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The Role of Machine Translation (MT) in the Promotion of National African languages

Bakary Manka
Email: bakary.manka@uit.ac.ma
Master of Arts (M.A.) in Translation at Pan-African University Institute for Governance, Humanities and Social Sciences (PAUGHSS), Advanced School of Translators and Interpreters (ASTI), University of Buea.

Thomas Njie Losenje
(PhD) Advanced School of Translators and Interpreters (ASTI), University of Buea

Sakwe George Mbotake
Prof. Advanced School of Translators and Interpreters (ASTI), University of Buea

ABSTRACT

This study set out to investigate the Role of Machine Translation (MT) in the Promotion of National African languages. This study therefore, aims at exploring how MT can facilitate the promotion of national African languages, identify associated challenges, and propose strategies for optimizing its effectiveness. A mixed-method research design was employed, combining data collected through questionnaires and semi-structured interviews. The analysis was conducted using Excel and SPSS. The findings reveal a general positive perception of the potential of MT to promote national African languages. Notably, 36.78% of respondents believe that MT could effectively bridge communication gaps across linguistic barriers. In addition, 35.23% of participants emphasize its role in fostering language learning and facilitating cultural exchange. Furthermore, 23.83% of the respondents view MT as a tool for disseminating knowledge in national African languages. However, challenges such as the linguistic complexity of various dialects, standardized terminology, data security concerns, accuracy and quality limitations, the inability of MT to capture idiomatic expressions, the absence of linguistic databases, and cultural nuances were identified as major obstacles. To overcome these obstacles, this study recommends enhancing MT systems' linguistic and cultural competence, expanding language coverage, and improving user-friendliness. Additionally, collaborative efforts among stakeholders— including language authorities, policymakers, technologists, local communities, and active end-user involvement —are essential for successful implementation

Keywords: Machine Translation (MT), Language Promotion, National African languages, Standardized Terminology, linguistic complexity

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RÉSUMÉ

Cette étude a pour but d'examiner le rôle de la traduction automatique (TA) dans la promotion des langues nationales africaines. Cette étude vise donc à explorer comment la traduction automatique (TA) peut faciliter la promotion des langues nationales africaines, à identifier les défis qui y sont associés et à proposer des stratégies pour optimiser son efficacité. Une méthode de recherche mixte a été utilisée, combinant des données recueillies par le biais de questionnaires et d'entretiens semi-structurés. L'analyse a été réalisée à l'aide d'Excel et de SPSS. Les résultats révèlent une perception généralement positive du potentiel de la MT pour promouvoir les langues nationales africaines. En particulier, 36,78 % des personnes interrogées pensent que la TA permet de combler efficacement les lacunes en matière de communication au-delà des barrières linguistiques. En outre, 35,23 % des participants ont souligné son rôle dans la promotion de l'apprentissage des langues et la facilitation des échanges culturels. 23,83 % des personnes interrogées considèrent en outre la TA comme un outil de diffusion des connaissances dans les langues nationales africaines. Cependant, des défis tels que la complexité linguistique des différents dialectes, la terminologie normalisée et les problèmes de sécurité des données, les limites de précision et de qualité, l'incapacité de la TA à capturer les expressions idiomatiques, l'absence de bases de données linguistiques et les nuances culturelles ont été identifiés comme des obstacles majeurs. Pour surmonter ces obstacles, l'étude recommande d'améliorer les compétences linguistiques et culturelles des systèmes de TA, d'étendre la couverture linguistique et d'améliorer la convivialité. En outre, les efforts de collaboration entre les parties prenantes - y compris les autorités linguistiques, les décideurs politiques, les technologues, les communautés locales et la participation active des utilisateurs finaux - sont essentiels pour une mise en œuvre réussie.

Mots-clés : Traduction automatique (TA), promotion des langues, langues nationales africaines, terminologie normalisée, complexité linguistique.

1. INTRODUCTION

In our globalised world, where connections span continents, safeguarding and promoting national languages, particularly those in Africa, is critical (Mufwene, 2008, P.1). Language transcends mere communication; it embodies a cultural identity and heritage (Crystal, 2000, P.5). Many African nations have a rich linguistic diversity, with numerous indigenous languages that are integral to their cultural fabric. However, the dominance of colonial languages such as English, French and Spanish, and the forces of globalisation pose a significant threat to the survival of many of these languages, putting them at risk of extinction (UNESCO, 2010, P.2).

According to El-Banna and Naeem (2016, P.3), “Machine translation is defined as a branch of artificial intelligence (AI) that entails the development of specialised computer systems that can translate text between different human languages.” Machine translation goes beyond merely translating words from one language to another by applying sophisticated linguistic analysis to the text and selecting the most likely words and sentence structures from corpora that were previously translated texts (Korošec 2011). This simply means that MT is a computer software that automatically translates texts from one natural language into another without the involvement of a human (Baker & Saldanha 2009, P.7).

Furthermore Hutchins & Somers (1992:3), defined “machine translation as “computerised systems responsible for production of translations from one natural language into another, with or without human assistance”. It is also referred to as mechanical and automatic

translation. It cannot be observed as a field in its own right since "it takes from linguistics, computer science, artificial intelligence, translation theory" and is dependent on their principles. The idea behind machine translation is the full automation of the translation process. However, there is, of course, a significant difference between an ideal and the reality that is, between what machine translation should be and what it really has to offer. The field of MT has been subjected to different studies since its inception. The main motif for the development of machine translation systems was the opinion that qualified human translators were "hard to find, expensive, and slow" (Slocum, 1985:111), an opinion that is still present in the industry.

Machine translation (MT) has emerged as a powerful tool with the potential to bridge language barriers and foster global communication (Hu et al., 2023). By incorporating African languages into MT systems, we can unlock a vast amount of digital content, currently dominated by English and other colonial languages (Abdul-Rauf et al., 2021). This shift will make knowledge and information more easily accessible to Africans in their own languages, combating the marginalisation of these languages .Additionally, it will foster intercultural understanding and appreciation while amplifying African voices on the global stage (Thiao et al., 2023). The democratisation of information through this process will empower individuals who may not be proficient in colonial languages (UNESCO, 2021). It will equally open up opportunities for Africans to actively participate in global conversations, share their unique perspectives with a broader audience, and contribute to enriching of linguistic diversity worldwide (Alegi et al., 2022).

The underrepresentation of African languages in the digital space has created a digital language divide, limiting access to information and resources for speakers of African languages. Despite Africa's renowned linguistic diversity, with over 2,000 languages spoken on the continent, these languages are significantly underrepresented in the digital world (Ethnologue, 2021). As Owolabi (2017) notes, this has affected their visibility in today's globalised world.

According to Wolff (2000:345), "African languages hold a reservoir of knowledge and culture, yet they remain on the periphery of the information technology revolution" (Wolff 2000 p. 345). This observation underscores the necessity for technological advancements, such as machine translation, to be leveraged to benefit the multitude of languages spoken on the continent.

Machine translation can significantly facilitate cross-lingual communication and promote linguistic diversity by enabling speakers of different languages to understand each other's content (Och et al., 2003). It holds the potential to be a significant driver for the promotion of national African languages. By making these languages more accessible in the digital sphere, machine translation can enhance their utility and relevance (Abate et al., 2013, p. 98).

In the digital realm, African languages face marginalization. Machine translation offers a powerful means to address this disparity, fostering linguistic diversity and safeguarding cultural heritage. By increasing the use of machine translation for national African languages, we can significantly enhance their digital presence. As Echeruo and Onwurah (2022:14) assert, "greater visibility of African languages online can foster a sense of pride and encourage wider usage." This heightened visibility is crucial for revitalizing national African languages and safeguarding cultural heritage, especially given that many languages worldwide face extinction, whereas others are endangered to varying degrees"(Etim, 2016,p.12). Therefore, preserving languages is an essential undertaking, and all stakeholders must work towards promoting national languages through advanced language technologies. This study, therefore, seeks to investigate the role of machine translation in this context, exploring how it can be strategically employed as a tool for social cohesion and cultural sustainability.

Statement of the Problem

The curricula at the Advanced School of Translators and Interpreters (ASTI), University of Buea and the Pan-African University Translation, Interpreting and Intercultural Communication (PAUTRAIN), primarily focus on translation from and into colonial languages such as English, French, Spanish, and German. This focus reflects a broader trend within translation studies, which often emphasises translation from and into European languages due to their widespread use and significant global influence. However, it neglects the rich linguistic diversity and untapped potential of national African languages. Research in this area, particularly concerning machine translation remains limited due to a lack of fluency and translation expertise in these languages among many students. This study therefore seeks to bridge this gap and contribute to the knowledge base of national African languages from a translational perspective and provide valuable references for future researchers.

Research Questions

This study aims to address the following research questions:

1. What is the role of Machine translation in the promotion of national African languages?
2. What are the challenges of using machine translation for the promotion of national African languages?
3. How can machine translation be optimised to promote national African languages?

Objectives of the Study

The objectives of this study are to:

1. Investigate the role of machine translation in the promotion of national African languages.
2. Identify and analyse challenges of using machine translation for the promotion of national African languages.
3. Propose strategies for optimising machine translation for the promotion of national African languages

2. LITERATURE REVIEW AND THEORITICAL FRAMEWORK

This section probes into key concepts of the study, examines the works of other authors in the areas as well as some theories that underpin the study. The following concepts have therefore been reviewed:

Translation

Etymologically, the word ‘translation’ means ‘to transfer’, which means ‘to carry across’.Translation is the movement of a message from source language into target language. Translation generally comprises of three key aspects: translation as a profession, which describes the role, task and duty of a translator and the ethics of translation. Translation as a process which consist of converting content from the source text to the target text. Translation as a product which refers to the text that has been translated (the end product of the translation process).

In line with this premise, translation has been defined in many ways by different scholars with them holding various ideas and opinions on it. Among the different proponents of translation are prominent scholars such as Vinay and Darbelnet, Catford, Nida and Taber and Newmark whose contributions have shaped contemporary understanding of translation.

This section notably explores the definitions of Cicero (106–43 BCE), Horace (65-8 BC), Catford (1965), Vinay and Darbelnet (1973), Newmark (1988), as well as Nida and Taber (1974).

The study of translation can be traced back to ancient Rome, where scholars such as Cicero (106-43 BC) and Horace (65-8 BC) laid the groundwork for translation theory. Cicero, in his works, emphasized the importance of translating meaning and not just words, advocating for a style that captures the spirit of the original text. Similarly, Horace (65-8 BCE) proposed a more flexible approach to translation, suggesting that translators should aim for "adaptability" rather than strict adherence to the source text. He believed that translators should prioritize conveying the overall effect and emotional impact of the original work, even if it required some degree of creative interpretation.

