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Adoption of Technology in the Promotion of Translanguaging in African Higher Education

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This study investigates how Nigerian higher education institutions adopt technology for translanguaging, focusing on the influences of technological, organizational, social, and cultural factors. The researchers anchored the study using translanguaging theory, sociocultural theory of learning, and the technology acceptance model. A quantitative cross-sectional survey design was utilized to collect data from lecturers and students at two institutions in Nigeria. The researchers used Jamovi software to analyze the data and evaluate the reliability, validity, and significance of the hypothesized relationships. The availability of digital tools, the technical proficiency of lecturers and students, institutional support, and training programs significantly enhance the adoption of technology. Collaboration, peer-to-peer communication, and a positive attitude toward multilingualism influence the use of technology. The acceptance of indigenous languages impacts how people use technology for translanguaging. The study concludes that adopting technology can enhance multilingual proficiency, promote linguistic diversity, and improve educational outcomes. This study provides insights to guide policymakers and educators in using digital tools to implement translanguaging practices. These practices will help preserve and promote indigenous languages within the context of technology adoption for multilingual education in Africa.

Keywords: technology adoption; translanguaging; multilingual education; digital tools; indigenous languages

1. Introduction

Many people consider the wide variety and diversity of languages in Africa to be one of the continent's distinctive characteristics. They showcase its cultural

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identity, reflecting the deeply rooted traditions, social structures, and histories. Despite the cultural diversity, many educators have adopted colonial languages for teaching and learning and have neglected indigenous languages. According to the United Nations Department of Economic and Social Affairs (2023), the younger generation's growing preference for global languages raises concerns about the gradual decline of indigenous languages and the possibility of their eventual eradication.

The development of translanguaging was prompted by the need to enhance students' linguistic skills. García and Lin (2016) stated that traditional models of bilingual education regard languages as distinct entities, while translanguaging enables students to apply all their linguistic resources to deepen their understanding of academic content. Translanguaging is important because it improves student comprehension and promotes the creation of an inclusive environment that bridges the gap between their native language and the formal language used in education. Creese and Blackledge (2015) explained that a multilingual classroom enables students to process complex terms in their native language and express their understanding of these concepts in English, thereby promoting cognitive engagement.

Despite translanguaging's potential benefits, several factors hinder its successful implementation in the African education system. A significant challenge is that a single language dominates instruction, which often neglects the linguistic diversity of students. This factor hinders students' ability to learn effectively and contributes to the decline of indigenous languages, as society often perceives them as lacking professional and academic value (Skutnabb-Kangas, 2017). This creates an urgent need to develop strategies that support multilingual education and consider the linguistic identities of students.

Digital technology addresses monolingualism by creating inclusive platforms that bridge language gaps in an inclusive and accessible way. Godwin-Jones (2018) noted that Memrise, Google Translate, and Duolingo have improved access to language learning and translation. Multilingual e-learning platforms enable students to access educational resources in their preferred languages, creating a more engaging and effective environment (Nordmeyer & Bettney, 2022).

However, the digital divide prevalent across the continent, especially in rural areas of Africa, restricts the benefits of technological advancement. Sharp (2024) found that only 28% of sub-Saharan Africa's population has internet access, with rural areas facing greater restrictions. Schools in these areas struggle to access digital platforms due to insufficient resources and infrastructure (Evoh, 2007). Bamgboṣe (1991) noted that a lack of indigenous digital educational content hinders the advancement of multilingual education.

The successful implementation of technology in an academic setting depends on the willingness of both educators and students to embrace it. Davis's (1989) explanation of the technology acceptance model supports this idea by stating that the perceived usefulness and ease of use of a technology are significant factors

influencing its adoption. Both educators and students may hesitate to adopt digital tools if they perceive them as unnecessary, challenging, or difficult to use. Venkatesh and Davis (2000) argued that training improves the digital literacy skills of educators and students.

Despite the linguistic diversity across Africa, educators often prioritize colonial languages as the primary medium of instruction. This emphasis marginalizes indigenous languages, as educational activities require students to use colonial languages instead of their everyday language (van Pinxteren, 2022). Some students may find it challenging to express themselves effectively, and comprehend and engage with academic content due to communication barriers. However, communication barriers may arise more from a lack of intellectual ability than from this difficulty (Mutepe et al., 2021).

Research has shown that translanguaging is an effective solution to this challenge, as it allows individuals to utilize all their linguistic skills to enhance learning and communication (Charamba, 2023; Omidire & Ayob, 2022; Saleh & Mazher, 2022). However, schools and educational institutions have implemented it only to a limited extent due to insufficient support, resources, and disparities in technology access and digital literacy. This study aims to promote the use of technology in facilitating translanguaging within the African education sector. The study examines the levels of access, acceptance, and use of technology that supports translanguaging in education. This study aims to address the following research questions:

1. How effective are digital tools in facilitating translanguaging practices among lecturers and students in educational institutions across Africa?
2. What is the level of accessibility and usability of technology that can promote multilingual education in Africa?
3. What role does technology play in the preservation and revitalization of indigenous languages through translanguaging practices in the education sector?
4. What factors influence the acceptance and adoption of digital tools for translanguaging in the education sector?

2. Literature Review

Research indicates a growing interest in adopting technology to promote translanguaging in African higher education. Several studies have examined various aspects of translanguaging, including the role of technology in promoting multilingualism, preserving languages, integrating cultures, and the challenges associated with technology adoption. Hence, the literature review investigates current studies to provide an overview of the topic.

2.1 Overview of Translanguaging

Williams introduced translanguaging in 1994 and it has since become essential for understanding multilingual education, especially for those using multiple languages daily. The strategic use of multiple languages within the same interaction enhances communication, expression, and understanding. García and

Wei (2014) defined translanguaging as a means to enhance language skills. People can easily apply these skills based on their needs and context, rather than viewing languages as static and distinct systems.

Translanguaging offers an alternative to traditional language learning methods that require individuals to master one language before moving on to another. According to García (2017), the aim is to enable multilingual individuals to utilize all available language resources simultaneously, thereby facilitating richer and more meaningful interactions. The concept is relevant to Africa, where multilingualism is the norm. This view is supported by Adegbija (2004), who stated that many Africans often learn multiple languages during their upbringing. These languages include indigenous languages, colonial languages such as English and French, and, depending on the region, Arabic.

Consequently, translanguaging reflects the everyday linguistic realities of Africans who switch effortlessly between languages based on their audience, situation, and purpose. Translanguaging significantly impacts education by enabling students to utilize their full linguistic abilities, enhancing cognitive development and reinforcing their cultural identity. This improves their academic performance (Wei, 2018). Educators' use of translanguaging practices leads to improved inclusive teaching methods that recognize linguistic diversity as an asset rather than a challenge. Translanguaging utilizes real-time linguistic experiences to promote a comprehensive and interactive learning process. It is recognized as a valuable resource in the dynamic linguistic landscape of African education.

Recent studies show that digital tools can preserve linguistic diversity and cultural heritage. Randle (2024) examined how designers incorporate African cultural narratives into modern video game design, using digital media to teach traditional knowledge, riddles, and storytelling to younger generations at risk of losing their cultural roots. This research shows how gaming platforms innovate cultural preservation. These platforms blend entertainment and education to preserve indigenous narrative traditions in tech mediated environments.

In a similar vein, Minhas and Salawu (2024) analyzed the role of Wikipedia in preserving the Setswana and Punjabi languages, showing that collaborative digital platforms can significantly enhance language visibility. These platforms also provide accessible repositories for documenting cultures. However, ongoing challenges related to content quality, community engagement, and the need for continued institutional support are affecting the vitality of language.

