



Strategies for Enhancing Technology Integration in Higher Education in Nigeria

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1. Introduction

Technology integration is seen as the effective use of technology to support learning and improve educational outcome. It requires a shift from traditional face-to-face teaching/learning to a new pedagogical approach that makes a good use of appropriate technology. It affirms the belief that learning is a shared and social process that takes place actively in a social context. It recognizes the importance of the new role of learners as active participants in constructing knowledge. It also recognizes the important role of educators in creating collaborative learning environments that support students to develop their knowledge, skills and attitudes. Education policy makers have claimed that effective technology integration in education can enhance learning experience for students and can further improve educational outcomes. It is believed that collaborative learning mediated by technology can transform the existing paradigm of teaching and learning from rote memorization approach to inquiry-based learning that encourages critical thinking, creativity and lifelong learning (Zirra, 2019). Therefore, in education systems around the world, there is a strong push for the effective use of technology in teaching and learning.

Higher education systems in developing countries such as Nigeria are generally suffered from insufficient resources that impair their ability to effectively deliver and achieve educational goals. However, it is argued that higher education systems in developing countries stand to gain the most from technology integration. The growth of the Internet and World Wide Web literally devices opportunities for higher education institutions to create novel learning environments that can overcome the barriers imposed by distance and time. Several studies have indicated that technology-enhanced learning environments have the potential to completely transform the existing paradigm of teaching and learning in higher education institutions in developing countries. It is believed that both educators and students can derive significant benefits from enhanced use of technology (JOY. & C. ISHIKAKU, 2012). For educators, technology can create new opportunities to improve the teaching quality through better course design, alternative learning activities and assessment methods. Technology can also create opportunities for educators to facilitate greater collaboration and interaction among students. For students, technology can provide access to information resources and educational materials anytime and anywhere, thus improving their learning performance. Technology can also create opportunities for students to present and share their ideas with others.

1.1. Background of Technology Integration in Higher Education

In this age of rapid advancements in technology, education systems that do not adapt to these changes will become irrelevant and uncompetitive like the Dinosaurs. Educational systems must therefore embrace technology, not only to remain relevant, but also to enhance the quality of education being delivered to consumers. Concerns around education quality, relevance, access and affordability directly affect the employability and productivity of a nation's labour force with serious implications socioeconomic development. Globalization's competitive pressures, resulting in demands for the bulk and massification of education, have brought about a reevaluation of the design and delivery of educational services globally and particularly in developing economies. The global impact of technology on the economy and the workforce has necessitated the integration of new information and communication technologies (ICTs) into education systems (Prince Ololube, 2013). Because the education sector is captivated by liberal policies, the economic and social forces driving change in the labour market and media have made similar inroads into education.

In the sprouting nation of Nigeria, the integration and effect of ICTs into education systems have come under increased scrutiny and evaluation by education consumers and stakeholders alike. There is an increasing concern with the slow and inappropriate integration and use of ICTs in government owned institutions of higher education with the bulk of this concern directed towards teacher education (TE) programs. ICTs are becoming indispensable tools in educational systems worldwide and teacher education systems in particular, have an imperative to address the integration and use of ICTs in both pre-service and in-service classroom teacher education programs. Traditional Colleges and Universities worldwide have had to confront and resolve the challenges and implications arising from the pervasiveness and impact of ITs and ISs in everyday life. Such challenges and implications are now being felt in government owned institutions of higher education in Nigeria and more specifically in teacher education programs.

2. Challenges of Technology Integration in Nigerian Higher Education

Technology integration in education has gained widespread attention in the past decade as a tool for enhancing and transforming teaching and learning globally. Higher education institutions in developing countries, including Nigeria, have been challenged to keep pace with the global integration of technology in education. This challenge has necessitated efforts to integrate technology in the higher education sector in Nigeria. However, there has been little improvement in the integration of technology in education despite ongoing efforts by policymakers and administrators. Research examining the challenges of technology integration in education in the Nigerian context is minimal. This highlights the need to investigate the challenges of technology integration in higher education institutions in Nigeria. Such challenges, if not identified and addressed, will undermine efforts to improve education quality through technology integration (Thomas Olutola & Omotoke Olatoye, 2015).

