhance their learning experience. Finally, Drennan et al. (2021) emphasize the importance of partnerships and collaborations with industry, government, and other higher education institutions to promote innovation and knowledge sharing. By following this strategic approach, Cameroon higher education can ensure its digital transformation efforts and align them with its mission and values, and be able to adapt to the changing technological landscape while maintaining its core strengths and values.

And finally, Cameroon's higher education should consider the think about how to develop digital competencies among faculty, staff, and students for ongoing professional development, and have a clear goal for their digital transformation, then rethink how to take initiative, which paths are substantial, finally, they will end with the investment in each worthy branch.

LITERATURE REVIEW

The rapid pace of technological change and the emergence of a new profession has had a significant impact on educational technologists, as noted by Laura Czerniewicz and Tony Carr in 2011. Bisong (2015) argues that educational technology is a key factor in achieving success in education, as it involves the systematic and organized application of modern technology to enhance the quality of education. This includes the use of modern teaching techniques, teaching materials, and the organization of work and relationships among all participants in the educational process. The implementation and evaluation of this educational process are conceptualized in a systematic way, as defined by Kamp (2016). The use of ICT in education has also been highlighted, comprising a complex set of goods, applications, and services for producing, manipulating, distributing, and transforming information (Munyua, 2005; United Nations, 2005). According to Tetang (2007), private schools began incorporating technology into their curriculum in the 1990s without any specific policy to guide their teaching methods. As a result, each school has its own approach. The official introduction of educational technology in Cameroon was in 2001, this recent government action was considered late by Mbangwana (2008). However, considering the researcher acknowledges, some private higher education institutes in the country are now equipped with a local area network (LAN), servers, word processing software, printers, scanners, video projectors, videotapes, and internet connectivity in the teaching-learning process. To ensure that higher education becomes more innovative and productive, Barclay et al (1991) argue that the use of technologies in Cameroon higher education should reflect the Cameroonian situation. Klopfer (2016) expects that technology will make higher education more innovative and productive.

Huyer (2003) in Tchombe (2008), also argues that the availability, access, and use of ICT in education may open up opportunities for many to develop technological skills that are in high demand in the 21st-century labor market and knowledge economy. Philips in Teneng (2016: 238) believes that continuous partnership between universities and the world of work is necessary to acquire the technological and ICT skills needed for future employment. Haddad and Draxler (2002), in Teneng (2017), argue that modern education systems that utilize digital technologies are more beneficial to learners, considering the rapidly changing skills demanded by the globalizing labor market. Fonkoua (2006) also suggests that the pedagogical integration of technologies should be introduced in teacher training programs to avoid teachers becoming obsolete. However, in African universities, technology initiatives face challenges relating to infrastructure, staff capacity, limited access to professional networks, severe resource constraints, and exorbitantly expensive and unreliable bandwidth. A study conducted by the Ministry of Higher Education in 2018 argues that the use of digital technologies in Cameroonian universities is still relatively low, as only 20% of universities have a dedicated ICT unit and only 10% of faculty have received training on how to use digital technologies in teaching and learning. These challenges are also reflected in the lack of funding and the digital skills gap, as highlighted by Tetang (2007), Fomunyam (2014), and the World Bank in 2019. Metuge (2002) questions whether the current use of technology in Cameroonian higher education deserves the label of educational technology.

METHODS

This study adopted a qualitative approach and used interpretative analysis (Smith, 2004; Creswell, 2013). This study was based on content from questionnaires and in-depth interviews with

Cameroonian academic members and managers, as well as higher education officials. (Creswell, 2013). Both the content analysis and interviews were aimed at achieving an authentic narrative of the challenges facing Cameroon higher education on digital transformation. The overarching research questions at the center of this study are concerned with the following: What are the challenges that face Cameroon higher education on digital transformation? What are the reasons behind these challenges?