Meighan (2021) supported this finding in his study, which synthesized three decades of research on the role of digital tools in revitalizing indigenous languages. He argued that successful initiatives for preserving language must first decolonize digital platforms. This approach emphasizes community autonomy, incorporates culturally appropriate teaching materials, and resists Western educational policies that could undermine the transmission of local knowledge.

Mlambo and Matfunjwa (2024) explored technological interventions for South African indigenous languages. They highlighted mobile applications (apps), digital dictionaries, and social media platforms as essential tools for promoting intergenerational language transmission. They addressed challenges related to digital literacy, internet accessibility, and the standardization of orthographies for languages with limited written traditions. Randle and Kayode (2025) studied the factors that influence undergraduate students' engagement with digital arts playrooms in South African game studies programs. Their research revealed that technological self-efficacy, institutional infrastructure, and culturally relevant content design significantly affect students' participation in digital creative spaces.

These findings highlight the importance of supportive learning environments for producing digital cultural content. This suggests that while digital tools provide significant opportunities for preserving language and promoting cultural integration, their effectiveness largely relies on community-led initiatives, the proper allocation of resources, and the creation of digital environments that respect and reflect indigenous knowledge systems and communication practices.

2.2 The Role of Technology in Promoting Multilingualism

The introduction of technology in the education sector has revolutionized how educators teach, students learn, and people use language worldwide. In recent years, technology has taken on a prominent role in promoting multilingualism. People use it to create platforms that enhance communication, translate languages, and facilitate language learning. Various technological tools, including digital storytelling platforms such as Storybird, language learning apps such as Babbel and Duolingo, and translation software such as Microsoft Translator and Google Translate, have transformed language learning, making it more engaging and accessible (Godwin-Jones, 2018). These tools enhance translanguaging by allowing users to learn at their own pace, receive immediate feedback, and be exposed to a variety of languages.

Technology effectively acts as a bridge to overcome the barriers posed by language differences. Digital platforms enable seamless interaction between individuals who speak different languages by facilitating the rapid translation of content. García and Wei (2014) observed that educators of students from diverse linguistic backgrounds often need to use essential tools. These students require assistance in understanding course content that is presented in a language different from their own. Similarly, technology provides educational resources in multiple languages, thereby motivating students to engage in learning and practicing different languages. This implies that lecturers should design tasks that encourage students to engage with the content in both their native language and their second language, which will help improve their overall understanding of the subject.

According to Phillipson (2009), technology plays a crucial role in preserving and promoting indigenous languages that have been marginalized by colonial languages. Digital platforms help document, promote, and enable the everyday

use of these languages, and they also assist in creating course materials. Mobile apps can be developed to offer language courses, multilingual dictionaries, and audiovisual content in indigenous languages. These efforts would improve and support the overall preservation of indigenous cultures, reflecting the inherent connection between language and cultural heritage.

2.3 Access to Technology and Digital Literacy in Rural Areas

Access to technology largely determines how digital tools can promote multilingualism. Insufficient infrastructure creates a digital divide between those with access to technology and those without. Warschauer (2004) observed that rural areas often lack access to digital devices, reliable internet connectivity, and technological infrastructure, highlighting this disparity. Limited access impedes lecturers and students from using technology for translanguaging, preventing them from benefiting from technology related to multilingualism.

Therefore, it is essential to ensure that the benefits of technology are accessible in rural areas. Initiatives such as Connect Africa by the African Union (2022) and Digital Skills for Africa by Google (Agbachi, 2022) aim to enhance digital literacy and accessibility. Baran (2014) explained that mobile devices with internet browsers and language learning apps are viable, especially in rural areas where people have greater access to mobile phones than to computers. This allows users to access multilingual resources, even in regions with limited resources.

Another key factor that contributes to access to technology is digital literacy. Gilster (1997) defined digital literacy as the ability to understand information in various formats from a wide range of sources. Eshet (2004) expanded the definition to include the skills and competencies needed to effectively use complex, fragmented information systems. Even though technology is available, individuals still need to receive proper training. Dooly (2017) stated that when students and instructors possess digital literacy skills, they are better equipped to use digital platforms to support multilingual learning and engage in translanguaging practices.

2.4 Technology for Language Preservation and Cultural Integration

Research has proven that technology is an effective tool for preserving languages, especially those that are marginalized or at risk of extinction. Brenzinger (2007) revealed that 40% of the world's languages are endangered, with a significant number originating from Africa. This emphasizes the importance of preserving languages to maintain linguistic diversity and uphold cultural identity. Banda (2019) noted that language serves as a means of transmitting knowledge, traditions, and the histories of cultures. Therefore, technology creates platforms that enable people to revitalize languages by establishing digital language archives, helping to prevent these languages from fading away.

Reed (2019) reported that several initiatives have utilized technology to preserve languages. The African Storybook initiative has developed digital platforms for users to create, read, and share stories in indigenous languages, promoting language use and literacy among children. In the same vein, users can create

content in their native languages on social media, promoting indigenous languages and leading to cultural integration and identity development.

Furthermore, podcasts and YouTube channels can promote indigenous languages by facilitating cultural discussions, storytelling, and showcasing songs. UNESCO (2023) observed that this content enables communities to pass on their cultural and linguistic knowledge to future generations, thereby ensuring the continued daily use of these languages in communication.

2.5 Challenges in the Adoption of Technology for Multilingual Education

Despite the obvious benefits that technology provides for promoting multilingual education, several challenges hinder its adoption, one of which is the digital divide. Castells (2010) explained that the digital divide affects individuals' access to devices, internet connectivity, and digital literacy. The financial implications of purchasing digital devices may limit students and lecturers in some parts of Africa from fully participating in digital learning, thereby hindering the use of technology to promote multilingualism.

Another significant challenge is that individuals who lack digital literacy skills cannot effectively utilize digital tools. Dooly (2017) suggested that developers create training programs to build digital skills, enabling educators and students to become familiar with tools that support translanguaging practices. Comfort with digital platforms, content creation, and engagement with educational resources in multiple languages is directly linked to the effectiveness of technology in promoting multilingualism.

2.6 Promoting Translanguaging Through Educational Technology

Educational technology facilitates the promotion of multilingualism in formal settings. The adoption of artificial intelligence (AI) to facilitate language translation and learning is a promising initiative. AI-powered platforms allow educators to create personalized language learning experiences, translate languages quickly, and analyze feedback provided by students in diverse languages. Zou et al. (2023) explained that AI can provide new language resources to support the development of translanguaging language models, as current language learning platforms underrepresent most African languages.

Instructors can upload course materials and assign tasks in various languages using the multilingual features provided by digital platforms such as Google Classroom and Moodle. This encourages students to respond in their native or other prominent languages (García & Kleyn, 2016). This promotes a culture of inclusiveness and acknowledges students' linguistic backgrounds, thereby boosting morale and motivating them to use their native languages for academic purposes.

Moreover, students can enhance their language learning skills by using language apps such as Duolingo and Babbel as supplements to traditional classroom instruction. Additional practice can help individuals improve their language skills beyond the classroom (Carraro & Trinder, 2021). These platforms enable users to switch between languages during lessons and motivate them to practice their new

language skills regularly. Finally, students can use speech recognition apps to improve their pronunciation skills, thereby developing their language skills more interactively.