Although higher education in Nigeria is undergoing reform, technology integration efforts in higher education institutions have been largely unsuccessful. This is evident in the meager allocation and slow implementation of e-learning budgets, limited development of e-learning capacity and facilities, restricted access to technology resources, inequitable distribution of facilities among institutions, poor internet connectivity, inadequate training for technology adoption, and lack of support from academic leaders. These challenges are further exacerbated by the socio-cultural context. An understanding of the local context is crucial for the successful implementation and sustainability of technology integration (Jaffer et al., 2007). Government policies advocating technology integration do not consider the contextual reality, leading to implementation failure. Although plans may be sound on paper, conflicting priorities often compromise them. Therefore, there is an urgent need to investigate the challenges of technology integration in education to inform policy and practice, as challenges may differ across socio-cultural contexts and educational systems. This need is especially pressing in the Nigerian context, where institutions are attempting to adopt technology but faced with numerous challenges.

Education is critical for national development, and higher education is regarded as the bedrock for producing educated citizens and trained manpower essential for fostering a nation's social, political, and economic development. However, the Nigerian educational system has been plagued with numerous problems that have hindered the quality of education and, consequently, national development. The quality of education in Nigeria has declined due to systemic issues, including lack of funding, inadequate infrastructure, poorly equipped libraries, inadequate learning resources, and a lack of commitment by academic leaders. The failure of the education system has given rise to a number of elite private institutions and foreign education seeking to upgrade academic qualifications and improve employment prospects. Such quests for upward mobility have fueled educational imperialism, with American and British institutions preying on the Nigerian population's desperation for quality education and internationally recognized qualifications, thereby entrenching inequities.

2.1. Infrastructure and Connectivity Issues

A significant barrier to the effective use of digital technologies in higher education institutions in Nigeria is the current state of infrastructure and connectivity. While some technology infrastructure exists in Nigerian higher education institutions, the availability of the internet remains woefully inadequate and poorly resourced. As a result, public universities in Nigeria can hardly create an environment conducive for the adoption of many digital technologies (Obiri-Yeboah et al., 2013). Inadequate technology infrastructure development has also been identified as the primary barrier to the adoption of digital technologies in higher education institutions in developing countries. Even when advancements in digital technologies can enhance the services offered by higher education institutions, the high cost of technology infrastructure development continues to inhibit many of them from adopting these new digital technologies. While some Nigerian public universities have established some minimal technology infrastructure for the delivery of digitized services, these infrastructural facilities are grossly inadequate considering the size of these institutions. Budgetary constraints that result in budget deficits make it even difficult for these institutions to adequately develop the necessary technology infrastructure. Even with meager budgets on technology infrastructure, there are constantly competing priorities resulting in tech infrastructure development being placed at the bottom of the hierarchy. Moreover, geo-spatial discrepancies in the location of higher education institutions in Nigeria have also resulted in uneven access to technology in these institutions. For example, ten of the 15 federal universities in the North East, North West, and North Central regions have either no but poorly resourced technological infrastructure or only academic libraries endowed with minimal tech infrastructure. In contrast, despite 13 of the 29 state and privately owned universities further exacerbating the uneven access to technology over half have relatively better technology infrastructural development because they are located in urban areas. While technology infrastructure development is critical in ensuring effective integration of technologies in offering higher education services, it is also the most challenging to develop. For this reason, it is imperative to explore strategies that could assist higher education institutions in developing the requisite technological infrastructure. A potential strategy could involve higher education institutions forming a consortium to advocate for the federal government or telecom companies to consider higher education institutions in their network development plans. This could potentially attract investment from the government or telecom companies in developing broadband internet access infrastructure in higher education institutions. Alternatively, a public-private partnership approach could be explored to attract investment from interested parties willing to develop tech infrastructural development. However, for any of these strategies to succeed, the onus lies on the management of higher education institutions to clearly recognize the need for robust technological infrastructure as the backbone for effectively integrating technologies in higher education. Ultimately, without improving connectivity, any effort towards technology integration will amount to a waste of resources. Therefore, improving connectivity emerges as the first priority for technology integration.

3. Best Practices in Technology Integration in Higher Education

A selection of best practices that have proven effective in technology integration in higher education is offered here. These practices provide a resource for educators seeking to enhance technology integration in their own institutions. However, it is emphasized that there is no “one-size-fits-all” solution. Each institution will need to adapt these practices to its own context—looking carefully at institutional culture as well as engaging with key stakeholders in the adaptation process (Billingham et al., 2013). Most educators would agree that technology integration cannot happen without