FINDING AND DISCUSSION

Motivations for promoting the digital transformation of higher education in Cameroon

Solving the problem of domestic inequity in education and the quality of education: The motivations for promoting the digital transformation of higher education in Cameroon are multifaceted. One key motivation is the need to keep up with global trends in education and technology. Cameroon, like many other countries, recognizes that technology has the potential to significantly enhance the quality of education by providing new opportunities for teaching and learning, improving access to educational resources, and facilitating communication and collaboration among students, teachers, and researchers. Another motivation for promoting the digital transformation of higher education in Cameroon is to address the challenges of traditional education delivery methods. For instance, many students in Cameroon are geographically dispersed, and it can be difficult and expensive to provide quality education to them all. Digital technologies such as online learning platforms and videoconferencing can help overcome these challenges by allowing students to access educational resources and interact with teachers and peers from anywhere, at any time. Furthermore, the government of Cameroon recognizes the potential economic benefits of investing in the digital transformation of higher education. A well-educated workforce that is skilled in the use of technology can be a competitive advantage in attracting investment and promoting economic growth. In addition, digital technologies can help create new jobs in areas such as software development, data analysis, and educational technology. Overall, the motivations for promoting the digital transformation of higher education in Cameroon are varied, but they all share a common goal of improving the quality and accessibility of education and preparing students for success in the digital age.

The goals of higher education and modernization in Cameroon: Cameroon has set an ambitious goal of becoming an emerging country by 2035, which requires collaboration, participation, and various tasks to be accomplished through international cooperation and organization. The country acknowledges the significant contribution of technological progress to its economy, culture, governance, and education. As stated in the National ICT Development Strategy document, the government has devised a plan to create and implement effective and reliable ICT programs. This demonstrates the priority the state has given to ICT in all aspects of political, economic, cultural, social, and educational life, as highlighted in the foreword by President Paul Biya. He emphasizes the active participation of Cameroon in technological advancement, particularly for the youth who are expected to acquire technical knowledge to improve their living conditions and capabilities on the global stage. In essence, the learning environment serves as the arena for this development.

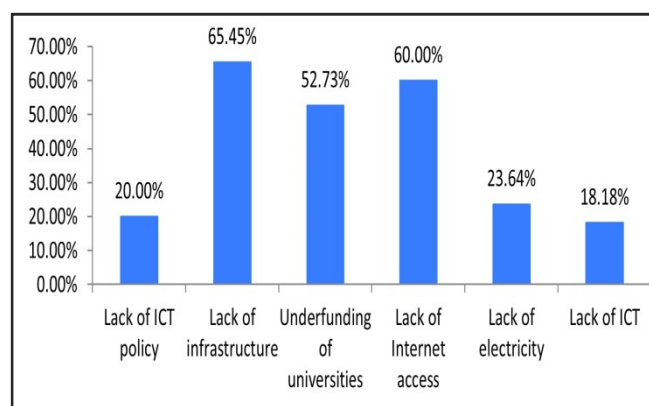**Challenges of digital transformation of higher education in Cameroon**

Design of the investigation into the digital transformation of higher education in Cameroon: To comprehensively understand the digital transformation challenges facing universities in Cameroon, the author designed five questionnaires. The survey was conducted in three universities as examples: University of Maroua, University of Yaoundé I, and II, with a participation rate of 58.18% for students, 23.64% for teachers, and 20% for administrative staff (regardless of

position). The author also engaged in informal conversations through social networking communities (WhatsApp, WeChat) with local people to identify several issues related to the digital transformation in Cameroon, and began the questionnaire development process, encouraging the active participation of others to gather relevant data. After collecting the data, the author conducted a statistical analysis using Excel and online survey tools. The final survey sample consisted of 55 participants, including 25 (45.45%) from the University of Yaoundé I, 17 (30.91%) from the University of Yaoundé II, and 13 (23.64%) from the University of Maroua. There were 32 male participants (58.18%) and 23 female participants (41.82%). The distribution of survey respondents is shown in the following graph.
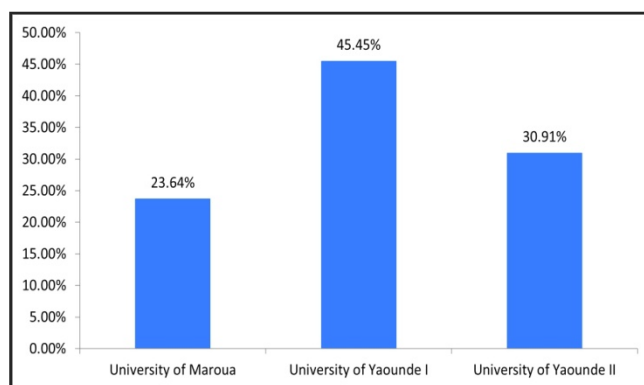
Graph1. Questionnaire respondents