Catford (1965, p.20) defines translation as 'the replacement of textual material in one language (SL) by equivalent textual material in another language (TL)'. His definition of translation focuses on textual material and its equivalent, which is crucial in the translation process. This is because, in translation, translators do not only render the meaning between languages but also attempt to replace SL meaning with an equivalent TL meaning so as to fulfil the same purpose of the SL. This means that, Catford (1965:20) emphasizes the linguistic view of translation but fails to consider extra-linguistic components notably the skopos context, culture and above all the receptor. This limitation highlights the complexity of translation, where mere linguistic equivalence may not suffice to achieve effective communication.

Vinay and Darbelnet (1973:20) define translation as "le passage d'une langue [A] à une langue [B] pour exprimer une meme réalite X". [the movement from one language A to another language B to express the same reality X] (my translation).

By this definition, they see translation as interlingual (d'une langue A à une langue B) hence they do not acknowledge the fact that translation can also be intralingual. Additionally, not enough information is provided on what happens during the translation process. The term 'passage' in the definition of Vinay and Darbelnet is rather vague and does not provide clarity on the translation process, leaving gaps in understanding how meaning is negotiated across languages.

Nida and Taber (1974:12) advance the discussion by defining translation as "reproducing into the receptor language, the closest natural equivalence of the source language message first in terms of meaning and secondly in terms of style". By this definition, the target reader should receive the same effect the SL reader was deemed to have received. The definition also highlights meaning and distinguishes meaning and style as objects of translation thereby shifting the focus of translation from a linguistic perspective to the target audience and target audience culture to reproduce the same natural effect of the ST in the TT. This means that the words and structure of the source language should not be given importance. Rather, the message, meaning, or idea must be reproduced in the receptor language. According to Nida, the word 'natural' in translation covers three areas: '(1) the receptor language and culture as a whole, (2) the context of the particular message, and (3) the receptor language audience' (Nida 2000: 136). From this point it can be inferred that among the equivalents which may be

found in receptor language, only one of them is the most used among the speakers of that language.

This equivalent can be considered the most natural. Finally, 'first in terms of meaning, secondly in terms of style' suggests that in non-literary translations, translators must prioritize reproducing the meaning of the source language text. The style of the text thus comes second in importance. This is applied both at word and sentence levels.

Newmark (1988:5) defines translation as "a craft consisting in the attempt to replace a written message and/restatement in one language by the same and/or statement in another language (Newmark, 1988, p. 5).This definition positions translation as both an art and a science, requiring a balance of linguistic knowledge and creative skill. As a science, translation includes of knowledge and assessment of the facts and the language that describes them. As a skill, translation contains the appropriate language and acceptable usage which differentiates good writing from a bad one.

Newmark further posits that effective translation requires more than basic linguistic skills; it necessitates a deep understanding of the cultural, social, and contextual factors that shape communication. This assertion aligns with the growing recognition of the role of cultural competence in translation, emphasizing that translators must be adept at navigating the cultural landscapes of both the source and target languages (Newmark, 1988:17). Based on this statement, the context of the text is important in translation because it shows that as a good translator it is important to have more than the basic skills in translation and also that translation requires further knowledge especially for translating literary works.

Baker (1992:12) provides a significant contribution to the field by emphasizing the role of context in translation. She argues that translation is not merely a linguistic exercise but a complex process influenced by social, cultural, and political factors. She introduces the concept of "translation shifts," which refer to the changes that occur during the translation process due to linguistic and cultural differences. Her insights have fostered a deeper understanding of the dynamic nature of translation, highlighting how context shapes the translator's decisions.

Pym (2010:2) introduces the concept of "translation as a social activity" .He posits that translation is not solely a linguistic endeavor but a socially embedded practice that reflects power relations and cultural exchanges. Pym's perspective emphasizes the importance of understanding translation within its broader social context, challenging traditional views that isolate translation as a technical skill. This approach encourages a more interdisciplinary understanding of translation, incorporating insights from sociology, anthropology, and cultural studies.

The various definitions of Catford, Vinay and Darbelnet, Newmark, and Nida and Taber reveal both similarities and differences in their approaches to understanding translation.They all define translation as an interlingual activity; which involves translating from one language into another language. Nida (1974:12) and Newmark (1988:17) built their theories on a scientific and correct understanding of translation from different angles and at different levels. Comparing these definitions gives insight into translation equivalence between different languages and cultures.

Catford (1965,p.20) and Newmark (1988) both conceive translation merely as the transfer of the message and do not take into account all the paratextual aspects of translation which are the key factors into consideration by the translator in order to carry out an effective communication and message rendering of a source language text into a target language text.

This study adopts Nider and Taber's (1974, p.12) definition of translation because their definition focuses on the target audience and conveying the source language message into the target language as naturally as possible. This definition appears to be the most appropriate for the context of this study due to its emphasis on naturalness and audience reception.

Naturalness is a major component of this study which seeks to explore the role of machine translation in the promotion of national African languages.

2.1.2 Language

Language, a medium of communication and cultural exchange in society, has long been a subject of scholarly exploration and debate for centuries. Its complexity and significance in shaping human thought, culture, and society, have led to many definitions and theoretical frameworks. Defining language concisely and comprehensively has proven challenging, with scholars emphasizing different aspects. They have defined language in various ways, emphasizing different aspects, and each perspective contributes to a more comprehensive understanding of this intricate phenomenon.
Ferdinand de Saussure (1916, p. 67) a pioneering Swiss linguist, laid the foundation for modern linguistics with his structuralist approach. He defined language as a system of signs where meaning is derived from the relationships between these signs rather than their inherent qualities (Saussure, 1916, p. 67) .He introduced the concepts of the *"signifier"* (the form of the word or sound) and the "*signified"* (the concept it represents), highlighting the arbitrary nature of the linguistic sign. Saussure posited that language is a product of collective agreement among its users, thus highlighting its social nature. His ideas on the structural nature of language propelled further inquiry into how linguistic signs function within a cultural context. His work has been critiqued for its focus on structure at the expense of considering language's dynamic and evolving aspects, which are influenced by cultural and social contexts over time. Furthermore, the binary division between signifier and signified has been challenged for oversimplifying the dynamic relationship between language and meaning.

Following Saussure, Sapir (1921, p. 8) contributed significantly to our understanding of language as a human-centric communicative tool. He defined language as "a purely human and non-instinctive method of communicating ideas, emotions, and desires by means of voluntarily produced symbols" (Sapir, 1921, p. 8). This definition places a strong emphasis on the voluntary nature of language and its auditory forms, while also recognizing the human effort involved in communication. However, it is important to note this definition is somewhat incomplete because ‘ideas, emotions and desires’ are not the only things language communicates. The term language covers many implication such as body language, sign language and animal communication. Additionally, Sapir's emphasis on "voluntarily produced symbols" raises questions about the role of instinct and social conditioning in language use, suggesting that the relationship between thought and language may not be as straightforward as he proposes.
Chomsky (1965, p. 12) revolutionized linguistic theory with his introduction of generative grammar. He argued that humans possess an innate, genetically determined capacity for language acquisition, which he termed the Language Acquisition Device (LAD). Chomsky proposed a "universal grammar"—a set of inherent linguistic principles shared across all human languages (Chomsky, 1957,
p. 13). This perspective shifted focus from surface structures to underlying rules and principles that govern language. His contribution has advanced our understanding of language acquisition and structure.

However, his emphasis on innate mechanisms underestimates the role of social interaction and environmental factors in language development. Furthermore, the concept of universal grammar has been questioned for its applicability across the diverse languages of the world.

Stork and Widowson (1974, p. 45) in their exploration of language as a social entity, they asserted that "all languages are highly developed and sophisticated communication systems" that meet societal needs and facilitate personal expression (Stork & Widowson, 1974, p. 45). They emphasized that language cannot exist in a vacuum, as it serves as a tool for individuals to express emotions and exchange information. Their perspective underlines the significance of language in fostering interpersonal relationships and cultural heritage, suggesting that language is deeply intertwined with social identity and community. Although Stork and Widowson recognize the social and cultural dimensions of language. However, their definition does not delve into the power dynamics inherent in language use. Their assertion that all languages are sophisticated communication systems may overlook the challenges faced by minority languages and the socio-political factors that can marginalize certain languages within broader societal contexts.

Expounding on the structural aspects of language, Katamba (2004, p. 15) described language as a "system of signs used to communicate," which includes both spoken and written symbols (Katamba, 2004, p. 15). He stressed the importance of rules and conventions that govern the use of linguistic symbols, thus reinforcing the structured nature of language. This definition draws attention to the shared understanding necessary for effective communication among speakers, echoing Saussure's notions of social agreement. While Katamba's definition is concise and emphasizes the systematic nature of language, nonetheless it does not fully account for the fluidity of language in everyday use. The emphasis on rules and conventions suggest a rigidity that does not reflect the adaptability and evolution of language in response to social and cultural changes.

UNESCO (2005, p. 4) defined language as a fundamental medium of communication—the basis by which individuals and communities express themselves, whether through oral traditions or written texts. This definition highlights the cultural and social implications of language, recognizing its role in identity formation and community cohesion (UNESCO, 2005, p. 4). By emphasizing the significance of language beyond mere communication, this perspective provides a broader understanding of its impact on cultural identity. However, the definition may not address the complexities of multilingual societies, where linguistic interactions occur across different cultural and contextual backgrounds.
Sofo et al. (2013 p. 45) introduced psychological dimensions into the discourse on language by stating that individuals who acquire language symbols can effectively encode and decode messages in any language they learn (Sofo et al., 2013, p. 45).This definition highlights the cognitive processes involved in language acquisition and comprehension, emphasizing the interplay between language and thought. This cognitive perspective has become increasingly important in understanding how language functions in the mind and its role in shaping human experience. However it has neglect the socio-cultural aspects of language use. Additionally, it assumes a degree of universality in language acquisition that may not apply to all individuals or linguistic communities.

The study of African languages, has gained prominence, with scholars such as Ngugi wa (1986, p. 14) advocated for the use of indigenous languages in literature and education, arguing that they are essential for cultural identity and powerful tools for decolonization. He emphasized the importance of fostering African languages as a means of countering colonial legacies and promoting cultural heritage. He further posited that the imposition of colonial languages contributed to the erosion of African cultures, making the reclamation of native languages a crucial endeavor for African nations (Ngugi, 1986, p. 14). While Ngugi's advocacy for indigenous languages is significant contribution to the discourse. Nevertheless,

his emphasis on language as a tool for decolonization may overlook the practical challenges of promoting indigenous languages in contemporary societies, where global languages often dominate educational and economic landscapes. Additionally, his critique of colonial languages might overlook their potential for fostering intercultural communication and access to global knowledge.

Wolff (2006, p. 60) have contributed to the understanding of African linguistic diversity by documenting and analyzing various language families across the continent. His work illustrates the intricate relationships between language, culture, and identity in African contexts, emphasizing the necessity of recognizing and preserving these languages as integral to human heritage (Wolff, 2006, p. 60). While documentation of African languages is invaluable, nonetheless, his emphasis on preservation efforts might benefit from a deeper exploration of how African languages can adapt to contemporary challenges, such as technology and globalization.