2.7 Theoretical Framework

This study is based on translanguaging theory, the sociocultural theory of learning, and the technology acceptance model. Williams used translanguaging to describe the teaching methods used in Welsh–English bilingual classrooms. García and Wei (2014) expanded the concept to encompass how multilingual individuals use their linguistic base for learning, communication, and understanding the world. Translanguaging theory argues that educators should permit students to use various languages to enhance their academic and cognitive development (Lewis et al., 2012). This implies that educators can actively create a linguistic environment that is inherently inclusive, thereby bridging the gap between the language of instruction and indigenous languages (Canagarajah, 2011).

Vygotsky (1978) posited that learning is a social process involving knowledge construction through interactions and cultural tools. The sociocultural theory of learning suggests that individuals learn through interactions with their peers, cultural artifacts, teachers, technology, and language present in their social environment. According to this theory, researchers regard language as more than just a means of communication; they see it as an essential tool for participation in social life, thinking, and understanding (Lantolf & Thorne, 2006; Vygotsky, 1978). Consequently, educators could benefit from using technology to facilitate translanguaging, which not only preserves language but also creates a learning environment that reflects the social realities of African students. This approach encourages languages to coexist and complement one another (Makalela, 2015).

Davis developed the technology acceptance model in 1989 to understand user acceptance of technology. This theory states that perceived usefulness and perceived ease of use determine the adoption of technology. Perceived usefulness refers to how much a person believes that using a particular technology can improve their performance, while perceived ease of use describes how easy it is for a person to use the technology with minimal effort (Davis, 1989; Venkatesh & Bala, 2008). This study identifies the factors that influence educators' and students' willingness to adopt digital tools for multilingual education, based on the technology acceptance model.

3. Research Framework and Hypotheses

This study links digital tools to multilingualism and translanguaging in African higher education institutions through a conceptual framework. The framework incorporates translanguaging theory, the sociocultural theory of language learning, and the technology acceptance model. The following section presents the hypotheses proposing an interaction between the adoption of digital tools and translanguaging practices in African higher education institutions. The framework consists of four primary groups of independent variables, as presented on the left in Figure 1. These independent variables lead to the central

mediating variable of technology adoption for translanguaging in the middle, which affects the dependent variable of multilingual proficiency and engagement in translanguaging practices on the right.

The independent variables are categorized into four groups: technological factors (availability of digital tools and technical skills of lecturers and students), organizational factors (institutional support as well as training and development), social factors (collaboration between lecturers and students and peer-to-peer communication), and cultural factors (attitudes toward multilingual practices and acceptance of indigenous languages). Each group of variables is arranged in a manner that impacts the adoption of technology, as indicated by the arrows labeled H1-H2, H3-H4, H5-H6, and H7-H8. The final arrow, H9, indicates that the effective adoption of technology for translanguaging is hypothesized to have a positive influence on both multilingual proficiency and engagement in translanguaging practices.

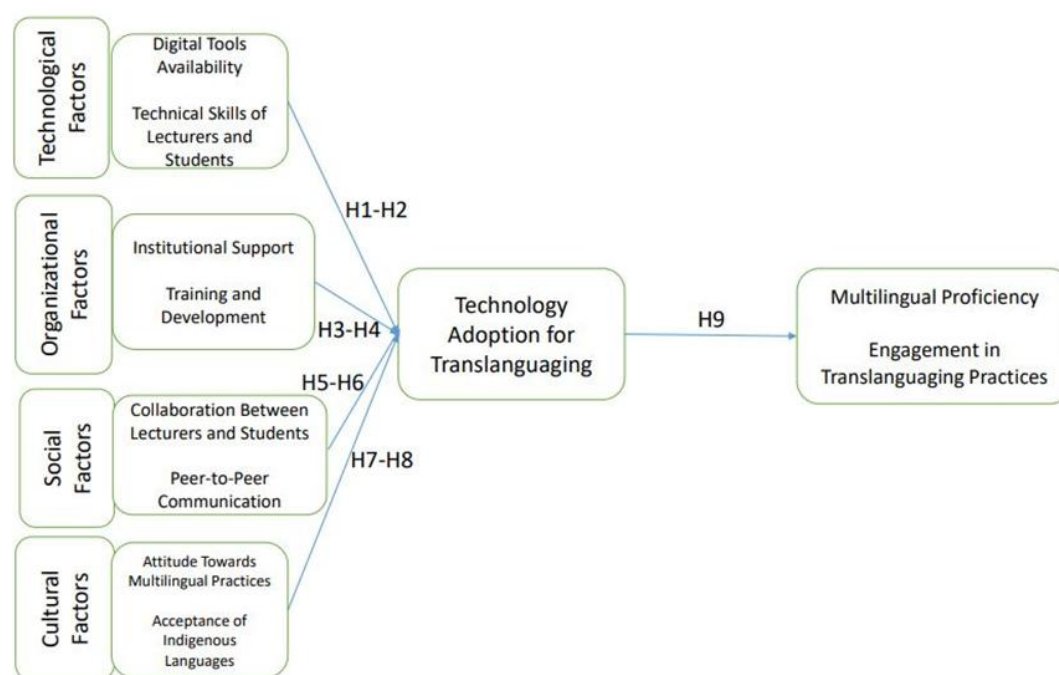


Figure 1: Conceptual framework diagram

3.1 Technological Factors

This section examines the hypotheses related to technological factors, including the availability of digital tools and technical skills.

3.1.1 Digital tools availability

In higher education, digital tools play a crucial role in enhancing translanguaging practices. Warschauer et al. (2004) argued that educators should integrate multilingual content into teaching and learning. Various tools, including online learning platforms, language-specific software, mobile apps, and digital communication technologies, can improve effectiveness. Institutions with adequate digital infrastructure are more likely to promote multilingualism through translanguaging activities. This access supports various linguistic

resources that foster inclusive and engaging educational environments (García & Wei, 2014). As a result, we propose the following hypothesis:

- **H1:** The availability of digital tools positively influences the adoption of technology for translanguaging.

3.1.2 Technical skills of lecturers and students

The technical skills of both lecturers and students largely determine the successful use of translanguaging practices with digital tools. Proficiency in digital platforms, online content creation, and multimedia communication likely enhances a person's ability to utilize these technologies effectively (Ambrose & Ogunbodede, 2022). Lecturers with advanced technical competence can design instructional content that supports translanguaging, while students who possess adequate digital literacy can fully participate in these learning activities, thereby improving their multilingual proficiency (Redecker, 2017). Thus, we propose the following hypothesis:

- **H2:** The technical skills of lecturers and students positively influence the adoption of technology for translanguaging.

3.2 Organizational Factors

This section explores the hypotheses concerning organizational factors such as institutional support, training, and development.

3.2.1 Institutional support

To determine the success of technology adoption in translanguaging practices, institutional support is essential. This includes providing administrative support, developing policy frameworks, and allocating resources to facilitate the integration of multilingual education technologies (García et al., 2017). According to García and Wei (2014), institutions that prioritize and support translanguaging initiatives create an environment conducive to the adoption of technology. It enhances the learning experience for both students and lecturers. Therefore, we propose the following hypothesis:

- **H3:** Institutional support positively influences the adoption of technology for translanguaging.

3.2.2 Training and development

Effective training helps lecturers and students use digital tools for translanguaging. Continuous professional development initiatives to improve digital literacy and multilingual skills can enhance users' competence in adopting new technologies. Integrating indigenous languages into digital platforms can promote the adoption of translanguaging technologies. Thus, we propose the following hypothesis:

- **H4:** Training and development programs enhance the adoption of technology for translanguaging.

3.3 Social Factors

This section explores the hypotheses concerning social factors, including collaboration between lecturers and students, as well as communication among peers.