Analysis of the problems of digital transformation of higher education in Cameroon: According to the survey data shown in Graph 2, it can be seen that the biggest problem facing the digital transformation of higher education in Cameroon is the lack of infrastructure, accounting for approximately 65.45%. In contrast, the proportion of lacking ICT is relatively low, at approximately 18.18%. At the same time, it can be seen from the graph that the proportion of lacking infrastructure and lacking internet access is relatively close. The proportions of the remaining options are all below 50%, including lacking ICT, lacking electricity, and lacking information and communication technology.


Graph 2. Challenges of digital transformation in Cameroon higher education

The results show that the main problems facing the digital transformation of higher education in Cameroon are the lack of infrastructure, lack of internet access, and the underfunding of universities. Combining the survey with the interview, a college lecturer asserts that Students from Yaoundé and Maroua face difficulties with network problems and accessing study materials, which affects their research and learning abilities. He said, "Students need to purchase their own internet data to access the internet on campus." A student from the University of Maroua related that: "Although Maroua University has a library, the resources are limited and only available in print format.

The school lacks campus-wide internet access, laboratory facilities, student and staff management information systems, and even a school management information system." Typically, this seems, lectures are delivered in the form of presentations without multimedia teaching or other forms of technology. Interviewer B also said: "Although the University of Yaounde I, II have the basic educational infrastructure, they do not have enough to ensure students' digital education. Many students can access digital resources on campus, but the management information system is very poor." Furthermore, according to interviewer C, the managers of Cameroonian universities lack an understanding of the importance of digital infrastructure, lack extensive experience in digitalization, and do not have a set of commonly accepted terminology and concepts to clearly classify and define the contents of various parts of technical infrastructure. Therefore, we can see that a common set of technical infrastructure terminology would be helpful for university managers to communicate information and develop policies. Universities can develop corresponding long-term or short-term funding plans based on the contents defined in the terminology to ensure the good operation of technical infrastructure and provide good technical support for the development of the university. Moreover, there is no clear mechanism for investing in and obtaining returns from technical infrastructure, which restricts the long-term development of technical infrastructure due to funding shortages. Interview D states that, in the University of Yaounde I, II, Maroua University, and others, large sums of capital are obtained from federal or state governments for the construction of technical infrastructure. After the construction is completed, there is a lack of corresponding management and maintenance funding, which affects the long-term development of the system. Finally, university budgets are intended to solve school matters, but there is still a lack of financial management in public universities in Cameroon. When managers develop budgets, they usually divide funds into multiple independent projects, including physical industries, infrastructure (such as power supply systems, water supply and drainage systems, heating systems, and telephone systems), maintenance, teaching and research, student services, and so on. Such a budget framework cannot be used to develop a budget for technical infrastructure, as the construction of technical infrastructure is related to each of the above items. University's management teams can provide assistance for the management work of the school and various departments, as well as teaching, research, and support services for students.

Reasons behind the problems of digital transformation in higher education in Cameroon: From the statistics in Graph 3, it can be shown that the problem of funds accounts for a high proportion, about 74.55%, while the lack of organization or stakeholders' involvement has a relatively low proportion, about 30.91%. The table shows that the reason behind the digital transformation issues in Cameroonian higher education is the problem of funds and the lack of international cooperation and support.
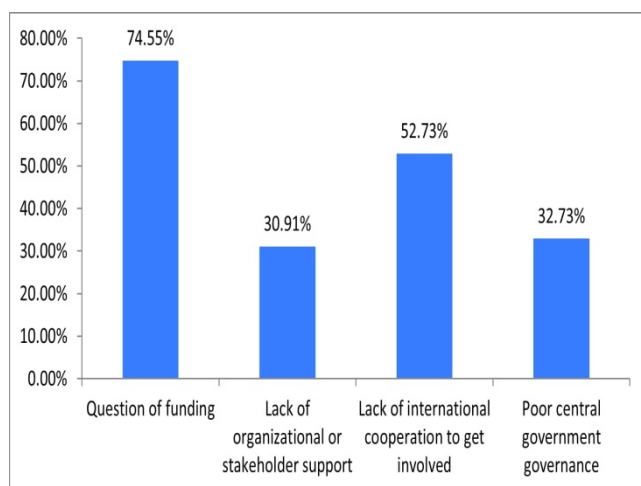
Graph 3. Reasons behind the transformation problem