supportive leadership. Therefore, it is vital that leaders understand their key role in fostering an environment where innovative practices can take root and flourish. There is considerable flexibility in how technology can be used in teaching and learning, and currently no absolute “right way.” As a result, it falls to administrators and leaders to encourage technology use in ways that best fit the needs of educators, students, and the wider institutional environment (Elzarka, 2012). One of the most effective ways for administrators to model technology use is simply by using it themselves, particularly when communicating with staff. Whether by email, newsletter, or the institution’s virtual learning environment, if administrators restrict their communication to face-to-face encounters, printed memos, and hard-copy letters, they send the message that technology is not important to them. On the other hand, using technology to share information and updates shows staff that technology can enhance communication. When sending out important information or policy documents, for example, supporting hard-copy materials with electronic versions allows educators the option to engage with technology at a time of their choosing. It is also important to remember that policy documents often have more impact when they are made available electronically—educators are more likely to read them if they can find them in a central location than if they have to dig them out from the pile of papers in their in-trays. Keeping all similar documents in one central place also prevents information being forgotten or overlooked, as is often the case when hard copy memos become buried under mountains of paperwork. Institutions contemplating the introduction of new technologies or systems should attend carefully to how they engage educators in the adoption process, as poor engagement can lead to resentment and resistance. When it is clear that an approach will not be accepted by all, trying to introduce it “top down” will usually cause problems. Although requiring some involvement from senior management, one of the best ways to secure acceptance is to set up working groups that include educators directly involved in teaching and learning. These groups can then develop proposals for how the technology might be used, with the understanding that their suggestions will be taken seriously and that the final decision will not be made solely by those in administrative or management positions.

3.1. Case Studies of Successful Integration

Case Studies of Successful Integration This section documents and analyzes the cases of selected institutions in Nigeria that have successfully integrated technology into their educational frameworks. In each case, a specific approach to technology integration is elaborated, as well as the challenges faced and how they were surmounted. The outcomes achieved from these strategies, though diverse in academic context, are expected to illustrate different models of effective technology use. These experiences also reveal that successful integration depends on collaboration among faculty, students, and administrative bodies. Institutions with sound integration efforts share strategies that can be emulated in whole or part by others. Although integration is still very much in its infancy at many HEIs, it is encouraging to note that most of the 20 institutions studied have made progress, at least on some levels. More importantly, it is evident that successful integration efforts significantly impacted student learning and engagement (C. Eze et al., 2018). Therefore, as other institutions embark on or advance current integration initiatives, these cases may serve as models. The lessons learned, articulated in the last subsection, will hopefully guide some of the more fundamental and often ignored aspects of integration. Three institutions were studied in depth, representing a range of technology use. Integrating technology was in the forefront of the academic mission at the first, Abubakar Tafawa Balewa University (ATBU), where multimedia lectures have been the sole mode of course delivery since 2010. The University of Ilorin (UNILORIN) represents a mid-range institution where technology use is gradually becoming institutionalized within a traditional framework. At Lagos State University (LASU), the socio-political context, largely outside the institution's control, has thwarted integration efforts, although individual faculty members employ technology in innovative ways. The experience of UNILORIN reveals the importance of mechanisms for faculty buy-in, such as computer facilities in lecture halls or assistance in developing technology-enhanced courses. Alternatively, LASU's experience illustrates how external factors significantly impact technology use in a university, regardless of credit or penalty. As faculty, students, and administrative bodies learn together and evolve their roles, technology use deepens, becomes more widespread, and takes on new purposes beyond what was initially intended.

4. Policy Recommendations for the Nigerian Government

The following policy recommendations are critical for the Nigerian government to enhance technology integration in higher education nationally. The higher education sector in Nigeria needs comprehensive policies that support the development of digital infrastructure necessary for technology use in universities. Investment in technology cannot occur without a supportive policy environment guiding such investment. Educational institutions need national funding policies that ensure sufficient budget allocation for technology infrastructure, implementation, and maintenance. These policies should prioritize establishing digital infrastructures, such as internet connectivity, to all higher education institutions in the country (A. Edewor et al., 2014). Policies that prescribe the minimum technology infrastructure for higher education institutions are also necessary. Currently, there are guidelines for the physical infrastructure of higher education institutions, but none exist for technology infrastructure. The invisibly implemented capacity and quality standards policies observed create disparities among institutions rather than enhance equality. Therefore, policies that prescribe the minimum requirement for technology infrastructure among higher education institutions are necessary to address equality disparity. Furthermore, a legislative policy should be put in place to create a regulatory framework with enabling policies implementing a balance between innovation encouragement through technology use and academic integrity protection. The Nigerian government is responsible for ensuring that policy frameworks adequately safeguard existing academic integrity protection practices threatened by technology advancement.