The study of language encompasses diverse perspectives from ancient to contemporary scholars. Each contribution—from Saussure's structuralism to cognitive linguistics—has deepened our understanding of how language functions within society. The contributions of scholars to the study of African languages have been particularly significant, shedding light on the diversity, richness, and historical depth of linguistic expression across the African continent. As scholars continue to investigate these dimensions, it becomes increasingly clear that understanding language requires an appreciation for its multifaceted nature as both a cognitive tool and a social phenomenon.

2.1.4 Language Promotion

The concept of language promotion has evolved significantly over time, reflecting broader socio-political movements and cultural shifts. Its roots can be traced back to the 19th and early 20th centuries, a period marked by the rise of nationalist movements and an increasing appreciation for linguistic diversity as a cultural asset. However, it was not until the latter half of the 20th century that language promotion emerged as a distinct field of study and practice. The establishment of organizations such as UNESCO in 1945 underscored the need for preserving linguistic diversity as part of cultural heritage, leading to the emergence of linguistic rights movements advocating for the recognition and support of minority languages.

Fishman (1966) is one of the pioneering figures in this field, a sociolinguist who introduced the term "language maintenance" in the 1960s. Fishman (1991) argued that language maintenance was essential for preserving cultural diversity and promoting social justice. He laid out the need for comprehensive language planning and policy that supports minority languages and multilingualism. He proposed a framework for language maintenance that included community involvement, educational initiatives, and governmental support, asserting that without proactive measures, many languages would continue to decline. His work highlights the importance of viewing language promotion as a dynamic process that involves not just the preservation of language as a relic of the past but also its active use in contemporary contexts. This perspective shifts the focus from mere survival to the promotion of languages as living, evolving tools of communication that contribute to cultural identity and social cohesion. However, critics such as Paulston (1994) have pointed out that Fishman's framework, while comprehensive, is heavily theoretical and lacks practical guidance for implementation in diverse socio-political contexts, especially in regions with limited resources for language policy development.

Skutnabb-Kangas (2000) made profound contributions to the understanding of language rights and their relationship to language promotion (2000, p. 84). She advocated for linguistic

human rights, emphasizing that everyone has the right to use their native language in various domains of life, including education, public discourse, and cultural expression. She argued that language promotion should be seen as a fundamental part of social justice movements, as language is deeply intertwined with identity and self-determination. Her work encourages policymakers to consider language promotion not just as an educational or cultural issue but as a human rights concern. By framing language promotion within the context of rights, Skutnabb-Kangas helps to elevate the importance of linguistic diversity in global discussions about equality and justice. Skutnabb-Kangas's contributions have been widely acknowledged, however scholars like Ricento (2006) have argued that framing language promotion primarily as a rights issue risks oversimplifying the complex sociolinguistic dynamics that influence language use. For instance, socioeconomic factors and globalization often lead communities to prioritize dominant languages over their native tongues, irrespective of rights-based arguments.

Hornberger (2006) further refined the understanding of language promotion by emphasizing the significance of community-driven efforts in language promotion. She argued that such initiatives should be culturally responsive and contextually relevant, arising organically from the communities that speak these languages rather than being imposed from above. This grassroots approach has led to a more nuanced understanding of language promotion, considering the social, political, and historical contexts in which languages exist. However, M origin (2010, p. 112) argued that while community-driven initiatives are crucial, they may lack the necessary resources and visibility to effect substantial change if governmental did not support.

Diop (1923) was among the first African scholars to advocate for the use of African languages in education and governance, arguing that the continued reliance on colonial languages undermines African identity and development. Diop emphasized the importance of integrating African languages into modern educational systems to foster cultural pride and intellectual growth. Similarly, Ngugi wa (1938) has passionately advocated for decolonizing language practices in Africa. Ngugi (1938) advocated for the active use of African languages in literature, education, and public discourse as a means of reclaiming cultural identity and resisting linguistic imperialism.

In recent years, scholars have expanded upon earlier frameworks by incorporating perspectives on the role of globalization and technology in language promotion. For instance, Mufwene (2001) discussed how globalization has affected linguistic diversity by creating new dynamics between dominant languages like English and local languages across Africa. He argued that while globalization poses threats to minority languages, it also offers opportunities for revitalization through digital platforms. Chen (2013) echoed this sentiment, asserting that the internet offers unprecedented opportunities for minority languages to thrive by enabling speakers to connect and share resources. Additionally, research by Hinton et al. (2018) underscored the role of technology in facilitating language learning and preservation efforts among younger generations, demonstrating that digital tools can enhance access to resources for minority languages, fostering environments where these languages can coexist with global lingua francas.

Translation from and into National African languages

Translation from and into national Africa languages is vital in preserving cultural identity and heritage, particularly in linguistically diverse regions such as Africa, where over 2,000 distinct languages exist (Ethnologue, 2021). National African languages encapsulate unique linguistic features—vocabulary, grammar, and idiomatic expressions—that reflect specific cultural contexts (Munday, 2016). Translation is essential for facilitating communication and

promoting the preservation of these languages, especially as many African languages are classified as endangered due to limited resources and dwindling numbers of speakers (UNESCO, 2010).

Translation projects are crucial for language preservation as they create written materials and encourage wider usage. Goulah (2016) asserts that "translation offers a powerful tool for decolonization by enabling the dissemination of knowledge and empowering African languages to reclaim their rightful place in global discourse." Mphahlele (1988:32) emphasizes that "the rich tapestry of African languages represents a unique cultural heritage, and translation serves as a bridge to ensure its survival and dissemination" (1988:32). Prominent figures in African studies have highlighted translation's significance in cultural preservation and intellectual exchange. Ngũgĩ wa (1986) translating literature into indigenous languages to promote cultural identity.

Pym (2010) underscored the significance of translation in the context of globalization, advocating for including African languages in the broader translation studies discourse. His research highlighted the potential of translation to empower marginalized languages and promote multilingualism within African societies.

Scholars such as Achebe (1958)**,** a Nigerian novelist and critic, emphasized the significance of translating African literature into European languages to promote intercultural understanding and challenge Western stereotypes. Gyasi (2023) noted that translators play a crucial role in cross-cultural communication, allowing diverse audiences to appreciate African cultures through translated works. Translation scholars such as Basil, Davidson et al. (2013) have contributed significantly by translating African texts into European languages, showcasing the continent's rich cultural heritage. Recent studies by Oloidi (2020) argued that translating educational materials into local languages enhances learning outcomes and accessibility, aligning with Banda's (2009) discussions on language development and policy implications in Africa.

Recent studies by Oloidi (2020) focused on the role of translation in education, arguing that translating educational materials into local languages can enhance learning outcomes and accessibility. This perspective aligns with the views of Banda (2009), who discussed the implications of translation for language development and policy in Africa.

However, translators face challenges due to linguistic diversity and the need to navigate different cultural contexts. Prah (2006) highlighted the complexity of translating national African languages due to linguistic diversity and the need for translators to navigate between different cultural contexts**,** stating that "translating national African languages requires a deep understanding of not just the words but also the cultural nuances embedded within them.**"** Wa Thiong'o (1986:34) added that "the translation of African literature presents a unique challenge due to the richness of oral traditions, proverbs, and figurative language". Skilled translators must navigate these complexities to ensure the target text conveys the essence and cultural nuances of the original work. "A successful translation of African literature goes beyond mere linguistic accuracy; it requires a deep understanding of the cultural context and the ability to recreate the original power of expression" (wa Thiong'o, 1986, p. 34).

To effectively translate from and into national languages, translators must employ various strategies such as paraphrasing or functional equivalence to maintain original meaning (Newmark, 1988). Coker and Afolayan (2014:p.115-
131) emphasized the importance of considering orality when translating African oral literature: They argued that "translators must be sensitive to rhythmic patterns and storytelling techniques unique to African oral traditions to ensure an accurate representation in translation".Translation is thus a vital field that promotes cultural exchange, enhances education, and empowers marginalized languages. As scholars advocate for including these

languages within translation discourse, there remains significant potential for enriching communication across linguistic boundaries.

Machine Translation (MT)

Machine Translation (MT) is a sub-genre of Artificial Intelligence focused on the automatic translation of texts between natural languages without human involvement (Sager, 1994 as quoted by Quah, 2006, p. 8; Hedblom, 2010, p. 1). This process, also referred to as Fully Automated Machine Translation (FAMT), uses computers to perform translation tasks (Paul Shih C, 2009, p. 136).

MT can be categorized into four types: Rule-Based Machine Translation (RBMT), Statistical Machine Translation (SMT), Hybrid Systems, and Neural Machine Translation (NMT) (Kadiu, 2019, p. 83-84).

Rule-Based Machine Translation (RBMT) emerged in the 1970s and continued until the 1990s. It relies on linguistic information about source and target languages retrieved from bilingual dictionaries and grammars covering the main semantic, morphological, and syntactic regularities of each language respectively" (Okpor, 2014:160). Rule-based translation engines perform translation using extensive lexicons with morphological, syntactic and semantic information and large sets of manually compiled rules, making them very labour-intensive to develop and maintain (Guy De Pauw, 2010). Rule-based machine translation engines may also employ a word dictionary with entries of source and target languages. What this implies is that incoming words get translated by making use of a dictionary.

The main downsides of rule based approach is small irregularities in the input can cause the algorithm to enter an infinite loop. For example, a human can easily look beyond "spelling mistakes," but the rule-based engine, which matches exactly all of the words or nothing, is unable to look beyond the error and try to see a probable solution.

Without a properly defined exit condition, the algorithm can end up in a never-ending cycle (EuroMatrix, 2012; Reese, 2015; Guy De Pauw, 2010).

However, a big advantage of this system is the syntactic and partially semantic analysis of both source and target languages, which makes RBMT appropriate for translating language pairs lacking parallel corpora. (Okpor, 2014:164). Notable RBMT systems include Lucy LT, Systran, and Apertium.

Statistical Machine Translation (SMT) developed in the 1990s and continued until the 2010s. SMT engines perform statistical analysis of bilingual text corpora to determine the most probable translations for sentences or phrases by analyzing their occurrences (Calzolari, Lenci & Zampolli, 2009).The core idea of SMT is that "every sentence in one language is a possible translation of any sentence in another language and the most appropriate is the translation that is assigned the highest probability by the system" (Okpor, 2014:163). In other words, each word or phrase from the source language is transferred to the target language as the input the system chooses as most probable in the assigned context. However, SMT performs well for languages that are structurally similar but fails whenever this is not the case (EuroMatrix, 2012; Guy De Pauw, 2010).

Hybrid systems emerged to address the limitations of RBMT and SMT.These systems combine the strengths of the two approaches to improve translation quality and performance (Okpor, 2014:164). "In some cases, translations are performed in the first stage using a rule-based approach followed by adjusting or correcting the output using statistical information. In the other way, rules are used to pre-process the input data as well as post-process the statistical output of a statistical-based translation system. This technique is better than the previous and has more power, flexibility, and control in translation." (Okpor, 2014:164).