3.3.1 Collaboration between lecturers and students

Collaboration between lecturers and students fosters the successful implementation of technology for translanguaging, enhancing knowledge sharing, co-creating multilingual content, and developing innovative approaches to using digital tools in language learning (Thorne, 2008). These partnerships improve student engagement and foster a sense of community, which are essential for the successful adoption of translanguaging technologies. Accordingly, the following hypothesis is proposed:

- **H5:** Collaboration between lecturers and students positively influences the adoption of technology for translanguaging.

3.3.2 Peer-to-peer communication

Peer-to-peer communication is a crucial social factor that supports the adoption of translanguaging technologies. García and Wei (2014) stated that students exchange ideas, assist one another in using digital platforms, and share effective strategies for utilizing multilingual resources through peer interactions. This type of communication creates a supportive learning environment that encourages the use of technology for the purpose of translanguaging. Therefore, we propose the following hypothesis:

- **H6:** Peer-to-peer communication positively influences the adoption of technology for translanguaging.

3.4 Cultural Factors

This section explores the hypotheses concerning cultural factors, including attitudes toward multilingual practices and the acceptance of indigenous languages.

3.4.1 Attitude towards multilingual practices

A positive attitude toward multilingual practices greatly influences how people adopt technology in translanguaging. Lecturers and students who recognize the value of multilingualism tend to embrace digital tools that support translanguaging (Bamgboṣe, 2021; Mbah, 2022). This attitude promotes a culture of diversity and inclusiveness in linguistic environments. It improves the adoption and effectiveness of technology in multilingual education. Hence, we propose the following hypothesis:

- **H7:** A positive attitude toward multilingual practices positively influences the adoption of technology for translanguaging.

3.4.2 Acceptance of indigenous languages

Educational institutions must actively accept and promote indigenous languages to facilitate the adoption of translanguaging technologies. Institutions that incorporate indigenous languages into their curricula create valuable opportunities for preserving linguistic heritage while also enhancing student engagement with multilingual content (García, 2017). Therefore, we propose the following hypothesis:

- **H8:** Acceptance of indigenous languages positively influences the adoption of technology for translanguaging.

3.5 Technology Adoption and Multilingual Proficiency

The successful integration of technology in translinguaging directly impacts students' multilingual proficiency and engagement. Students can easily switch between languages with the help of digital tools that support translinguaging, reducing stress and enhancing their linguistic competence and cognitive flexibility (García & Wei, 2014). Moreover, these technologies engage users in language learning in a more in-depth manner, leading to improved academic results and increased awareness of cultures. Thus, we propose the following hypothesis:

- **H9:** Effective adoption of technology for translinguaging positively influences multilingual proficiency and engagement in translinguaging practices.

4. Material and Methods

The following sections provide an overview of the study's context, sampling methods, questionnaire design, and the demographic profile of the respondents.

4.1 Study Context, Sampling and Questionnaire Design

We employed a cross-sectional survey design to assess the influence of digital tools on the promotion of translinguaging practices among lecturers and students in Nigeria. We gathered data on the attitudes of respondents, engagement levels, and linguistic performance outcomes both before and after introducing a gamified digital tool designed to promote language diversity in learning environments. Lecturers and students from two higher education institutions in Nigeria participated in this study. We selected Nigeria for its linguistic diversity and postcolonial educational setting, making it an ideal location for decolonial translinguaging research.

We based the choice of institutions on accessibility for research, readiness to adopt technology, and existing linguistic diversity. We adopted the quantitative method because, unlike qualitative methods that are useful for studying respondents' lived experiences but can be subjective in multilingual environments, quantitative methods provide empirical and replicable evidence. Advocacy for policy is crucial in Nigeria's under-researched translinguaging environment. Students and lecturers in the social sciences and language fields who engaged in translinguaging practices constituted the target population.

This study limited the sample size to 120 respondents, which included 40 lecturers and 80 students. This means that 20 lecturers and 40 students from each of the two institutions participated. We selected the sample using a purposive sampling technique based on specific criteria aligned with the study's objectives. These criteria included access to the required technology, a willingness to engage with a digital tool, and involvement in social science or language courses.

We collected data for the study using a structured, closed-ended four-point Likert scale questionnaire (see Appendix 1). The questionnaire evaluated several variables, including the frequency of interaction, ease of use, satisfaction, and

perceived impact of digital tools on language skills (see Table 1). We analyzed the gathered quantitative data using both descriptive and inferential statistics.

Table 1: Measurement instrument overview

Construct	Sample item	Source
Digital tools availability	<ul style="list-style-type: none"> • Provision of adequate tools for multilingual education. • Access to multilingual tools in institutions. 	Venkatesh et al. (2003)
Technical skills of lecturers and students	<ul style="list-style-type: none"> • Adequate training for operating digital tools. • Technical proficiency enhances adoption of digital tools. 	Davis (1989)
Institutional support, training, and development	<ul style="list-style-type: none"> • Provision of adequate training on digital technology for multilingual education. • Support for the integration of indigenous languages through digital technology. 	Zhuang et al. (2013)
Collaboration between lecturers and students	<ul style="list-style-type: none"> • Collaborative environment between lecturers and students using digital tools. • Collaborative learning enhances multilingual proficiency at the institution. 	Bandura (1986)
Peer-to-peer communication	<ul style="list-style-type: none"> • Peer feedback on digital platforms is beneficial for improving language skills. • Digital tools support informal communication among students in different languages. 	Lave and Wenger (1991)
Attitude towards multilingual practices	<ul style="list-style-type: none"> • Multilingual practices enhance the overall learning experience. • Value of using indigenous languages in educational settings. 	Gardner (1985)
Acceptance of indigenous languages	<ul style="list-style-type: none"> • The use of indigenous languages promotes cultural identity. • Digital tools can effectively preserve indigenous languages. 	Fishbein and Ajzen (1975)
Technology adoption for translanguaging	<ul style="list-style-type: none"> • Digital technology improves the ability to teach and learn in multiple languages. • The adoption of digital tools enhances cultural preservation in education. 	Rogers (2003)
Multilingual proficiency	<ul style="list-style-type: none"> • Digital tools enhance proficiency in indigenous languages. 	Cummins (2000)
Engagement in translanguaging practices	<ul style="list-style-type: none"> • Digital tools encourage engagement in translanguaging practices. 	García and Wei (2014)

This study adhered to ethical standards by obtaining informed consent, maintaining confidentiality, and ensuring the anonymity of respondents. We sought and obtained approval from the boards of the institutions and granted each respondent the right to withdraw at any stage without facing any consequences. Furthermore, we stored the data securely and only used it for its intended purpose.

4.2 Demographic Profile

Table 2 presents the respondents' demographic characteristics. We distributed a total of 120 questionnaires; however, after collection and sorting, only 98 were completed correctly. In terms of age distribution, 17% of the respondents were under 20 years old, 37% were between 20 and 30, 28% were between 30 and 40, and the remaining 18% were over 40. In terms of gender, 52% of the respondents were male, while the remaining 48% were female. Regarding their roles, 41% of the respondents were lecturers, while the remaining 59% were students. Regarding educational qualifications, 59% of the respondents were undergraduates, 28% held master's degrees, and the remaining 13% held doctoral degrees.

Table 1: Demographic distribution of respondents

Variable	Item	Frequency	Percentage (%)
Age	Younger than 20	17	17
	20-30 years	35	37
	30-40 years	28	28
	Older than 40	18	18
Gender	Male	51	52
	Female	47	48
Role	Lecturer	40	41
	Student	58	59
Academic qualification	Undergraduate	58	59
	Master's degree	27	28
	Doctoral degree	13	13

5. Results, Analysis, and Presentation of Data

We analyzed the data using Jamovi software, version 2.6 in two stages: first, we conducted a confirmatory factor analysis for the measurement model, and second, we performed structural equation modeling for the structural model.