4.1. Legislation and Funding

Robust legislation supported by appropriate funding mechanisms is now a prerequisite for the successful integration of technology in higher education. The local legislation governing technology use in academia is limited, mostly outdated, ill-defined, and addresses none of the current technological needs. As such, there is an urgent need for higher education institutions to petition government to create clear legislative frameworks that govern technology use in areas such as intellectual property rights, code-of-conduct agreements, research and publication rights, protection against harassment,

and security. A lot of the current local legislation was created long before technology became pivotal in academic institutions and is no longer relevant. Policies need to be reviewed and updated in line with current local, national, and international trends. The broader technology era must also be embraced and factored into policy documents (Mostert, 2005). In addition to legislation, the equitable allocation of funding is crucial for the sustainability of technology initiatives. Without financial resources, technology initiatives will wither and die. Currently each institution handles budgeting differently – some allocate a flat amount regardless of size, while others consider size in funding allocation. It is the argument here that simply providing funding isn't enough – the higher education sector needs to work together to create a uniform funding allocation strategy. Funding allocation strategies must consider that technology is ever-changing and requires ongoing investment – not just a one-off injection into infrastructure. Mechanisms must be put in place to ensure institutions have access to funds for ongoing training, support staff, maintenance, and upgrades, as well as infrastructure improvements. The government and the private sector need to take note of this, and consider increased investment in education technology. Currently most private funding comes from hardware vendors eager to sell their machines, and the government has provided little to no funding for technology in education. This, despite several successful local pilot projects. The onus is now on institutions to put together grant opportunities and find potential funding partners to nurture and support innovative projects. Such partners include local industry, government departments, international donor agencies, and professional bodies. It is critical that any technology funded projects take heed of the pitfalls exposed earlier, and that binding agreements are put in place to ensure equity of access across all institutions. Furthermore, projects should aim to build capacity within institutions to become self-sustaining, rather than creating a reliance on outside agencies. Ultimately, technology projects should ensure there is a legislative framework to support projects, as well as policies to govern the implementation. As such donor agencies should insist on legislative and policy ratification prior to technology roll-outs. This legislative and funding framework, if adopted, would go a long way to ensuring that technology use in higher education in South Africa is carefully considered, equitably distributed, and widely embraced across all institutions. Only then will technology have the chance to create a truly sustainable, thriving ecosystem within higher education.

5. Professional Development for Educators

Professional development is an essential component in ensuring that educators possess the skills necessary for effective integration of technology within higher education. Ongoing training programs can be provided for educators to enhance their technological competencies. Training can be delivered through workshops, seminars, or even online courses; however, it is crucial that training programs are developed with input from educators themselves (Collins Tyner, 2018). As technology continually evolves, so too must the learning of educators, making it imperative that their professional development includes ongoing training. Furthermore, institutions should aim to create a culture of lifelong learning to encourage staff to remain current in new developments and best practices.

One approach could involve industries providing collaborative training efforts for education institutions. Such collaboration would provide opportunities for industry experts to train educators on the latest technologies and best practices as well as the practical application of specific technologies (Blackmon, 2013). Another approach could involve the formation of learning communities where educators would work together to share new ideas and support each other's growth. A mentoring program could also be beneficial where more experienced educators assist novices in learning how to integrate technology into their teaching.

Finally, it is critical to note that professional development is most effective when educators can receive ongoing support. Educators must be afforded opportunities to practice what they learn in training and then receive feedback as needed. This can be accomplished by ensuring that professional development efforts include a means for educators to receive ongoing support after initial training. As technology integration often requires significant changes in pedagogical practices, it is crucial to provide sufficient support for educators as they work to implement new technologies. Whenever possible, training programs should include a means to evaluate the effectiveness of professional development efforts. This can include gathering feedback from participants on the usefulness of training as well as data on whether or not the desired skills have been achieved.