The data analysis reveals that the Cameroonian higher education system faces various challenges, such as a lack of infrastructure, internet connectivity, and insufficient university funding. Although these issues are recognized as soon as possible, the root cause of these challenges is the lack of funding for digital transformation investments in Cameroon and the absence of international cooperation and support to provide donations.

Besides, According to Interviewer E insight: "Transformation is a long-term process that requires a significant investment of funds. Despite the country's economic prosperity, public universities struggle with capital issues." University managers face challenges in investing in digital transformation, whether it is at the University of Maroua or the University of Yaoundé I and II. He said, in general, the capital universities acquire is not enough to meet the transformation needs. Interview B also said: "Although they attempt to integrate digital education into higher education, this is only the initial stage of transformation." University managers rely heavily on central government funding or budgets to formulate digital plans, and they lack the innovation capabilities to define digital strategies quickly. On the whole, many higher education institutions lack investment in digital transformation and have no initiative to establish cooperation with international institutions or corporation about it. The digital transformation of Cameroonian higher education nowadays still lacks significant investment support. With international participation and stakeholders' assistance, there will be progress in digital science, investment in digitalization, infrastructure, and other issues that must be first addressed through reasonable strategies.

The overall result of findings based on statistical data: Based on the statistical data, the findings indicate that higher education institutions in Cameroon face several challenges regarding digital infrastructure, internet access, and underfunding. The lack of funding is the root cause of these challenges, which is compounded by a lack of international cooperation to support the digital transformation of higher education in Cameroon. Additionally, the central government's poor governance contributes to these challenges. Overall, the statistical data suggests that there is a pressing need for increased investment in digital infrastructure and internet access, as well as international cooperation and improved governance, to address the challenges faced by higher education institutions in Cameroon.

Enhancing Cameroon's Higher Education Digital Transformation Strategies and Insights

Advancing Cameroon's Digital Transformation Efforts

Strengthening international partnerships and increasing digital education infrastructure investment: To promote digital education in Cameroon's higher education sector after the pandemic, it is important for international organizations and coordinating bodies like the United Nations to address the issue of unequal educational resources. International cooperation strategies should be developed, which align with respective development goals, to support regions, universities, and populations in need by allocating resources accordingly. Cameroon can seek support from international organizations and platforms to establish an online education academy platform that offers university staff training courses on ICT-related knowledge and skills, thereby enhancing their information literacy and abilities. Collaboration with successful digital education universities through lectures or forums is also recommended to facilitate the rapid development of digital education in Cameroon. Examples of international university collaborations include Maroua University-Nankai University and Yaoundé University-Zhejiang University.

To achieve the fundamental needs of digital transformation, adequate hardware and software infrastructure is crucial for Cameroon's higher education digital transformation. Hardware facilities and internet connectivity are necessary, while supporting professional knowledge and course resources and improving teachers' ICT capabilities are critical to sustainable digital development. Cameroon's universities

require support for multimedia teaching, localized course resources, cross-school resource sharing, learning intelligence analysis, and comprehensive teaching management. Public multilateral cooperation among governments, enterprises, and universities should be explored to facilitate resource allocation, and academic, industrial, and government cooperation and dialogue should be encouraged to provide necessary financial resources for developing Cameroon's universities through innovative funding mechanisms and sufficient infrastructure.