5.1 Measurement Model Assessment

We employed the confirmatory factor analysis methodology explained by Goretzko et al. (2024) to assess the reliability and validity of the connections between constructs in this study. The procedures included (i) assessing indicator reliability; (ii) evaluating internal consistency reliability; (iii) examining convergent validity; and (iv) analyzing discriminant validity.

Table 3 presents the factor loadings, composite reliability, and average variance extracted for each construct. All constructs exhibited satisfactory internal consistency, with composite reliability values exceeding the acceptable threshold of 0.70 and average variance extracted values surpassing 0.50. This indicates that the constructs demonstrate convergent validity.

Table 3: Factor loadings and reliability

Constructs	No. of items	Factor loadings	Composite reliability	Average variance extracted
Digital tools availability	6	0.751–0.846	0.839	0.564
Technical skills	6	0.723–0.812	0.827	0.541
Institutional support	6	0.758–0.879	0.844	0.586
Collaboration	6	0.743–0.865	0.832	0.554
Peer-to-peer communication	6	0.731–0.827	0.821	0.532
Attitude towards multilingual practices	6	0.710–0.843	0.816	0.528
Acceptance of indigenous languages	6	0.767–0.874	0.856	0.602
Technology adoption for translanguaging	6	0.755–0.868	0.843	0.572
Multilingual proficiency	6	0.760–0.865	0.840	0.564
Engagement in translanguaging practices	6	0.738–0.856	0.828	0.541

We examined discriminant validity, an important aspect of measurement model assessment, using the Fornell–Larcker criterion. This criterion involves comparing the square root of the average variance extracted for each construct with the correlations between that construct and other constructs in the model (Fornell & Larcker, 1981). To establish discriminant validity, the square root of the average variance extracted for each construct should be greater than the correlations between constructs.

Table 4 presents the results of the Fornell–Larcker criterion analysis for the ten constructs under study. It confirms that the diagonal values, which represent the square roots of the average variance extracted, consistently exceed the off-diagonal correlations in each corresponding row and column.

Table 4: Discriminant validity using the Fornell–Larcker criterion

Construct	Digital tools availability	Technical skills	Institutional support	Collaboration	Peer-to-peer communication	Attitude towards multilingual practices	Acceptance of indigenous languages	Technology adoption for translanguaging	Multilingual proficiency	Engagement in translanguaging practices
Digital tools availability	0.751									
Technical skills	0.485	0.827								
Institutional support	0.432	0.470	0.844							
Collaboration	0.397	0.515	0.463	0.832						
Peer-to-peer communication	0.421	0.428	0.424	0.451	0.821					
Attitude towards multilingual practices	0.378	0.434	0.440	0.466	0.478	0.816				

Construct	Digital tools availability	Technical skills	Institutional support	Collaboration	Peer-to-peer communication	Attitude towards multilingual practices	Acceptance of indigenous languages	Technology adoption for transanguaging	Multilingual proficiency	Engagement in transanguaging practices
Acceptance of indigenous languages	0.461	0.389	0.412	0.471	0.486	0.469	0.856			
Technology adoption for transanguaging	0.467	0.466	0.445	0.488	0.491	0.460	0.485	0.843		
Multilingual proficiency	0.389	0.399	0.400	0.429	0.433	0.397	0.430	0.452	0.840	
Engagement in transanguaging practices	0.405	0.454	0.426	0.457	0.480	0.432	0.461	0.490	0.453	0.828

The diagonal values indicate that the square roots of each construct's average variance extracted are represented, while the off-diagonal values show the correlations between the constructs. For example, the average variance extracted for the availability of digital tools has a square root of 0.751, which exceeds its correlations with other constructs, such as technical skills (0.485) and institutional support (0.432). Similarly, technical skills have an average variance extracted square root of 0.827, which exceeds their highest correlation of 0.515 with collaboration. This pattern consistently confirms the discriminant validity across all constructs. Indicators of each construct share a greater degree of variance with that construct than with other constructs.

The analysis shows that the values for average variance extracted range from 0.524 to 0.860, confirming that all constructs achieved adequate convergent validity, as values above 0.50 indicate sufficient convergence, according to Hair et al. (2017). Additionally, the researchers verified construct reliability using composite reliability, and all constructs exceeded the recommended threshold of 0.70, which indicates internal consistency reliability, according to Henseler et al. (2015). These findings suggest that the measurement model is both reliable and valid, ensuring that detailed results can be obtained for further analysis of the structural model.

5.2 Structural Model Assessment

The effectiveness of the structural model was evaluated using R^2 and Q^2 values to determine its explanatory power and predictive relevance, respectively. Technology adoption for transanguaging had an R^2 value of 0.783 and a Q^2 value of 0.611. This implies that the independent variables explain 78.3% of the variance in technology adoption and demonstrate high predictive relevance. Multilingual proficiency had an R^2 value of 0.655 and a Q^2 value of 0.512, while engagement in transanguaging practices had an R^2 value of 0.634 and a Q^2 value of 0.497, indicating that the predictive power is substantial.

We assessed the statistical significance of the direct relationships in the structural model by evaluating 5000 bootstrap resamples and applying a one-tailed test, with critical t -values exceeding ± 1.65 . The findings highlight the key factors that affect the adoption of translanguaging practices in educational settings and their subsequent impact on student outcomes. After reviewing the availability of digital tools, the analysis shows a significant and positive relationship with technology adoption for translanguaging ($\beta = 0.181$, $t = 3.142$, $p < 0.01$), suggesting that access to adequate technological resources promotes translanguaging practices. Similarly, we found that technical skills have a statistically significant positive effect on technology adoption for translanguaging ($\beta = 0.134$, $t = 2.129$, $p < 0.05$). This indicates that proficiency in using digital tools plays a vital role in enhancing multilingual practices.

The emergence of institutional support served as a highly influential factor, demonstrating a significantly positive relationship with technology adoption for translanguaging ($\beta = 0.290$, $t = 4.756$, $p < 0.001$). This emphasizes how organizational backing, including administrative and policy support, facilitates the adoption of translanguaging strategies. Furthermore, stakeholders' collaboration significantly and positively affected technology adoption for translanguaging ($\beta = 0.212$, $t = 3.652$, $p < 0.001$). This implies the importance of teamwork and cooperative efforts in achieving successful implementation.

We found peer-to-peer communication to be a strong indicator, positively influencing technology adoption for translanguaging ($\beta = 0.167$, $t = 2.543$, $p < 0.05$), emphasizing the importance of informal exchanges and knowledge sharing among students and educators in supporting multilingual practices. However, attitudes toward multilingual practices did not significantly impact technology adoption for translanguaging ($\beta = 0.095$, $t = 1.523$, $p > 0.05$), suggesting that while they are important, their influence may not be as pronounced or salient as other factors affecting adoption.

Acceptance of indigenous languages was found to have a strong positive effect on technology adoption for translanguaging ($\beta = 0.276$, $t = 4.325$, $p < 0.001$). This indicates that embracing native languages and integrating them into the educational framework significantly promote translanguaging practices. When analyzing the outcomes of translanguaging adoption, we found that technology adoption for translanguaging had a significantly positive effect on multilingual proficiency ($\beta = 0.423$, $t = 6.871$, $p < 0.001$). This confirms that integrating translanguaging practices enhances students' ability to carry out tasks in multiple languages. Additionally, we found that technology adoption for translanguaging has a substantial impact on engagement in translanguaging practices ($\beta = 0.367$, $t = 5.643$, $p < 0.001$). This finding suggests that the adoption of such practices increases student's involvement and participation in multilingual activities.