5.1. Training Programs and Workshops

Fostering educators' ability to integrate technology effectively is crucial to educational development and improvement. Therefore, it is necessary to highlight the various training programs and workshops intended for this purpose. Hands-on workshops provide practical experience with new technologies that focus on a particular aspect of integration, such as interactive whiteboards, web-based learning environments, or e-portfolios. Training typically occurs in a computer lab with a small group of educators, allowing personalized instruction. Unfortunately, coordinating the schedules of busy educators can be challenging, but this format fosters greater confidence with technology. Online courses are ideal for busy educators unable to attend face-to-face training. These courses can take many forms, including structured classes focusing on specific integration strategies, or allowing educators to experiment with technologies without a prescribed path. Another option is collaborative training seminars that encourage educators to share their experiences. Institutions are encouraged to offer technology training, but the focus should be on developing new pedagogical strategies rather than tutorials on using specific tools. Tailoring training programs to meet educators' specific needs is vital to maximizing impact (P. C. & L. C, 2017). A common frustration is attending training that is too basic or not relevant. Regarding accessibility, it is crucial to prioritize the availability of training opportunities, particularly for those in remote areas. An encouraging development in higher education institutions is that several conduct training for their educators. There are successful examples of training initiatives that have made a significant difference in educators' knowledge and confidence in using technology. Training can take many forms, including partnerships with outside organizations, a valuable way to access expertise. Technology firms are often eager to support education and are a great resource for developing training materials. Educational development units also play an essential role in supporting training initiatives. However, it is crucial to establish a balance when developing in-house training. Educators are often keen to share their experiences, but it is essential to ensure they have adequate preparation time. Continuous assessment of training programs is necessary to determine effectiveness, relevance, and adequacy for educator needs. Therefore, setting aside time for this purpose is essential. Training programs should be designed to facilitate a culture of competency in using technology among educators. This includes learning how to develop new pedagogies,

test alternative strategies, and model technology literacy for students. However, if incompetence in technology use persists, other programs can be implemented to address this issue.

6. Quality Assurance and Monitoring

Quality assurance and monitoring processes for technology use in education should be developed. These should include metrics and benchmarks for evaluating the effectiveness of technology in academic environments, as well as specific monitoring activities. Regular feedback from students and educators who have experience with technology is one way to assess its impact on collective learning outcomes. Researching successful technology use in education across institutions can identify best practices for achieving particular goals. These processes should be structured to ensure that technology integration is consistently applied and improving. Technology implementation plans should include initial monitoring frameworks, even if they are rudimentary.

Reports on the accomplishments of various technology initiatives in education should be prepared with a view towards transparency and accountability. Credible reform is difficult without a commitment to openness about what has been done and honest appraisal of its success. At a minimum, institutions should be encouraged to publicly report on the basic tenets of their technology strategy, as well as the parameters for assessing its success. Institutions should have the option of conducting self-assessment or forming external review teams to evaluate their technology integration efforts against agreed-upon benchmarks. To ensure adherence to best practices, external evaluators should be selected from a pool of qualified experts that can include monitoring by other institutions. Finally, an effort should be made to encourage a culture of continuous improvement among institutions, as this is key to maintaining high standards.

Quality assurance should be seen as essential for sustaining successful technology integration in education. Institutions should be encouraged to conduct internal reviews of their technology integration efforts on a periodic basis, providing a checklist that ensures all important aspects are considered. External reviews can supplement these self-assessments and should focus on how best to help institutions implement recommendations. Simply complying with quality assurance procedures is not sufficient; procedures need to be effective in evaluating how well institutions are meeting their stated goals. Quality assurance can help ensure educational technology projects are well planned and implemented, but it can also impose rigid standards that stifle innovation.

6.1. Assessment of Technology Integration

This section outlines methodologies and tools that can be used to assess the effectiveness of technology integration in higher education. It considers evaluation frameworks that can be applied to measure educational outcomes related to technology use. Both qualitative and quantitative assessment methods are significant. In addition to research studies, peer reviews and self-assessments are presented as valuable components of a comprehensive assessment strategy. The role of external evaluators and accreditation bodies is addressed in ensuring that institutions adhere to quality standards. On-going collection and analysis of data is advocated to inform decisions about policy and practice. It is also important to involve stakeholders in the assessment process, particularly students. Ultimately, effective assessment practices are essential for refining technology integration strategies and achieving desired educational goals (James, 2017).

Assessment of Technology Integration Strategies. Various methodologies and tools can be used to assess the effectiveness of technology integration strategies in higher education. A range of evaluation frameworks can be applied to measure educational outcomes related to the use of technology in teaching and learning (Sweeney et al., 2017). Both qualitative and quantitative assessment methods are significant. In addition to more formal research studies, peer reviews and self-assessments are presented as useful and valuable components of a comprehensive assessment strategy. External evaluators and accreditation bodies also have a role in ensuring that institutions are adhering to quality standards in technology integration initiatives. On-going collection and analysis of data are advocated to inform decisions about policy and practice in relation to technology integration in higher education. Stakeholders need to be involved in the assessment process and it is particularly important to elicit the views of students. Effective assessment practices are essential for refining technology integration strategies and ensuring that desired educational goals are achieved.