The most recent and promising advancement in MT is Neural Machine Translation (NMT), which has been in development since the 2010s, employs neural networks—artificial units modelled after neurons in the human brain—to translate languages. Despite its name, NMT does not directly relate to the human brain. Instead, it uses artificial neural networks, computational units inspired by the way neurons in the human brain operate. These units activate based on stimuli received from other units and pass the stimuli along to other connections (Forcada, 2017, p. 292). NMT systems learn languages through extensive training data and continuously improve their performance over time (Forcada, 2017:292). Some of the examples of NTM systems include Google Translate, DeepL, Sockeye, OpenNMT, Neural Monkey, etc.

Recent advancements have introduced adaptive and interactive NMT. Adaptive refers to the system's ability to adapt to the translator's style, that is, to change in response to confirmed segments. It also means adapting chosen segments to the context of the whole document instead of taking into consideration only the preceding or succeeding words or the sentence-level context. Adaptive NMT systems take the context of the whole text into consideration before choosing equivalents for the final output.

The evolution of machine translation reflects significant advancements in technology and methodology over time. Each type of MT has its unique strengths and weaknesses that influence its application in various contexts.

Machine Translation and the Promotion of African National African languages

Machine Translation (MT) has garnered considerable attention in recent years, particularly for its potential to dismantle language barriers and foster cross- cultural communication. In Africa, where over 2,000 languages are spoken (UNESCO, 2019), MT holds unprecedented potential for bridging linguistic divides and facilitating global understanding. Smith et al. (2019, p. 12) highlighted the integration of machine translation technologies with initiatives to promote national African languages, asserting, "*By leveraging machine translation tools, we can bridge linguistic divides and empower speakers of minority languages to participate fully in the digital age*." However, realizing this potential, various challenges persist, necessitating innovative strategies to address the unique characteristics of national African languages ensuring that MT can effectively contribute to preserving linguistic diversity and enabling broader participation in the digital era.

As early as 1992 Hutchins and Somers (1992, p.35) noted that "African languages exhibit diverse grammatical structures and lexical peculiarities, making the development of accurate machine translation systems a complex task". This observation underscores the significant linguistic diversity in Africa and highlights the difficulties associated with creating comprehensive MT systems. Limited availability of parallel corpora and other linguistic resources has been a persistent issue, as Mahlakeng et al. (2014 p.28) pointed out: "The scarcity of parallel corpora for most African languages poses a major challenge for building statistical machine translation models". Additionally, Stephen Kiilu (2014, p. 156) emphasized that the lack of adequate human translators to generate data for MT systems further compounds these challenges.

Recent efforts have sought to address these limitations through a variety of approaches. The MMTAfrica initiative represents a significant milestone in developing a multilingual translation system for six African languages (Fon, Igbo, Kinyarwanda, Swahili, Xhosa, and Yoruba) alongside two non-African languages (English and French).Dossou (2022, p. 48) highlighted the effectiveness of transfer learning among African languages sharing similar sub-class, resulting in better translation quality. Moreover, the MMTAfrica Test Set has provided critical benchmarks and insights for future research, with innovative techniques

such as backtranslation yielding significant improvements in translation quality across various benchmarks (Dossou, 2022, p. 48).

Another notable initiative is the Masakhane Project, an open-source platform dedicated to developing MT systems for over 38 African languages. This initiative emphasizes participatory research and community engagement, enabling contributions from researchers without formal training. It has led to the creation of unique datasets and benchmarks while fostering a collaborative research environment.

Similarly, the OB Translate Initiative, founded by Emmanuel Gabriel, aims to translate over 2,000 African languages using deep learning. Gabriel (2024, p.
34) stressed the role of community involvement in data collection to ensure cultural and dialectal authenticity while highlighting the potential for job creation among language professionals. Meta's No Language Left Behind (NLLB) project further expands support to 55 African languages, significantly enhancing digital access for speakers of these languages. This initiative demonstrates a commitment to linguistic diversity and inclusion while aiming to improve communication and information accessibility across the continent.
Furthermore, platforms such as Google Translate and Apertium have incorporated several national African languages such as Swahili, Yoruba, Hausa, Wolof, Bambara, Lingala, Afrikaans, Luganda, Malagasy, Zulu, Shona, Susu, Fon, Oromo, Fulani and Zulu, among others, into their MT systems, promoting multilingual communication. Ife Adebara and her team have also contributed to this progress through SERENGETI and AfroLID, language identification programs supporting over 500 African languages and making the African market more accessible and promoting linguistic diversity.
Researchers like Koehn (2010, p. 75) and Martinus and Abbott (2019, p.145) have identified ongoing challenges despite these advancements. Koehn (2010, p.
75) highlighted the difficulty of translating idiomatic expressions while preserving nuanced meanings presents additional obstacles for MT systems .Martinus and Abbott (2019,p. 145) emphasized factors such as low resource availability, reproducibility issues, lack of focus on specific needs, and an absence of standardized benchmarks.
Strategies such as transfer learning, code-switching techniques, and multilingual models have been explored to overcome these obstacles. For instance, Kibirige et al. (2018, p. 23) demonstrated the effectiveness of transfer learning using English as a pivot language for Swahili and Luganda translations. Similarly, Njenga et al. (2019, p. 30) employed code-switching techniques to enhance MT systems for English-Kikuyu translation. According to Hewavitharana et al. (2019:22) "Multilingual models can help bridge the gap between under-resourced languages by leveraging information from related languages". For instance, Ngwenya et al. (2018:12) presented a multilingual model based on Google's Neural Machine Translation System (GNMT) that supports translations between English and five African languages: Afrikaans, IsiXhosa, IsiZulu, Setswana, and Yoruba.
The application of MT in domain-specific contexts has also shown promise. For instance, Mbogori et al. (2018) developed an MT system for translating legal documents from English to Kiswahili using parallel corpora extracted from Kenyan court cases and legislative databases. Osei-Tutu et al. (2019) proposed an MT system for Twi, news articles, leveraging both monolingual and parallel corpora from bilingual news websites to enhance performance in handling idiomatic expressions and metaphors common in Twi news articles. These domain-specific approaches have improved translation quality and addressed user-specific needs.
Recent research on Machine Translation and the promotion of national African languages has shown promising results in addressing challenges related to data scarcity through transfer

learning, code-switching techniques, and multilingual models while improving translation quality by focusing on specific domains or genres using domain-specific resources such as parallel corpora or monolingual corpora extracted from various sources like court cases or news websites respectively. As Mahlakeng et al. (2019:4) aptly noted, "Machine translation holds great potential for promoting multilingualism by providing access to information across language barriers". Nevertheless, further research is needed to address issues related to data scarcity, domain adaptation, and quality assurance to fully realize the transformative potential of MT for national African languages.

Theoretical Framework

A sound theoretical background must underpin every good research undertaken. The relevant theories for this study are presented below.

The Linguistic Theory of Translation

The linguistic theory of translation can be traced back to structuralism, which emerged in the early 20th century, significantly influencing the development of translation studies. Structuralism was characterized by its focus on the underlying structures of language, most notably influenced by the works of Ferdinand de Saussure (1916), often referred to as the father of modern linguistics. Saussure introduced concepts such as *langue* (language system) and *parole* (speech), which laid the groundwork for analyzing language as a structured system of signs.

The linguistic approach to translation became more formalized in the mid- 20th century, with figures such as Roman Jakobson, J.C. Catford, and Eugene Nida making significant contributions. These scholars emphasized the role of linguistic elements in translation, advocating for methods that account for syntax, semantics, phonology, and morphology in transferring meaning from one language to another.

This theory considers translation as a purely linguistic operation based on a comparison of linguistic structures of source text (ST) and target text (TT). This approach emphasized that the common denominator of both literary and non- literary translation is the linguistic element and translation must be defined in terms of language.

In the linguistic approach, there is little attempt to link meaning within language to actual language use in the outside world. Also, this theory viewed translation as an absolute transfer of meaning, suggesting that a specific SL expression can be directly translated into a TL expression. However, as noted by Baker (2011), translation is inherently relative; it involves negotiation and adaptation to fit the cultural and linguistic norms of the TL. This perspective recognizes that no two languages express the same situation in the same ways, and translation often requires a more nuanced understanding of meaning that goes beyond direct equivalence.The neglect of communication and sociolinguistic aspects of translation led to the development of sociolinguistic or communicative theory of Translation.

The Linguistic Theory of translation is relevant in this study as it examines the structural and linguistic aspects of translation, providing insights into how machine translation systems can be designed to effectively promote national Languages through accurate linguistic representation and cultural adaptation.

The Sociolinguistic Theory

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Technology Acceptance Model (TAM)

This model was developed by Fred Davis in 1986. The Technology Acceptance Model (TAM) is a widely used theoretical framework that explains how users accept and use technology. According to Davis (1986), TAM is based on the theory of reasoned action and posits that perceived usefulness and ease of use are key determinants of an individual's intention to use a technology, influencing actual usage. TAM focuses on two key factors: perceived usefulness and ease of use.

Perceived Usefulness (PU): The degree to which a user believes the technology will enhance their job performance or productivity (Davis, 1989).

Perceived Ease of Use (PEU): The extent to which a user perceives the technology as effortless to learn and operate (Davis, 1989).

According to Davis (1986), the link between the intention to use an information system and perceived usefulness is more potent than perceived ease of use. This suggests that the factor which influences users the most is the perceived usefulness of a tool. Davis (1986) states that the success of an information system depends on the intention to continue using the system.

In promoting national African languages through machine translation, the TAM can provide valuable insights into how users, such as language speakers and translators, perceive and adopt this technology. This can help researchers, policymakers and developers of MT tools to create solutions that are not only accurate but also user-friendly and cater for users with varying technical expertise for the promotion of these languages through this technology.

Empirical Review

This section reviews previous empirical works relating to the Role of Machine Translation in the Promotion of National African languages.

To begin with, Ndebele (2014) seeks investigated the challenges hindering the use of indigenous African languages in South African higher education. The research aimed to identify the factors contributing to the marginalisation of these languages within universities.

Ndebele employed a qualitative research design using semi-structured interviews and document analysis. The interviews targeted language practitioners in South African universities to understand how they use technology in relation to Indigenous African languages. Documentary sources included journal articles on ICT products, institutional websites, and project reports relevant to the research topic.

The research revealed several factors contributing to the marginalisation of indigenous African languages in higher education. These factors include negative attitudes towards these languages, lack of terminology, identity issues, poor language policies, and inconsistent writing systems. The study also highlighted that indigenous African languages are often used as reference languages rather than as subjects of comment. The researcher emphasised the importance of co-existing indigenous African languages and English within higher education to benefit of all students and their societies, while recognizing the significance of English in the era of globalisation.