The structural model showed that exogenous factors strongly predict the adoption of technology for translanguaging and its impact on multilingual proficiency and engagement in translanguaging practices. Consequently, we found that successfully implementing translanguaging practices depends on a combination

of technological resources, institutional support, collaborative efforts, and cultural acceptance. After analyzing the proposed relationships in the conceptual framework, we determined that all the relationships were accurate except for the one concerning attitudes toward multilingual practices.

Table 5 presents a summary of the hypotheses.

Table 5: Summary of hypothesis testing

Hypothesis	Path	<i>t</i> -statistics	<i>p</i> -value	Supported
H1: Digital tools availability → Technology adoption for translinguaging	0.181	3.142	< 0.01	Supported
H2: Technical skills → Technology adoption for translinguaging	0.134	2.129	< 0.05	Supported
H3: Institutional support → Technology adoption for translinguaging	0.290	4.756	< 0.001	Supported
H4: Collaboration → Technology adoption for translinguaging	0.212	3.652	< 0.001	Supported
H5: Peer-to-peer communication → Technology adoption for translinguaging	0.167	2.543	< 0.05	Supported
H6: Attitude towards multilingual practices → Technology adoption for translinguaging	0.095	1.523	> 0.05	Not supported
H7: Acceptance of indigenous languages → Technology adoption for translinguaging	0.276	4.325	< 0.001	Supported
H8: Technology adoption for translinguaging → Multilingual proficiency	0.423	6.871	< 0.001	Supported
H9: Technology adoption for translinguaging → Engagement in translinguaging practices	0.367	5.643	< 0.001	Supported

6. Discussion

This study explored how digital tools facilitate translinguaging, promote multilingual proficiency, and support indigenous language preservation in African educational institutions. The study used translinguaging theory, sociocultural learning theory, and the technology acceptance model to explain how languages are used interchangeably in various settings and how digital tools facilitate this.

6.1 Effectiveness of Digital Tools in the Facilitation of Translinguaging

The findings show that digital tools effectively facilitate translinguaging among lecturers and students. The respondents strongly agreed that digital tools enhance students' ability to engage in translinguaging, thereby facilitating smooth language switching during learning sessions (Hypothesis 1). García and Wei (2014) asserted that translinguaging is an essential feature of multilingualism and that digital platforms provide an accessible framework for it, thereby supporting

this finding. Therefore, digital platforms enhance the learning experience and promote linguistic diversity by easily incorporating multiple languages.

Makalela (2021) introduced the concept of *ubuntu* digital translanguaging, emphasizing how technology dissolves rigid language barriers in African contexts. While Makalela's framework focused on social media and informal digital spaces, the findings of this study expand that perspective to encompass formal educational settings, showing that structured learning environments also benefit from technology facilitated translanguaging. This study demonstrates that digital tools can help bridge policy gaps, such as the one identified by Agbozo and ResCue (2021), which highlights the persistent dominance of monolingual ideologies in African educational policies amid multilingual realities.

Furthermore, students expressed that they feel more confident using multilingualism in academic settings (Hypothesis 2). This sentiment becomes more evident when educators employ digital tools to incorporate indigenous languages into learning tasks. This implies that students view digital tools as platforms for acquiring fluency in widely spoken languages and enhancing their command of indigenous languages. Cummins (2000) proposed a model of bilingual education that emphasizes the importance of integrating all languages into students' repertoires, which aligns with this finding.

Therefore, this study offers solutions to some of the pessimism expressed by Kgosiemang (2025), who noted obvious disparities in resource allocation and the marginalization of minority languages. While Kgosiemang demonstrated how the dominance of Setswana marginalizes other indigenous languages, this study suggests that intentionally using digital tools to support multiple indigenous languages simultaneously would help students gain confidence in their entire linguistic repertoire, rather than just in the dominant regional languages.

6.2 Accessibility and Usability of Technology for Multilingual Education

Hypothesis 3 examined the accessibility and usability of digital tools in promoting multilingual education. The results indicate that although students perceive digital tools as accessible, some regions face challenges related to digital literacy and infrastructure. However, most respondents felt that more accessible and user-friendly digital tools encourage their use for translanguaging practices (Hypothesis 4). This implies that, although certain accessibility challenges exist with digital tools, these tools can still provide a platform for facilitating multilingual education, especially if users find them easy to use.

This finding contrasts with concerns raised by scholars studying decolonization through digitalization in isiXhosa at South African universities. Lockett and Hurst-Harosh (2021) warned that digitalization may perpetuate existing analogue power structures. This study offers a more balanced perspective by highlighting improvements in accessibility, albeit uneven ones. Earlier studies noted complete implementation failures, contrasting with this partial success. The development of digital infrastructure during the COVID-19 pandemic likely accelerated a significant shift in the digital landscape in recent years (Fernández-Gutiérrez,

Gimenez, & Calero, 2022; Leach, MacGregor, Scoones, & Wilkinson, 2021; Trinidad, Clarkson, Pagram, & Funnell, 2016).

Furthermore, the analysis reveals that educators use digital tools to ensure active collaboration between learning and translanguaging, with many students indicating that this collaboration has improved their language skills (Hypothesis 5). García and Wei (2014) stated that the nature of translanguaging practices is typically collaborative, lending credence to this assertion, as it enables students to learn from one another through language interactions across digital platforms.

Niyibizi et al. (2021) discovered comparable collaborative translanguaging practices in Rwandan social media, demonstrating that digital platforms foster new forms of understanding within multilingual communities. However, their study examined informal communication, whereas our findings show that structured educational settings can also benefit from collaborative approaches. Researchers can purposefully use digital tools for translanguaging in academic contexts, thereby broadening the theoretical scope of translanguaging research beyond its traditional boundaries.

6.3 Role of Technology in the Preservation and Revitalization of Indigenous Languages

This study aimed to examine how technology can help preserve and revitalize indigenous languages through translanguaging. The findings from Hypothesis 6 clearly indicate that digital tools significantly enhance proficiency in indigenous languages. Many students in this study noted feeling more confident using their indigenous languages in academic contexts when using these tools. Blommaert (2010) supported this finding by positing that previous studies have highlighted the potential of digital tools to enhance student engagement with their linguistic and cultural heritage. The findings of our study directly contradict the concerns expressed by some scholars regarding the damaging effects of digital communication on African indigenous languages.

Makalela and White (2021) edited a study that challenges the notion that digital communication is simplistic or detrimental to African languages. Our research supports this perspective by providing empirical evidence of significant improvements in proficiency in indigenous languages following the introduction of digital tools in educational settings. This challenges earlier deficit-oriented perspectives that viewed technology as a threat to linguistic diversity.

Reports indicated increased motivation for learning and the utilization of indigenous languages by students with access to digital platforms (Hypothesis 7). This finding shows that the use of technology is not only restricted to facilitating academic learning but also promotes a sense of cultural identity and pride. These are important prerequisites for the revival of indigenous languages in educational settings. The recent work of Mlambo and Matfunjwa (2024) aligns with this finding on motivation, focusing on the use of technology to preserve South African indigenous languages. Their research highlights mobile apps and digital platforms as crucial tools for transmitting languages across generations. While they primarily focused on documentation and archival functions, our research

demonstrates that digital tools also play a crucial role in motivating the revitalization of language. This indicates that technology extends beyond mere preservation to active engagement and use, which is essential for language policy and planning in African educational contexts.