7. Collaboration and Partnerships

The importance of collaboration and partnerships in enhancing technology integration in higher education is widely recognized. A collaborative approach, characterized by the synergy of efforts among various stakeholders in education, such as educational institutions, government, and the private sector, can go a long way in achieving greater technological integration in educational practices. This partnership is critical, especially for developing nations like Nigeria, where there are high demands on educational institutions with limited resources. Forming a collective could help bridge the resource gap while opening avenues for creating innovative educational practices. Therefore, higher educational institutions in Nigeria must actively seek opportunities to partner with private industries and other educational agencies locally and globally. Furthermore, outreach and link programs could greatly benefit by ensuring that education access and delivery are technologically advanced.

Partnership efforts' successes should be documented and shared with other institutions to encourage similar initiatives, as some institutions have entered partnerships that have led to technological advancement and improved learning outcomes. In addressing the issues of education accessibility and delivery in Nigeria, synergistic collaboration with other educational institutions globally will go a long way in overcoming local limitations. In addition, creating a knowledge-sharing platform for institutions that have technologically advanced educational practices will enhance the overall effectiveness of educational institutions. Educational practices can also be improved by creating outreach programs for private industries to partner and assist in enhancing technology use in educational institutions where the community is reluctant to engage. Establishing a community network can provide similar institutions access to various resources, services, and expertise, which will be difficult for a single institution to obtain. Partnerships are crucial because they help improve social networking, community support, and educational practice accessibility.

7.1. Industry-Academia Collaboration

This subsection examines industry-academia collaboration as a strategy for technology integration in higher education. It explores the significance of partnerships with industry for institutions to access cutting-edge technologies, tools, and practical expertise in problem resolution. Industry-academia collaboration refers to collaborative efforts between industrial sectors and academic institutions for mutual benefit (Afuwoqi & Wu, 2011). Such collaboration presents a wide range of opportunities, including funded research collaboration, joint research and development, scholarships, and student internships, for both parties involved. Through these partnerships, industries acquire academic resources, student manpower, and new ideas, while academia benefits from access to industry resources, funding, and professional development opportunities. In developing countries, the greatest bane for academia has been the inability of universities to align curricular delivery with the current needs of industries. This is crucial for better preparing graduates seeking employment in the industry. However, universities generally do not consult the industry in designing academic curricula, which may explain why so many educational institutions produce graduates who are ill-suited to fill existing vacancies in industry. Meanwhile, industries observe academic institutions producing graduates with no applicable skills and knowledge. Therefore, developing effective partnerships between industries and academia, where each party can play complementary roles, is imperative.

The establishment of effective partnerships may not be an easy task, particularly in developing countries where liberalization has been recent. Industries may be wary of academia's capacity to deliver, while academics may resent the imposition of industry's agenda on inquiries deemed scholarly. Consequently, through interviews and literature review, several suggestions for overcoming the initial barriers in establishing effective industry-academia partnerships are presented. In addition, a number of successful industry-academia partnerships across the globe are documented as case studies for best practices. Finally, it is argued that to ensure sustainable engagement of the two sectors, more robust collaborative frameworks are necessary, with the onus largely placed on academia. Nevertheless, industry-academia collaboration is seen as critical for innovation, competitiveness, and improved educational outcomes.

8. Innovative Technologies for Higher Education

Innovative technologies have the potential to transform the learning environment in higher education. Developing countries like Nigeria, with its rapidly expanding student population and higher education institutions, face challenges with overcrowded classrooms and limited resources. Emerging technologies could be used to maximize existing resources and provide new interactive tools for teaching and learning. However, the proliferation of tools alone does not ensure effective teaching and learning. Educators must critically assess the relevance and impact of technological tools on the learning environment. Many higher education institutions in Nigeria have established a structural framework for technology projects, focusing on affordability, internet connectivity, equipment procurement, training, and skill-building. Nevertheless, educators are often excluded from the planning process. Strategies are needed for institutions to better understand the educational implications of new technologies and how to incorporate them into pedagogical practice.

A range of new tools has emerged that can enhance existing practices. Online learning platforms are becoming common practice in higher education institutions, with many professors posting lecture notes and reading lists online. Learning management systems provide a framework for blended learning, combining face-to-face teaching with online activities. These systems offer a range of interactive tools for sharing content and facilitating activities such as online discussions and quizzes. As mobile phone ownership rises, many higher education institutions experiment with mobile learning initiatives. Major telecom providers offer subsidized internet access to students on campus, presenting possibilities for integrating ICT into academics. There is a growing interest in using artificial intelligence applications for education, such as chatbots for course information and academic support or writing assistance (A. Edewor et al., 2014). However, the same considerations as with web-based applications should apply. While adopted technologies may have advantages (cost-effective, ease of use), they can equally be challenges (poor design, lack of control).