This research shares similarities with the current study as it focuses on National Languages and addresses the challenges of integrating them with information communication technology (ICT). However, there are also notable differences. While the work under discussion investigated the language problems associated with the low profile of indigenous African languages in South African higher education institutions, the current research aims to explore the role of machine translation in promoting national languages. The geographical locations of the studies also differ. In terms of data collection, this study employed semi- structured interviews and document review, while the current research employed questionnaires and interviews. Furthermore, the specific research questions guiding each study differed.

Nwafor and Andy (2022) conducted a study titled “A Survey of Machine Translation Tasks on Nigerian Languages.” This research focuses on exploring the current state of machine translation research on Nigerian languages, emphasizing neural machine translation techniques. The primary objective of the survey was to assess the advancements and challenges in machine translation for Nigerian languages.

The methodology employed in the study involved the utilization of MENYO-20k, a dataset comprising texts in English and various Nigerian languages Igbo, Yoruba, Hausa, and Pidgin), containing over 20,000 sentences The research revealed several factors contributing to the marginalisation of indigenous African languages in higher education. These factors include negative attitudes towards these languages, lack of terminology, identity issues, poor language policies, and inconsistent writing systems. The study also highlighted that indigenous African languages are often used as reference languages rather than as subjects of comment. The researcher emphasised the importance of co-existing indigenous African languages and English within higher education to benefit of all students and their societies, while recognizing the significance of English in the era of globalisation.

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The main similarity between this research and the present study is the focus on National Languages and the potential use of machine translation to promote them.

However, there are differences between the work under discussion and the current study. While this research is geographically limited to South Africa, the current research is focused on Cameroon, specifically the Advanced School of Translators and Interpreters (ASTI). The main objective of the research in question aimed to preserve Indigenous languages through technological strategies, which differs from the present study, which aims to explore the role of machine translation in the promotion of national languages.

Ouily, Sabane et al. (2024) conducted a study titled "Neural Machine Translation for Mooré, a Low-Resource Language." This research aimed to develop an automatic translation system for Mooré, a national African languages of Burkina Faso. By improving communication between Moore and French speakers, the system could enhance linguistic inclusion in administrative, educational, and media contexts.

The researchers employed a corpus-based approach, utilizing existing resources such as the Jehovah's Witnesses' Bible (Mooré-French), the Universal Declaration of Human Rights (Mooré-French), and a Mooré-French dictionary. This corpus was pre-processed for analysis.

The study trained two machine translation models using the Transformer architecture. The research findings indicated that the models achieved an average BLUE score of 44.82 for automatic translation from Mooré to French on the collected data. The research is ongoing, with efforts focused on optimizing the models and developing a user-friendly web application for public use.

This research shares one notable similarity with the present study in terms of its focus on using machine translation to promote national African languages.

However, it should be noted that the studies are conducted in different countries. In addition, they also differ in terms of methodology, while this study in question employed a corpus-based approach, this study collected primary data through questionnaires administered in class and online via Google Forms, as well as interviews. It is also important to highlight that while the research under discussion is an experiment, our study is purely academic research.

3 METHODOLOGY

This part presents the research design and data collection methods used to achieve the objectives of the study. It touches on the research design, sampling technique, data collection instruments, validity and reliability of research instruments, method of data processing and analysis, ethical considerations and conclusion.

Research Design

This study employed an exploratory research design, which integrates a mixed-methods approach, combining both quantitative (questionnaires) and qualitative (semi-structured interviews) as data collection methods. This approach allows for a more comprehensive understanding of the study compensating for any limitations inherent in each individual data collection method, thereby reducing biases and increasing the validity of the research findings.

Sampling Technique

This study employed a purposive sampling, a non-probability technique where participants were deliberately selected based on their relevance to the objectives of the study. In this case, the sample consisted of six (6) senior translation lecturers, and 100 M.A. students in translation studies at ASTI and PAUTRAIN.

Data Collection Methods

This study employed a mixed-methods approach, combining both quantitative (questionnaires) and qualitative (semi-structured interviews) as data collection instruments.

Questionnaire

The questionnaires were developed on the basis of research objectives and questions. Some of the questionnaire was printed and and physically distributed to the participants, while the remaining ones were administered through Google Form, an online survey tool.
The hypertext link generated by the Google Form served as a gateway for respondents to access the online platform and complete the questionnaires digitally. The same questionnaire was given to all respondents, which makes the data uniform and standard.

Semi-Structured Interviews

The semi-structured interviews were conducted with six (6) senior translation lecturers from ASTI (Advanced School of Translators and Interpreters), University of Buea.

Validity of Research Instruments

The validity of the data collection instruments used in this study was ensured through several measures. Firstly, all the questions included in the questionnaires were carefully designed to cover the research questions derived from the research objectives. This alignment between the research questions and the questionnaire content established content validity.
To further enhance validity, the study employed both questionnaires and semi-structured interview guides as research instruments. Using multiple instruments allowed for triangulation of the results, meaning that different methods were used to gather data and validate the findings.

Reliability of Research Instruments

The reliability of the research instruments used in this study relies on the honest responses provided by the respondents. The sample population was not subjected to coercion or threats,

ensuring that the answers obtained are reliable and valid. Additionally, the respondents were specifically chosen based on their expertise and knowledge, making them well-suited for the interviews. The instruments used in this research are considered viable and reliable because they have the potential to yield consistent results if administered independently by other researchers investigating the same issue. This highlights the replicability of the research findings, indicating that the instruments are reliable and capable of generating similar outcomes when used by others.

Method of Data Processing and Analysis

The data collected through the questionnaire was processed using an Excel spreadsheet, which was organized according to codes and stored for easy retrieval and analysis. This step ensured that the database was structured to identify individual participants' answers and perform checks in areas of uncertainty.

The coded data was then imported into SPSS (Statistical Package for the Social Sciences) through the Excel file for statistical analyses. This allowed for the application of various statistical tools to quantify and analyze the data. Once the validation phase was complete, the quantitative data was analyzed using descriptive statistical techniques. The results were presented in frequency distribution tables and charts, providing a visual representation of the data.

In addition to descriptive statistics, the study employed content analysis to analyse the qualitative data. Content analysis systematically examines textual data to identify themes, patterns, and recurring concepts. This approach enables the researcher to interpret the qualitative data within the context of the participants' experiences and perspectives, leading to a deeper understanding of the phenomenon under investigation.

Ethical Considerations

The golden rule of scientific research is that certain ethical values must be taken into account, such as participant anonymity, data confidentiality, voluntary participation, participant consent, and so on. This study, adhering to the principles of human subject research, respected these principles. In addition to these universal principles, this study also adhered to ethical propriety based on fairness, honesty, openness and respect for individual integrity, ensuring that the data remains unbiased and ethical. Respecting these cardinal principles ensures research integrity and the credibility of findings.

To ensure ethical conduct, participants were fully informed about the research objectives, context, and intended use of the data. The researcher was fully available to address any questions or concerns that arose. Participants were allowed to voluntarily decide whether to partake in the study or decline their participation. The respondents who willingly participated in this study were made aware that the research was solely intended for academic purposes and that no personal information would be used without their consent. This assurance of confidentiality and anonymity gave the respondents a sense of security. Emphasizing the principle of informed consent helped build trust, which was crucial for the success of data collection.

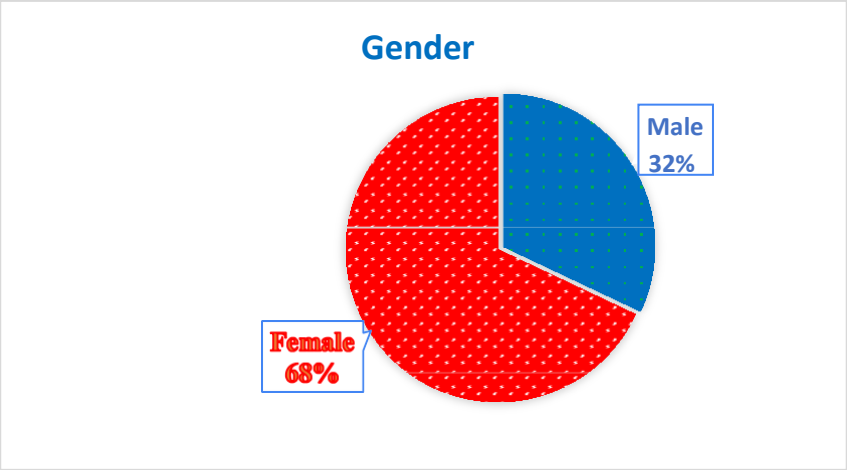
Additionally, the research acknowledged the contributions of prior scholars whose work influenced the study. These contributions are correctly cited and referenced in the bibliography.

4 DATA PRESENTATION AND ANALYSIS

This section presents, analyses and interprets the findings of the data collected in the field. The data has been presented and analysed based on demographic and preliminary information, as well as the research objectives.

Analyses of data collected through Questionnaires

The data collected from the questionnaire are presented and analyse in this section of the study.
Demographic information of respondents Figure 1: Gender distribution of participants



Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

A gender analysis of 100 M.A. students from ASTI and PAUTRAIN provided valuable insights into the gender distribution within these institutions. The participant demographics revealed that 68 students, accounting for (68%) were female, while 32 (32%) were male, highlighting a notable gender imbalance. This disparity can be attributed to the increasing number of female students pursuing higher education in translation studies compared to their male counterparts.

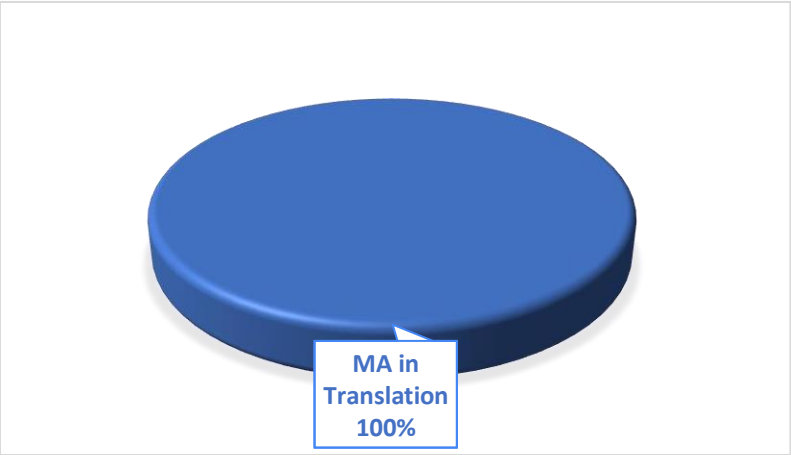
Table 1: **The breakdown of respondents by age group.**

S/N	Age Group	Frequency	Percentage
1	18-25	46	46%
2	26-35	49	49%
3	36-45	2	2%
4	46 and Above	3	3%
	Total	100	100%

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

The analysis of the age distribution among the respondents revealed that a significant portion of the participants (46) fell within the 18-25 age group, representing (46%) of the total sample. Furthermore, 49 respondents were aged between 26 and 35, accounting for (49%) of the participants. In contrast, only 2 respondents were in the 36-45 age range, comprising (2%) of the total, while 3 respondents were aged 46 and above, making up (3%) of the sample. These findings revealed that most students in translation studies at ASTI and PAUTRAIN belonged to the younger age demographics, with 95% of participants aged 35 or below.