6.4 Factors Influencing the Adoption of Digital Tools for Translanguaging

We focused on identifying the factors that influence the acceptance and adoption of digital tools for translanguaging in the education sector in Hypotheses 8 and 9. The results showed that institutional support and the perceived relevance of digital tools to students' academic success were the most significant factors encouraging the adoption of these tools. This means that administrators who recognize the significance of digital tools in promoting multilingualism are likely to incorporate these tools into their teaching practices. Kemp et al. (2024) found that institutional factors and instructor practices significantly influence technology acceptance among students, closely relating these findings to recent extensions of the technology acceptance model in educational settings.

Li and Yu (2023) highlighted the importance of positive feedback from lecturers in shaping students' attitudes in their study on extending the technology acceptance model to digital academic reading tools. We expand the application of the technology acceptance model beyond general educational technology to focus specifically on multilingual education and translanguaging. This novel contribution demonstrates how institutions can address concerns related to linguistic justice in African higher education by adapting established technology acceptance frameworks.

The study revealed that students' attitudes toward technology determine their willingness to engage in translanguaging practices. Students are more motivated to actively use digital tools when they have a positive perception of these tools as a means of improving their language skills. Venkatesh et al. (2003) argued that factors such as perceived ease of use and usefulness of a technology significantly influence its adoption, which aligns with these findings.

Waluyo and Rouaghe (2025) found similar patterns regarding student-initiated translanguaging with AI tools. Their study revealed a strong correlation between students' autonomous use of AI translation tools and their positive attitudes toward technology. However, their study was conducted in a setting of English as a foreign language in developed countries, whereas our educational context in Africa faces unique challenges related to infrastructure and digital literacy. The emergence of similar attitudinal patterns in these diverse environments suggests that the relationship between attitudes toward technology and the adoption of translanguaging may be universal. However, there are regional variations in the specific barriers and enablers, which have important implications for understanding technology acceptance in multilingual contexts throughout the Global South.

7. Theoretical and Practical Contributions

The following sections outline the theoretical and practical contributions of the study, review its limitations, and recommend potential areas for future research.

7.1 Theoretical Contributions

This study makes a valuable contribution to the theoretical understanding of translanguaging practices and the use of digital tools for promoting multilingualism in educational settings in Africa. A distinguishing element is the use of García and Wei's (2014) translanguaging theory, Vygotsky's (1978) sociocultural theory of learning, and Davis's (1989) technology acceptance model as they relate to the adoption of digital tools in educational settings. This approach provides a multidimensional perspective on facilitating translanguaging practices through digital tools.

This research contributes to the growing body of knowledge by proposing a new framework that links theoretical perspectives on bilingualism and translanguaging with the accessibility of digital tools. Unlike earlier studies that primarily examined language practices without incorporating technology, this study emphasizes the role of digital tools, such as online learning platforms, apps, and other digital resources, as mediums for multilingual and translanguaging practices. By doing so, this study enhances the understanding of the interaction between digital tools and linguistic practices in educational settings by proposing that these tools not only assist in language learning but also act as active participants in the processes of language interaction and development.

In terms of methodology, this study contributes to translanguaging research by applying modern statistical techniques to test measurement and structural models related to digital tools and language use. This is invaluable to educational research focused on Africa, where the impact of digital tools on multilingual education has not been examined in detail.

7.2 Practical Contributions

The findings of this study are invaluable for policymakers, educators, and developers of educational technology. They can use this information to identify areas that need to be incorporated into software development and to enhance multilingual proficiency and translanguaging practices in Africa using digital tools. This would enable policymakers to recognize the importance of using digital tools for language education and learning activities overall, paving the way for the development of policies and initiatives that optimize learning.

From a resource management perspective, the study suggests that digital tools should be considered not only as technological assets but also as dynamic capabilities that can support institutional strategies aimed at improving multilingual education. By recognizing digital tools as essential factors in the process of translanguaging, this study encourages institutions to strategically incorporate technology into their educational practices, particularly concerning the preservation and revitalization of indigenous languages. This aligns with Cummins' (2000) emphasis on the connection between language development

and academic success in multilingual environments. Institutions would then be able to maximize their return on investment by aligning their technological infrastructure with their goals for multilingual education.

Additionally, the findings provide valuable guidance for developers aiming to design educational platforms that support translanguaging practices. By prioritizing user-friendly interfaces and incorporating features that facilitate collaboration and language switching, they can create tools that actively encourage multilingual engagement. Educators can use the knowledge gained from this study to develop curricular materials and teaching strategies that leverage digital platforms to support translanguaging and promote multilingual communication.

7.3 Limitations and Future Directions

Although this study's findings are significant, we must acknowledge that there are some limitations. Firstly, self-reported data significantly limits researchers by introducing subjectivity and bias among respondents, as they may exaggerate their engagement and proficiency in multilingualism or provide responses that are socially desirable rather than necessarily truthful. To address this issue, future researchers may need to utilize objective measures, such as monitoring the use of digital tools or conducting performance-based assessments.

The limited scope of the study, which focuses solely on specific institutions in Nigeria, may restrict the generalizability of the findings, making them less applicable to other countries in Africa or worldwide. We acknowledge the concerns about generalizing their conclusions to the entire African continent, as findings from only two Nigerian institutions do not fully represent the diverse higher education systems across Africa. The findings are intended for *transferability* rather than universal generalization, aligning with the principles of quantitative research that emphasize context-based inference (Creswell & Creswell, 2018).

The selected institutions exemplify typical public colleges in a multilingual, postcolonial African context. They share characteristics with other sub-Saharan institutions that face similar challenges, including monoglossic policies, the marginalization of indigenous languages, and uneven access to technology. The study's findings suggest potential patterns that may apply to similar contexts in Africa; however, they do not definitively apply to all 54 African countries. Therefore, it is expected that future studies will build on this research by replicating the same study in various institutions across Africa or conducting a comparative analysis among different nations with divergent levels of digital tool adoption and language policies.

The cross-sectional survey design employed in the study limited its examination of technology adoption to a single point in time, making it imperative for future studies to use a longitudinal approach to assess the long-term effects of these tools. Similarly, since the current study only examined general technology adoption, further research should be conducted to explore the use of digital tools

and their effects on multilingual proficiency and translanguaging practices in greater detail. When considering the demographics of students, several factors should be taken into account, including socioeconomic backgrounds, cultural perspectives, technology exposure, and language proficiency. Finally, due to the constant evolution of technology, there is a need for further studies to examine how emerging technologies, such as AI, machine learning, and virtual reality, affect multilingual proficiency and translanguaging practices.

8. Conclusion

This study contributes to the growing body of literature on digital tools and translanguaging practices in higher education, particularly in Africa. The study examined the factors driving the integration of digital tools into language learning, as well as the outcomes that follow. The focus was on promoting multilingual proficiency and improving translanguaging among both students and lecturers. The study's results show that several key factors influence the successful implementation of digital tools in facilitating translanguaging practices, including adequate IT infrastructure, accessibility of technology, institutional support, collaboration between students and faculty, and positive attitudes toward the use of technology in education.

Most significantly, the findings show that academic settings effectively improve multilingual skills and encourage translanguaging by incorporating digital tools, thereby making the learning environment more inclusive, dynamic, and interactive. This study found that using tools such as multilingual apps and collaborative platforms enables translanguaging to break down rigid language barriers. This approach facilitates easy communication that acknowledges the full linguistic repertoires of students while also challenging monolingual policies rooted in colonial legacies. This study demonstrates that digital tools, such as translation apps and interactive learning platforms, significantly enhance students' confidence in using indigenous languages in an academic setting.