8.1. Virtual Reality and Augmented Reality

Virtual reality (VR) and augmented reality (AR) can create immersive experiences for students in higher education, offering an innovative pedagogical strategy for educators. These technologies provide fully immersive experiences that can increase student engagement, learning, and retention. Students can be transported to dangerous or inaccessible areas through VR and AR, enhancing their academic experience. The integration of these technologies into educational practices can create engaging, immersive, and interactive learning environments. VR and AR are being used and experimented with in different subjects across the academic landscape. For example, architecture and design students can learn about spatial considerations in virtual 3D environments. Science students can inspect and manipulate molecular compounds in 3D. However, VR and AR adoption in higher education is still in the early stages, and several barriers may hinder their further use. Cost is a major barrier to the implementation of VR. Institutions that have developed a VR space have invested significant funds in hardware and software. Another challenge is the technical infrastructure needed to run the VR space. 3D modelling is a huge part of the virtual world, which needs to be created by skilled personnel or trained educators. Without in-house expertise, institutions must outsource, incurring additional costs. Moreover, VR and AR technology cannot stand alone; they need educator training to ensure their potential is fully developed. Pedagogy will play a significant role in the successful integration of these technologies. VR and AR should be embedded in existing curricula rather than create new subjects. Institutions need to develop strategies for educators to enhance current subjects with VR and AR technology. The discussion aims to encourage institutions to develop educational practice with these innovative technologies and implement them within higher education (Peisachovich et al., 2021).

9. Ethical and Legal Considerations

With the profound impact of technology upon society, there exists a pervasive and often unchallenged assumption of the 'benefits' of technology integration. However, there are a host of ethical and legal implications surrounding technology integration that need to be considered. Many of the fears surrounding academic integrity in the digital age are driven by a misunderstanding of how and why students cheat and a failure to address the deeper cultural problems in higher education (Mostert, 2005). With the rise of the internet, information has never been more accessible or, paradoxically, more difficult to navigate. The web has created a culture of 'cut and paste' in which students cobble together from different sources without any real comprehension the text they submit. This discussion of plagiarism highlights the importance of having clear policies and guidelines in place to help clarify what constitutes acceptable and unacceptable practices, as well as the potential consequences of academic dishonesty.

Data privacy has become a major concern in a world where personal information is regularly collected by companies to create targeted advertising. The challenge for educators is to ensure students understand their rights and responsibilities and there exist clear channels for reporting careless or malicious breaches of confidentiality. There needs to be a dialogue between students and their educators about what information will be collected, how it will be used, and the responsibilities of both parties in the safeguarding this information. The ever-increasing use of technology in the classroom makes it necessary to consider intellectual property rights. Students and educators alike need to be aware of the ownership rights pertaining to the technology they use. As free web applications have become central to the daily life of many students, most do not read the lengthy terms and conditions they agree to when signing up for these services. In many cases the company becomes the owner of anything created by the user.

When utilizing technology, educators carry a responsibility to ensure ethical standards are upheld. Most importantly, they need to ensure that students are aware of their rights when using technology. Legal compliance with the Data Protection Act is necessary if institutions want to maintain student trust when handling personal information. The act states students should be made aware of the use and potential sharing of their personal data. In an age when students are routinely expected to provide sensitive information online, care should be taken not to treat them as unwitting participants in a technological experiment. Institutions must also accept their responsibility to properly safeguard the information collected; student records should be treated with the utmost confidentiality. If sensitive information about a student is leaked to the public or a third party, the implications could be disastrous.

Aside from legal implications, there are also ethical considerations. That a student could be unfairly disadvantaged should they breach the terms of service of a web application is reason enough to consider the ethics of using such technology. Ongoing debate should be encouraged in relation to the ethics of all technologies being used to ensure considered and responsible practices are adopted. While technology integration may offer a wealth of opportunities, there exists the potential for harm. There needs to be a careful consideration of the ethical implications of technology use in all educational settings, in all situations. It needs to be acknowledged there is a difference between simply using technology, even in innovative ways, and using it responsibly. Ethical considerations should not merely be an afterthought remedying issues as they arise but rather proactively planned for from the outset. Ultimately, 'ethics' should be considered essential for any integrated use of technology to be sustainable.