Figure 2: Level of education of participants.

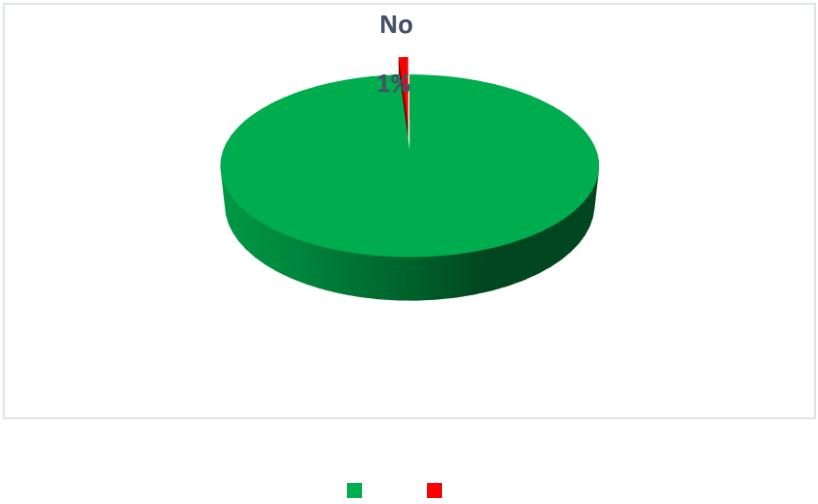


Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

The participants were exclusively MA students in translation studies. This targeted sample ensured that respondents possessed the requisite background in translation, including knowledge of Machine translation (MT) and translation from and into national African languages.

A. Other Preliminary information

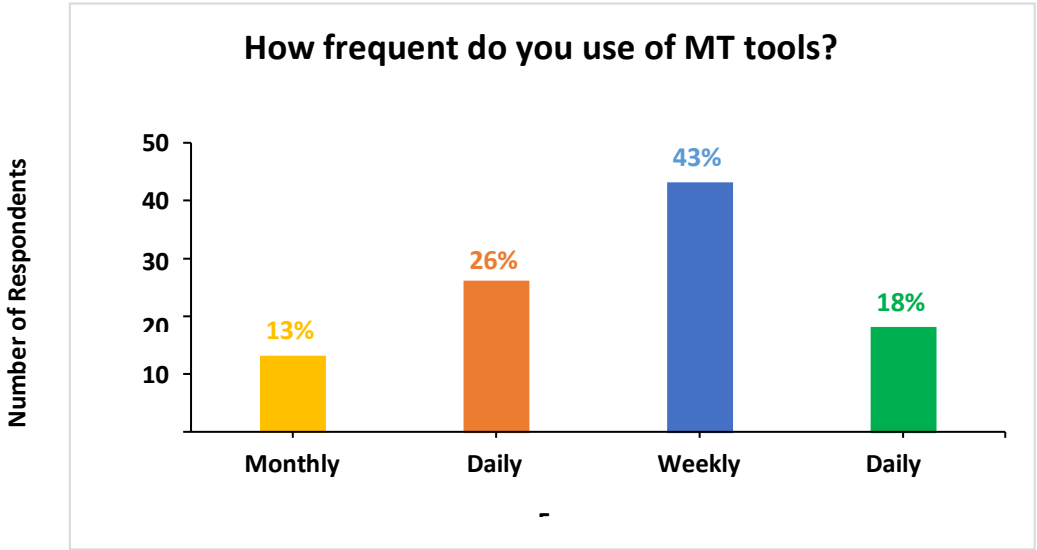
Figure 3: Participants' prior experience with Machine Translation (MT)



Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

The analysis revealed that (99%) of participants reported having prior experience with machine translation in their academic work, while only 1% indicated no such exposure. This high prevalence of machine translation familiarity among participants significantly enhances the credibility of this study, suggesting that they possess the requisite knowledge to provide valuable insights into the research topic.

Figure 4. Frequency of Machine Translation (MT) usage among respondents.



Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

The data showed a detailed breakdown of MT usage frequency among M.A. students at ASTI and PAUTRAIN. The largest group (43%) utilizes MT weekly, followed by (26%) who reported daily use. A moderate portion (18%) relied on MT only occasionally, while the least frequent users (13%) employed it monthly. The findings indicated that many students employ

machine translation regularly, most using it weekly or daily. The high frequency of usage suggests a significant degree of dependence on these technologies among the students.

Table 2: National African languagesof respondents.

S/N	National African languages	Frequency	Percentage
1	Abo (Dawala)	2	2%
2	Ako'ose	3	3%
3	Asante Twi	1	1%
4	Bafut	1	1%
5	Bamoun and French	1	1%
6	Bamoun, (Shu Pamem)	4	4%
7	Bassa	3	3%
8	Boki	2	2%
9	Bulu	2	2%
10	Ciluba	1	1%
11	Dii (also known as dourou)	1	1%
12	Douala language	1	1%
13	Pidgin	3	3%
14	Pidgin and French	11	11%
15	Eton	2	2%
16	Eton and Fe'fe'	1	1%
17	Eton and Fulfulde	1	1%
18	Ewondo	1	1%
19	Fang Beti	1	1%
20	French	6	6%
21	Malagasy	1	1%
22	French, English and Gbaya	1	1%
23	Fulfulde	1	1%
24	Ghomala	9	9%

25	Itaŋikom	1	1%
26	Kiswahili	1	1%
27	Lamnso'	3	3%
28	Mandinka	1	1%
29	Manguissa	1	1%
30	Massa	1	1%
31	Medumba	1	1%
32	Mejumba	4	4%
33	Mokpe	1	1%
34	Mooré	1	1%
35	Moundang	2	2%
36	Nda'a	1	1%
37	Ndebele	1	1%
38	Ngemba	1	1%
39	Ngiemboon (, Ngyɛmbɔɔŋ)	4	4%
40	Ngombale	1	1%
41	None	3	3%
42	Nufi	1	1%
43	Nweh	1	1%
44	Shona	1	1%
45	Shü mom	1	1%
46	Sousou	1	1%
47	Toupouri	2	2%
48	Yemba	4	4%
49	Yoruba, Igbo, Hausa	1	1%
	Total	100	100%

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

The data presented in the table highlights the linguistic landscape among the respondents, revealing a wide range of National African languages spoken and reflecting the linguistic

diversity within the population. The data revealed a linguistically diverse population with French 6 (6%), Pidgin 3 (3%), and both 11 (11%) being the most prevalent National African languages. This finding underscored a significant bilingual population, where some individuals reported speaking multiple National African languages.

In addition to French and Pidgin, the data also revealed a significant number of respondents speak other National African languagessuch as Ako'ose 3 (3%), Bassa 3 (3%), Ghomala (9%), Bamoun 3 (4%), Lamnso' 3(3%), Yemba 4 (4%), Mejumba 4 (4%), and Ngiemboon 4 (4%).Furthermore, the respondents reported several other National African languagesbesides those mentioned earlier, including Abo (Dawala) Asante Twi, Bafut, Bamoun, Boki, Bulu, Ciluba, Dii (also known as dourou), Douala, Eton, Fe'fe', Fulfulde, Itaŋikom, Kiswahili, Mandinka, Manguissa, Massa, Medumba, Mokpe, Mooré, Moundang, Nda'a, Ndebele, Ngemba, Ngiemboon, Ngombale, Nufi, Nweh, Shona, Shü mom, Sousou, Toupouri, Yemba, Yoruba, Igbo, and Hausa.Interestingly, only 3 (3%) identified with having no National Language. The coexistence of multiple National African languagessignifies the rich tapestry of linguistic heritage within the respondent community, underscoring the importance of understanding and preserving linguistic diversity.

B. Data analysis with regard to the Role of Machine Translation in National African languages.

Research Objective One: To investigate the Role Machine Translation in the promotion of national African National African languages

Table 4: Roles of Machine Translation in the Promotion of National African languages.

S/N	Main roles of MT in National African languages Promotion	Frequency	Percentage
1	Facilitating communication between different language speakers	71	36.78%
2	Encouraging language learning and cultural exchange	68	35.23%
3	Enabling the translation of important documents and information	46	23.83%
4	The third role would be the main if machine translation was possible in national African languages	2	1.04%
5	Development, revitalization and Preservation of national African languages	1	0.52%
6	Machine translation assist translators to work faster in order to meet deadline set by clients	1	0.52%
7	Promoting language inclusion and visibility on an international scale	1	0.52%

8	Preservation of the national African languages by digitalising it	1	0.52%
9	Enhancing the development of language	1	0.52%
10	Promoting national African languages	1	0.52%
	Total	**193**	**100%**

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

A survey of 100 respondents was conducted to determine the perceived roles of machine translation (MT) in the promoting of national African languages. The data revealed a consensus around its potential benefits. The most frequently cited role, identified by 71(36.78%) of respondents, was facilitating communication across linguistic barriers. This was closely followed by fostering language learning and cultural exchange with 68 (35.23%).Furthermore enabling access to crucial documents and information through translation was deemed significant by 46 (23.83%) of the participants. Interestingly, while a small percentage 2 (1.04%) believed other unspecified roles could become prominent with enhanced MT capabilities in national African languages, a recurring theme emerged in the remaining responses. Multiple respondents, albeit a small fraction each 1 (0.52% each), emphasized potential roles of MT in areas such as language preservation and revitalization through digitization, accelerating translation workflows, promoting language inclusion, and enhancing language development. The findings revealed a strong belief in the capacity of MT to contribute significantly to the Promotion of national African languages. While bridging communication gaps remains paramount, respondents acknowledged its potential in fostering cultural exchange, knowledge dissemination, and even language preservation and development.

Table 5. Potential benefits of using MT for promoting National African languages

S/N	Potential benefits of using Machine translation for the Promotion of National African languages	Frequency	Percentage
1	Increased accessibility to information for non-native speakers	77	26.55%
2	Enhanced cross-cultural understanding	65	22.41%
3	Preservation and revitalization of endangered languages	53	18.28%
4	Economic opportunities through language services	51	17.60%
5	Aiding in language learning	41	14.14 %
6	Working faster, Meeting deadlines, solving terminological issues	1	0.34%

7	Creating linguistic literary material	1	0.34%
8	Enhance cultural development	1	0.34%
	Total	**290**	**100%**

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

A survey of 100 M.A students at ASTI and PAUTRAIN explored the benefits of integrating machine translation (MT) for the Promoting of national African languages. The data revealed a focus on enhanced accessibility and cross- cultural understanding as primary advantages, with 77 (26.55%) of respondents highlighting increased information accessibility for non-native speakers, while 65 (22.41%) emphasized the potential of MT as fostering cross-cultural understanding.