Strengthening Investment and Governance for Lifelong Learning in the Digital Age: To achieve lifelong learning for all, adequate financial support is necessary. Thus, promoting the digitization of lifelong education requires an increased overall investment in lifelong learning in the digital age. The government should promote affordability and further increase overall investment in this regard. Individuals, employers, and the broader community should also understand the long-term benefits of lifelong learning and actively participate in and share the direct costs of lifelong learning. Simultaneously, there should be increased investment in the digital infrastructure for lifelong education. From the start of digital transformation, the government should prioritize the use of digital tools and infrastructure to reduce unnecessary integration and coordination costs. The government should play a more strategic guiding role and improve governance capabilities to realize the digitization of lifelong education. With the rapid progress of emerging technologies such as artificial intelligence and the Internet, establishing a fully functional and efficient digital government is the key foundation for the country. To adapt to new development situations and respond to new policy challenges, the government needs to transform from "e-higher education" to "digital higher education." This transformation should include data governance, digital technology, etc., pursuing digitalization and informationization of business processes to data-driven platform intelligence and modern governance. To smoothly achieve the transformation and upgrading, attention should be paid to the overall digital design of the lifelong education system, reflecting a people-centered government approach. The main goals, key indicators, data collection, tracking and monitoring, cross-national comparison, and results disclosure should be determined in the development of the lifelong education system. Thirdly, stakeholders in the construction of the lifelong education system should be encouraged to actively participate in open sharing.

Insights from International Experience to Address the Challenges of Digital Transformation in Cameroon's Higher Education

Encouraging investment in new infrastructure and strengthening Digital Education in Cameroon: To enhance education in Cameroon, it is recommended to encourage investment in new infrastructure and strengthen the digital foundation of education. Many countries and organizations across the globe are already doing this. For instance, the European Union is planning to provide 1-gigabit networks and 5G coverage to schools, while Germany is helping teachers establish virtual classrooms. Cameroon should follow suit and focus on transitioning in teaching and learning. To achieve this, universities in the northern and northernmost regions, such as Buéa University, University of Yaounde I and II, and Maroua University, should build high-speed and high-capacity communication networks, ensure access to terminal equipment, and develop and use intelligent campuses. By investing in new infrastructure, Cameroon can strengthen the digital foundation of education and enhance learning opportunities for students.

Advancing Digital Education through International Cooperation and Standards Alignment: International cooperation and strategic dialogues on digital education can accelerate the development of digital education standards worldwide. Successful examples, such as Germany's support for educational resource sharing and the EU's encouragement of closer dialogue among educational and training institutions, demonstrate the effectiveness of cooperation in achieving effective and inclusive digital education. In Cameroon, digital education is still in its early stages of primary education, and there is a

need to establish new paradigms of digital learning. Cross-school cooperation and collective teaching research can be explored through the lens of international practices, and new digital technologies such as cloud learning, communication, and collaboration can be utilized to promote the overall digitization of education. Cameroon should engage in various forms of international exchange and cooperation to explore digital education's implementation experience and improvement strategies, promoting high-quality development in higher education.

Develop a Digital Competency Model to Foster the Growth of Digital Talent in Education Digitization: Various states and regions in the US have implemented international strategies that offer specialized learning opportunities, high-quality digital education resources, and technical assistance to teachers to support accessible educational resources. Their aim is to develop students and educators with digital literacy. Similarly, the European Union Commission has established teacher colleges and launched online self-reflection tools to help teachers assess their strengths and weaknesses in digital literacy and provide professional development opportunities for teachers and educators. Cameroon should prioritize the development of human resources with digital literacy by establishing and enhancing digital literacy frameworks and assessment systems, considering learners' needs as digital natives, and integrating digital literacy development into education. Furthermore, it should create a comprehensive digital service system.

CONCLUSION

The emergence of e-learning has revolutionized higher education, providing students with a wider range of learning options. In Cameroon, the government has recognized the potential benefits of innovative education and aims to promote digital transformation in higher education. However, the country currently faces several challenges, such as the lack of digital infrastructure, internet access, and funding for higher education institutions. Addressing these issues is crucial for achieving the long-term goal of integrating educational technology into higher education in Cameroon. The solutions presented in this study, such as increasing investment in digital infrastructure and internet access, promoting international cooperation, and improving governance, can help overcome these challenges and pave the way for the successful digital transformation of higher education in Cameroon.

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