9.1. Data Privacy and Security

9.1. Data Privacy and Security Technology integration in higher education offers numerous benefits; however, it also raises concerns related to data privacy and security. As technology becomes more embedded in the educational landscape, institutions must grapple with the implications of collecting, storing, and using student data, particularly sensitive information. When implementing new educational technologies, there is a risk of student data being unknowingly shared with third-party vendors or outside parties. Therefore, it is crucial to prioritize data privacy alongside technology integration (Saidu et al., 2018). Fortunately, higher education institutions can take several steps to mitigate privacy and security risks. First, they should have a clear understanding of relevant data protection laws and regulations, ensuring compliance and protecting against potential liabilities. Second, when using educational technologies, institutions should have data privacy agreements in place to safeguard sensitive information. This is particularly critical for third-party technologies that handle student data, necessitating a thorough review and consideration of data privacy terms. Implementing robust training programs for staff and students is also essential to enhance understanding of data security risks and best practices for protection. Training should cover issues such as phishing scams, the dangers of using public Wi-Fi networks, and the risks associated with downloading unverified applications or links. Beyond training, it is crucial to have clear incident management protocols in place for responding to data breaches and security threats, assuring stakeholders of the necessary steps taken to protect their data. Finally, transparency regarding data collection, usage, and storage is vital. Institutions should provide clear information on what data is collected, its purpose, the duration of storage, and collaborative usage with third parties. By addressing these challenges head-on, higher education institutions can create a secure environment for students and staff and foster the effective use of technology in education.

10. Conclusion and Future Directions

The adoption and integration of technology in education is no longer an option but a necessity. Having reviewed the issues related to technology integration in higher education institutions, and having explored strategies for dealing with the challenges involved, it can be concluded that some progress has been made. However, much still needs to be done. Most of the problems identified continue to persist and require determined action if the goal of enhancing the quality of higher education through effective technology integration is to be achieved. The strategies presented offer a basis for moving forward in dealing with some of the challenges. Above all, it is essential to acknowledge that technology will only be effectively integrated if the issues and challenges are proactively and vigorously addressed. It is evident that some challenges can be dealt with more easily than others, and hence it is necessary to keep in mind the relative priority and urgency of the various challenges. Some may also take longer to overcome than others.

Technologies are constantly evolving, and so too are the needs for their integration in education. New developments in technology bring with them new challenges and issues. While it is essential to deal with existing problems, care must also be taken to ensure that future technological developments are

harnessed to enhance education. For example, there are emerging trends in educational technology such as Web 2.0 functional communities, online collaborative learning, podcasting, and technology for mobile learning that warrant attention. It is suggested that it is important to keep abreast of emerging trends in technology for education, and consider how these trends can be harnessed to enhance higher education (Mostert, 2005). As technology is being integrated to meet pedagogic needs, careful consideration should also be given to the nature of the technology being adopted. Some technologies might be more pedagogically effective than others, so it is advisable to consider how best to choose technologies that facilitate and enhance the desired learning. There are also wider issues such as the escalating digital divide that need to be considered when planning and implementing technology integration.

It has been noted that one of the main challenges facing the higher education sector in Nigeria is the lack of adequate infrastructure. As a result, it is critical that investment continues to be made in the infrastructure required for integrating technology. Similarly, one of the barriers that institutions must overcome in order to be pro-active in integrating technology is the lack of training and expertise among educators. Therefore, it is paramount that professional development opportunities for educators are expanded and supported. Finally, it is important to emphasize the need for there to be a concerted effort by all stakeholders to ensure that technology integration policies address issues and challenges in a comprehensive manner (Zirra, 2019). Educational institutions and providers need to have a clear understanding of the issues and challenges that need to be addressed, governments need to play a more committed role in setting the framework for and supporting technology integration, and industry leaders need to put the education needs of the institutions at the forefront when developing technology solutions. Without such commitment and involvement from all the relevant stakeholders, efforts to integrate technology will continue to yield limited results.

10.1. Summary of Key Findings

This section provides a brief summary of the key findings that have emerged from the discussion on strategies for enhancing technology integration in higher education in Nigeria. The challenges to technology integration, best practices in technology integration, and policy recommendations for enhancing technology integration are highlighted. The significance of professional development of educators in the integration of technology in education and the collaborative efforts of all stakeholders in enhancing technology integration are emphasized as key findings (Mostert, 2005). The summary also includes insights on innovative technologies and their potential use in education. The importance of ethical and legal issues regarding the use of technology is underscored because these issues must be clearly understood in order to effectively integrate technology into education (JOY. & C. ISHIKAKU, 2012).

By summarizing the key findings, this section offers a reflective overview of the discussion presented in the previous sections. This summary is intended to assist readers in clearly understanding what has been discussed regarding technology integration in higher education in Nigeria. In addition, it is hoped that this summary will provide readers with a clear take away regarding the current situation of technology integration in higher education in Nigeria.

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