Furthermore, the data revealed a link between MT and language preservation, learning, and economic prospects. 53 (18.28%) of participants believed MT could contribute to the preservation and revitalization of endangered languages. An additional 41 (14.14%) saw MT as a valuable tool for language learning. Interestingly, 51(17.60%) of respondents identified potential economic benefits stemming from MT-driven language services. While a minority of respondents 1(less than 1% collectively) pointed towards benefits such as increased work efficiency, problem-solving in specialized translation tasks, and potential contributions to literary creation and cultural development, these responses highlighted the diverse potential applications of MT in linguistic contexts. The overall perception underscored the potential of MT as a transformative tool in fostering linguistic diversity and cultural exchange.

Research Objective Two: To identify and analyse challenges of using Machine Translation for promoting national African languages.

Table 6: Main challenges of using MT for promoting national African languages

S/N	Main challenges of using MT for promoting National African languages	Frequency	Percentage
1	Language-specific nuances and cultural references	76	19.34%
2	Accuracy and quality of translations	75	19.08%
3	Lack of standardization in national African languages grammar and vocabulary	60	15.27%
4	Integration with local dialects and idiomatic expressions	55	14%
5	Limited training data for National African languages	51	13%
6	Lack of support for less widely spoken languages	48	12.21%

7	Security concerns related to data privacy	24	6.10%
8	The gap between tonal languages (African national languages) and Syllabic languages (European languages)	1	0.25%
9	Lack of reliable literature and linguistic database	1	0.25%
10	Non-existence of foreign cultural lexical elements in the local languages	1	0.25 %
11	Too many languages with minor or little differences and similarities that could be made one.	1	0.25 %
	Total	**393**	**100%**

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

This analysis summarized survey data from 100 M.A. students at ASTI and PAUTRAIN, focusing on their perspectives on the main challenges of using machine translation (MT) for the promotion of national African languages.

The most frequently cited concerns revolved around the accuracy and nuances of MT in the context of national African languages. Nearly 76 (19.34%) of respondents highlighted the difficulty in conveying language-specific nuances and cultural references, while 75 (19.08%) expressed concerns about the overall accuracy and quality of translations. This challenge is further compounded by the lack of standardization in grammar and vocabulary observed in many national African languages, as pointed out by 60 (15.27%) of the respondents. 55(14%) of respondents reported integration with local dialects and idiomatic expressions as a challenge that MT will face in accommodating regional variations and idioms while 24 (6.10%) of respondents expressed concerns about data privacy and security.

Other Challenges: Non-existence of foreign cultural lexical elements was raised by 1(0.25%) of respondents, indicating that some foreign cultural concepts lack corresponding terms in local languages. In addition, 1 (0.25%) of respondents, included the gap between national African languages and syllabic languages, limited training data for less spoken languages, the absence of reliable literature and linguistic databases, and the existence of numerous similar languages. The findings underscored the significant challenges associated with leveraging MT for national African languages promotion. Issues related to accuracy, linguistic complexity, data scarcity and security, standardization of the languages and technological limitations are particularly prominent. Addressing these challenges is crucial for unlocking the full potential of MT in supporting and revitalizing National African languages.

Table 7: Measures that can be taken to overcome the challenges of using MT for promoting National African languages

S/N	Measures can be taken to overcome the challenges of MT in promoting NL	Frequency	Percentage
1	Combining machine translation with human editing and proofreading	79	22.83%
2	Improving the accuracy and quality of machine translation algorithms	73	21.10%
3	Developing specialized machine translation models for specific language pairs	67	19.36%
4	Developing collaborative platforms for language experts and machine translation developers	67	19.36%
5	Incorporating user feedback and continuous improvement cycles	56	16.19%
6	Creating translation software that include the general alphabet of African languages	1	0.29%
7	Broader linguistic cultural database	1	0.29%
8	Enhance language teaching and training ,sensitization, enhance publication in the national African languages	1	0.29%
9	Standardizing national African languages alphabets ,terms and spellings	1	0.29%
	Total	**346**	**100%**

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

The data revealed that 79(22.83%) of respondent suggested a hybrid MT systems which is combining human expertise with MT technologies, 73 (21.10%) of respondents highlighted MT algorithm enhancement by improving the accuracy and quality of MT models, 67 (19.36%)of participants recommended developing tailored MT systems for specific language pairs to better address linguistic nuances. The same percentage 67 (19.36%) also indicated the importance of establishing collaborative platforms where language experts and MT developers can work together to improve translation outcomes. In addition 56 (16.19%) of participants emphasized user-centered MT, which involve incorporating user feedback for continuous improvement cycles to refine MT systems. Less frequently proposed strategies 1 (0.29%) each included the creation of translation software encompassing a universal African language alphabet, the development of comprehensive linguistic databases for more effective translations, enhanced language education, sensitization, and increased publication in national African languages and resource development, and the need for standardizing National African languages alphabets and terminology to facilitate more consistent translations. The findings strongly emphasised leveraging human expertise, refining machine translation

technology, fostering collaboration between language experts and developers and user engagement as key strategies for overcoming MT challenges in national languages promotion. While most respondents focused on these primary measures, there is also a recognition of the importance of standardization and the creation of comprehensive linguistic resources.

Research Objective: To propose strategies for optimizing MT for the promotion of national African languages

Table 8: Key ways in which MT can be optimized to better promote national African languages.

S/N	Key ways in which MT can be optimized to better promote NL	Frequency	Percentage
1	Better capture cultural nuances and idioms	73	22.46%
2	Improving the accuracy and quality of translations	70	21.54%
3	Supporting a wide range of language pairs and dialects	66	20.31%
4	Incorporating machine learning techniques to adapt to specific language nuances	62	19.07%
5	Enhancing the user interface and user experience of machine translation tools	52	16%
6	Machine translation should be optimised irrespective of languages involved	1	0.31%
7	Include sign language and more visual learning tools	1	0.31%
	Total	**325**	**100%**

Source: Survey of M.A students at ASTI and PAUTRAIN 2024

A survey of 100 respondents assessed key areas for optimizing MT to enhance national African languages Promotion. The data revealed that 73 (22.4%) of respondents prioritized MT systems capable of precisely capturing cultural nuances and idioms, 70 (21.54%) of respondents advocated for improving translation accuracy and quality and 66 (20.31%) deemed expanding language coverage to include a wider range of language pairs and dialects. Leveraging machine learning for language adaptation and enhancing the user-friendliness of MT tools through improved interface and experience was deemed crucial by 62(19.07%) and 52 (16%) of participants respectively. While suggestions for language-agnostic optimization and incorporating visual learning tools were minimal 1 (0.31%) each, the core focus remains on improving MT for linguistic and cultural competence.

The findings revealed that to effectively promote national African languages through MT, system developers should prioritize enhancing translation accuracy, cultural sensitivity, language coverage, and user experience. Additionally, the integration of machine learning techniques to adapt to specific language nuances holds promise for improving MT performance. Addressing these areas will likely to contribute significantly to the wider adoption and efficacy of MT for National Languages preservation and development.

Table 9: Stakeholders that should be involved in optimising MT for promoting National African languages.

S/N	Stakeholders	Frequency	Percentage
1	Language experts and linguists	94	28.75%
2	Machine translation developers and engineers	69	21.10%
3	Language learning institutes and educators	68	20.80%
4	Government organizations and policymakers	51	15.61%
5	Users of machine translation tools	41	12.54%
6	Language users	1	0.30%
7	Learners in civil society and bible translation association	1	0.30%
8	Translators and terminologists	1	0.30%
9	Translators	1	0.30%
	Total	**327**	**100%**

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

The data collected from 100 respondents highlighted the various stakeholders deemed essential for optimizing Machine Translation (MT) to promote national African languages. The findings indicated a diverse range of perspectives regarding who should take an active role in this process. Language experts and linguists emerged as the most critical stakeholders, accounting for 94 (28.75%) of the sample. Following closely were Machine Translation developers and engineers 69 (21.10%). While 68(20.80%) of respondents deemed language learning institutes and educators as crucial, 51(15.61%) of participants acknowledged the role of government bodies and policymakers in creating supportive environments, setting policies and allocating resources, and frameworks for the effective implementation of MT technologies.

Additionally, 41 (12.54%) of participants considered the input of end-users valuable, as their experiences can inform improvements and adaptations in MT applications Other groups such

as language users, learners in civil society, Bible translation associations, translators, and terminologists were mentioned but their representation was minimal 1 (less than 1% combined). The findings revealed that optimizing machine translation for the Promotion of national African languages requires a collaborative effort involving various stakeholders. Language experts and linguists emerged as the most critical contributors, followed closely by MT developers and educators. While the perspectives of users and niche groups are acknowledged, the primary focus should remain on those with the expertise and authority to drive meaningful advancements in Machine Translation technology.

Analyses of Semi-Structured Interviews

This section focused on the analysis and interpretation of data collected through semi-structured interviews. Six senior translation lecturers from ASTI and PAUTRAIN were interviewed to gain in-depth insights and perspectives on the topic of Machine Translation (MT) and its impact on the Promotion of national African languages. The six responses were grouped into three categories, as presented in the tables below:

Table 12: Roles of MT in the promotion of National African languages

Question 1	1st Response	2nd Response	3rd Response
In your opinion, what are the main roles of machine translation in promoting National African languages?	**Supporting Language Preservation**: By providing translations for lesser-known languages, MT helps preserve these languages by making them more accessible and usable in various digital contexts. **Enhancing Language Learning**: MT tools can assist in learning and teaching national African languages by providing accurate translations and examples, making it easier for learners to understand and use these languages effectively.	Enables dissemination of information in national African Languages across various platforms such as websites, mobile apps, and social media Enabling the translation of important documents and information	MT could help in enhancing the terminology and vocabulary of these languages. Promotion of national African languages

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

Participants viewed Machine Translation (MT) as a potential catalyst for the Promotion of national African languages. They highlighted the ability of MT to facilitate the dissemination of information in national African languages across digital platforms such as websites, mobile applications, and social media. Moreover, MT was seen as a tool for preserving and enriching the lexical resources of these languages through the development of specialized terminologies. Participants also emphasized the role of MT in enhancing accessibility to

official documents and information by enabling their translation into national African languages. Additionally, they believed that MT could streamline language learning and teaching processes while contributing to the overall vitality of national African languages. The findings indicated that MT can significantly contribute to the effective promotion of national African languages by improving accessibility and engagement with these languages in digital spaces.

Table 13: challenges in using Machine Translation to promote NL

Question 2	1st Response	2nd Response	3rd Responses
What do you see as the main challenges of using machine translation to promote National African languages?	**Quality and Accuracy**: MT often produces errors and mistakes that can affect the meaning and clarity of the translated content, leading to misunderstandings and miscommunications. **Cultural Sensitivity**: MT lacks the cultural awareness that human translators possess, which can lead to culturally insensitive or	Accuracy and quality of translations Language-specific nuances and cultural references Limited training data for National African languages Lack of standardization in National African languages grammar and vocabulary Lack of clear policies and investments from governments	Design specific model of MT for translating from National African languages into languages such as English, French, and Spanish etc. The literacy level of people in using the tools, Cost of the initial investment and acceptability of the languages in the
	inappropriate translations.		community by people from different tribes Another significant is challenge having the right terminology to translate certain conceptsfrom languages such as English and French to African languages.