This finding extends Makalela's (2021) work on *ubuntu* digital translanguaging into the realm of formal education. Unlike informal social media platforms, these tools offer structured opportunities for active engagement with indigenous languages. This engagement not only enhances language proficiency and cultural pride but also supports the learning process and revitalizes endangered languages by incorporating them into academic settings. These tools directly address policy gaps and promote linguistic justice in African higher education.

As for theoretical contributions, the study first developed an integrated framework that combines translanguaging theory, the sociocultural theory of learning, and the technology acceptance model. This framework improves the understanding of how technological factors and organizational capabilities work together to facilitate the adoption of digital tools for multilingual and translanguaging practices. In doing so, it highlights the factors that drive the use of digital tools to promote multilingual proficiency and translanguaging practices in higher education. Practically, the study is invaluable to educational administrators, software developers, and policymakers, as it provides an

understanding of the importance of ensuring the availability and accessibility of digital tools in language learning and academic endeavors. While many people praise digital technology for facilitating translanguaging by allowing users to easily mix languages across various apps and platforms, some scholars argue that it can actually widen existing gaps rather than bridge them. For instance, algorithms often prioritize major languages such as English, marginalizing indigenous languages and complicating genuine revitalization efforts for smaller communities.

Additionally, there are concerns that tools designed to preserve languages may inadvertently standardize them, undermining unique dialects or imposing Western technological frameworks. For less common languages, AI and translation technology frequently fall short, providing unreliable support that frustrates users rather than empowering them. This makes people feel that revitalization is more like tech hype than a genuine cultural lifeline. Therefore, indigenous voices must develop digital tools for translanguaging to avoid merely replicating old power imbalances under a digital guise.

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Appendix 1

Demographic Information

Please provide the following demographic information by selecting the appropriate option.

Item No.	Question	Options
1	What is your age group?	<input type="checkbox"/> Under 20 years <input type="checkbox"/> 20–30 years <input type="checkbox"/> 30–40 years <input type="checkbox"/> Over 40 years
2	What is your gender?	<input type="checkbox"/> Male <input type="checkbox"/> Female
3	What is your role at the institution?	<input type="checkbox"/> Lecturer <input type="checkbox"/> Student
4	What is your highest educational qualification?	<input type="checkbox"/> Undergraduate <input type="checkbox"/> Master's degree <input type="checkbox"/> Doctoral degree

Questionnaire Design for Translanguaging and Digital Technology in African Higher Education

Measurement Scale

Each question will be measured on a four-point Likert scale to capture responses:

1. Strongly Disagree (SD)
2. Disagree (D)
3. Agree (A)
4. Strongly Agree (SA)

Section 1: Digital Tools Availability

Scholarly Source: Adapted from Venkatesh et al. (2003), Unified Theory of Acceptance and Use of Technology.

Item No.	Question
1	The institution provides adequate digital tools for multilingual education.
2	The available digital tools support seamless language integration during learning.
3	I have access to digital platforms designed for multilingual interactions.
4	The digital tools provided are compatible with our institution's needs for translanguaging.
5	Students and lecturers have access to language-specific digital resources.
6	The institution ensures regular updates and maintenance of digital tools for learning.

Section 2: Technical Skills of Lecturers and Students

Scholarly Source: Adapted from Davis (1989), Technology Acceptance Model.

Item No.	Question
1	I am confident in using digital tools for multilingual education.
2	Students demonstrate adequate technical skills for using educational technology.
3	I have received sufficient training on how to use digital platforms for teaching.
4	Students can navigate digital platforms for multilingual communication effectively.
5	The technical proficiency of lecturers enhances the adoption of digital tools.
6	I can troubleshoot minor technical issues encountered on digital platforms.

Section 3: Institutional Support, Training, and Development

Scholarly Source: Adapted from Zhuang et al. (2013), Institutional Support Theory.

Item No.	Question
1	The institution provides adequate training on digital technology for multilingual education.
2	There are regular workshops to enhance our digital literacy.
3	The institution supports the integration of indigenous languages through digital technology.
4	I receive technical support when using digital tools for language teaching.
5	The institution invests in the development of digital tools for multilingual learning.
6	Policies are in place to promote technology use in multilingual education.

Section 4: Collaboration Between Lecturers and Students

Scholarly Source: Adapted from Bandura (1986), Social Learning Theory.

Item No.	Question
1	There is a collaborative environment between lecturers and students using digital tools.
2	Digital platforms facilitate interaction between lecturers and students in multilingual contexts.
3	I often collaborate with students to solve problems using digital tools.
4	Students actively participate in discussions facilitated through digital platforms.
5	Collaborative learning enhances multilingual proficiency in our institution.
6	Peer feedback is encouraged in digital learning environments.

Section 5: Peer-to-Peer Communication

Scholarly Source: Adapted from Lave and Wenger (1991), Communities of Practice.

Item No.	Question
1	Digital tools facilitate peer-to-peer communication in multilingual settings.
2	I collaborate with my peers to improve my multilingual skills.
3	Digital communication enhances language learning through peer interactions.
4	Students frequently share learning resources through digital platforms.
5	Peer feedback on digital platforms is beneficial for improving language skills.
6	Digital tools support informal communication among students in different languages.

Section 6: Attitude Towards Multilingual Practices

Scholarly Source: Adapted from Gardner (1985), Socio-Educational Model of Second Language Acquisition.

Item No.	Question
1	I believe integrating multiple languages into education is beneficial.
2	Multilingual practices enhance the overall learning experience.
3	I enjoy participating in multilingual learning environments.
4	Using digital tools for multilingual education is a positive experience.
5	I am motivated to improve my multilingual proficiency through technology.
6	I value the use of indigenous languages in educational settings.

Section 7: Acceptance of Indigenous Languages

Scholarly Source: Adapted from Fishbein and Ajzen (1975), Theory of Reasoned Action.

Item No.	Question
1	I believe indigenous languages should be preserved in higher education.
2	The use of indigenous languages promotes cultural identity.
3	I support the integration of indigenous languages into the curriculum.
4	Digital tools can effectively preserve indigenous languages.
5	Indigenous languages should be prioritized alongside global languages.
6	I feel confident using indigenous languages in academic settings.

Section 8: Technology Adoption for Translanguaging (Mediator)

Scholarly Source: Adapted from Rogers (2003), Diffusion of Innovations Theory.

Item No.	Question
1	I frequently use digital tools for multilingual education.
2	Digital technology has improved my ability to teach or learn in multiple languages.
3	I plan to continue using digital tools for language learning.
4	Digital tools make translanguaging more effective.
5	I encourage others to adopt digital tools for multilingual learning.
6	The adoption of digital tools enhances cultural preservation in education.

Section 9: Outcome Variables

Multilingual Proficiency

Scholarly Source: Adapted from Cummins (2000), Bilingual Education Theory.

Item No.	Question
1	I have improved my multilingual skills through digital tools.
2	I can effectively communicate in more than one language.
3	Digital tools enhance my proficiency in indigenous languages.
4	I feel confident using multiple languages in academic settings.
5	My language skills have improved due to collaborative activities on digital platforms.
6	I can translate concepts effectively between languages.

Engagement in Translanguaging Practices

Scholarly Source: Adapted from García and Wei (2014), Translanguaging Theory.

Item No.	Question
1	I frequently switch between languages during learning sessions.
2	Digital tools encourage me to engage in translanguaging practices.
3	I participate in multilingual discussions using digital tools.
4	Translanguaging practices have improved my academic performance.
5	I feel motivated to engage in translanguaging in my academic work.
6	I actively promote the use of multiple languages in my learning environment.