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

Participants highlighted several critical challenges hindering the effective utilization of Machine Translation (MT) to promote national African languages. The primary concern was accuracy and quality of MT output which remain suboptimal, leading to misunderstandings and miscommunications. This is compounded by the inability of MT to capture cultural nuances and language- specific intricacies, often resulting in culturally insensitive or inappropriate translations. Furthermore, the absence of standardized terminology in national African languages poses a significant obstacle. This, coupled with the limited availability of training data and low literacy rates among potential users, exacerbates the challenges associated with MT development and adoption. The high cost of developing language-specific MT models for national African languages is relatively high, posing a barrier to implementation. Finally, there is absence of clear policies and governmental investment in supporting the development and integration of MT for national African languages.

Table 14: Measures for overcoming the challenges in MT for promoting national African languages.

Question 3	1st Responses	2nd Response	3rd Response
What measures can be taken to Overcome the challenges of using machine translation for promoting National African languages?	To overcome the challenges of using machine translation (MT) for promoting national African languages, several measures can be implemented: **Human Oversight:** Employ human translators to review and refine MT outputs, ensuring accuracy and cultural relevance. **Collaboration with Native Speakers**: Collaborate with native speakers and local linguists to ensure that MT systems are well-tuned to the specificities of national African languages. **Regular Updates**: Continuously update MT algorithms with new linguistic data and feedback from users to keep improving their performance	Developing machine translation systems that account for cultural and linguistic nuances Involving human translators and language experts to refine and validate machine translations Investing in high-quality training data and models for National African languages Provide regular feedback and correction from language instructors or native speakers. Other (please specify) the codification of all National African languages	The states dedicates more funding to research on National African languages and the selection of national African languages should be based on the most spoken languages to economize resources and to achieve this objective faster. Personal motivation for research into National African Languages and Machine Translation and availability of economic resources for investing into MT

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

Participants identified several measures to address the challenges associated with utilizing Machine Translation (MT) to promote National African Languages. Primarily, human translators and language experts should collaborate with native speakers and linguists to refine MT outputs, ensuring accuracy, cultural appropriateness, and alignment with linguistic nuances.

Continuous algorithm updates, leveraging new linguistic data, and incorporating user feedback are essential to enhancing MT performance over time. Developing MT systems that account for cultural and linguistic nuances is crucial, as is investing in high-quality training data and models tailored to National African Languages. Additionally, providing regular feedback from language experts and native speakers can significantly improve system performance.

Standardization of national languages through codification is necessary to facilitate MT development. Furthermore, fostering personal interest in National African Language research and ensuring adequate financial resources are vital for sustained progress. Finally, Governments should prioritize funding for MT research focused on the most widely spoken National African Languages to optimize resource allocation and accelerate achievements.

Table 15: Stakeholders in Optimizing MT for national African languages

Question 4	1st Response	2nd Response	3rd Response
In your opinion, who should be involved in optimizing machine translation for promoting national African languages?	**Linguists and Language Experts**: They provide crucial insights into the grammatical, syntactical, and cultural nuances of national African languages, ensuring the MT system produces accurate and contextually relevant translations. **Local Communities**: Engaging native speakers and local communities helps in gathering authentic language data and feedback, enhancing the quality of translations and ensuring the MT system respects cultural contexts. **Policy Makers and Government Agencies**: These stakeholders can provide support through funding, policy development, and creating initiatives that promote the use of national African languages in digital spaces.(QUESTION 6) **Non-Governmental Organizations (NGOs):** NGOs focused on language preservation and promotion can play a vital role in advocacy and in providing resources and platforms for the development and use of MT for national African languages. **Users**: End-users, including translators, businesses, and the general public, provide valuable feedback and use cases that can help refine and improve MT systems.	Machine translation developers and engineers Language experts translators and linguists Government agencies and policymakers Language learning institutes and educators Users of machine translation tools	Governments, the ministries, Scholars, journalists, linguists, terminologists, local communities, translators, Native speakers ,Funding bodies such as UNESCO, Language developing authorities, academics (Universities),interpreters, publishers and editing houses

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

Participants emphasized the need for collaboration among linguists, MT developers, scholars, journalists, terminologists, language educators, language authorities, academics, interpreters, publishers, translators, and native speakers. These stakeholders possess the requisite expertise to ensure the development of culturally appropriate and linguistically accurate MT systems.

Moreover, the involvement of policy-makers, government agencies, and funding bodies is essential for establishing supportive policy frameworks and allocating necessary resources. Non-governmental organizations, such as UNESCO, can play a vital role in advocacy and resource provision.

Finally, end-users, including translators, businesses, and the general public, are crucial for providing valuable feedback and real-world use cases.

To sum up, optimizing machine translation for promoting National African languages requires a collaborative effort involving a diverse range of stakeholders. This collaborative effort will ensure the development of MT systems that are not only technologically advanced but also culturally relevant and linguistically accurate.

Table 16: Strategies recommended by respondents to optimize MT for promoting National African languages

Question 5	1st Response	2nd Responses	3rd Responses
What strategies will you recommend for using machine translation to promote National African languages?	**Create Machine-Friendly Content**: Ensure the source content is clear, concise, and free of slang or idiomatic expressions that might be difficult to translate. Use formal and direct language, and avoid complex sentence structures to improve MT accuracy **Leverage Local Expertise:** Engage native speakers and local linguists in the development and refinement of MT systems. Their input is crucial for improving the quality and relevance of translations	Build community-driven glossaries and terminology databases Incorporate machine translation as a supplementary tool in language learning curricula Encourage the use of machine translation by government agencies and public institutions	Investment in research and aggressive literacy campaign to promote NL and also incorporate MT and National African languages in academic program at level of schools.

	Integrate MT in Education: Use MT tools in language education to expose learners to real-life texts and enhance their understanding of national African languages. This can help students engage with authentic materials such as news articles, literature, and social media posts.		

Source: *Survey of M.A students at ASTI and PAUTRAIN 2024*

Participants recommended creating machine-friendly content, which entails ensuring that source materials are clear, concise, and devoid of slang or idiomatic expressions.

Engaging native speakers and local linguists in the development and refinement of MT systems is crucial for ensuring that translations are culturally and linguistically appropriate. Furthermore, participants advocated for the integration of MT tools into language education, exposing learners to real-life texts to deepen their understanding of national African languages.

Building community-driven glossaries and terminology databases can facilitate consistent and accurate translations. Incorporating MT as a supplementary tool within language learning curricula and encouraging its use by government agencies and public institutions can further enhance its acceptance and effectiveness.

Investment in research and aggressive literacy campaigns is also essential to promote national African languages. Additionally, incorporating MT and national African languages into academic programs at various educational levels can foster greater awareness and usage of these languages. These strategies, combined with the inclusion of MT in academic programs, offer a promising path towards leveraging MT for the effective promotion of National African languages.

5 DISCUSSION OF FINDINGS

This section presents the discussion of findings of the study, detailing the specific research objectives and their related findings. It also affirms whether each objective has been achieved.

The first objective aimed to investigate the Role of Machine Translation in the promotion of national African languages, this objective is achieved as evidences from the data collected revealed that 71(36.78%) of respondents reported that MT will facilitate communication across linguistic barriers. This was closely followed by fostering language learning and cultural exchange with 68 (35.23%). In addition enabling access to crucial documents and information through translation was deemed significant by 46 (23.83%) of the participants.

Interestingly, while a small percentage 2 (1.04%) believed other unspecified roles could become prominent with enhanced MT capabilities in national African languages, a recurring theme emerged in the remaining responses. Multiple respondents, albeit a small fraction each (0.52% each), emphasized potential roles of MT in areas such as language preservation and revitalization through digitization, accelerating translation workflows, promoting language inclusion, and enhancing language development. The findings revealed a strong belief in the capacity of MT to contribute significantly to the promotion of national African languages. While bridging communication gaps remains paramount, respondents acknowledged its potential in fostering cultural exchange, knowledge dissemination, and even language preservation and development.

The second objective is to identify the challenges of using Machine translation for the promotion of national African languages. This objective has been duly attained as evidences collected both data collection methods clearly highlighted several challenges associated with leveraging MT for national African languages promotion. The Primary concern revolved around accuracy and quality of MT output which remain suboptimal, leading to misunderstandings and miscommunications. This is compounded by the inability of MT to capture cultural nuances, idiomatic expressions, and language-specific intricacies, often resulting in culturally insensitive or inappropriate translations.

Furthermore, the absence of standardized terminology in national African languages poses a significant obstacle. This, coupled with the limited availability of training data and low literacy rates among potential users, exacerbates the challenges associated with MT development and adoption. The cost of developing language-specific MT models for national African languages is relatively high, posing a barrier to implementation.

Finally, issues related to linguistic complexity of various dialects, data security and the absence of clear policies and governmental investment in supporting the development and integration of MT for national African languages were particularly prominent. Addressing these challenges is crucial for unlocking the full potential of MT in supporting and revitalizing national African languages.

The third research objective is propose strategies for optimising Machine Translation for the promotion of national African languages. This objective is equally achieved. A Summary of strategies proposed by the two categories of respondents were as follows:

The data revealed that 73 (22.4%) of respondents prioritized MT systems capable of precisely capturing cultural nuances and idioms, 70 (21.54%) of respondents advocated for improving translation accuracy and quality and 66 (20.31%) deemed expanding language coverage to include a wider range of language pairs and dialects. Leveraging machine learning for language adaptation and enhancing the user-friendliness of MT tools through improved interface and experience was deemed crucial by 62(19.07%) and 52(16%) of participants respectively While suggestions for language-agnostic optimization and incorporating visual

learning tools were minimal (0.31%) each, the core focus remains on improving MT for linguistic and cultural competence.

RECOMMENDATIONS

The following recommendations are made to the different stakeholders for promoting national African languages through Machine Translation (MT). These recommendations are based on the results obtained from the study and more specifically on the challenges highlighted in chapter four (4).

For Policymakers, Government Authorities:

a) *Invest in Machine Translation Infrastructure***:** Allocate resources for building and maintaining national African languages MT models and infrastructure, including servers, data storage, and ongoing maintenance.

b) *Funding for Research & Development*: Fund research and development initiatives specifically focused on improving MT accuracy and handling the complexities of national African languages.

c) *Standardization & Corpora Creation:* Support language standardization efforts and prioritize the creation of comprehensive corpora (large datasets of text) in National African languages to train and improve MT models.

d) *Open-Source Development:* Encourage and support open-source MT projects for National African languages to foster wider collaboration and innovation.

e) *Establish Language Access Requirements:* Implement legal requirements to ensure that Limited English Proficient individuals have reasonable access to services in their native language.

For Translators & Local Communities:

a) *Community Engagement:* Organize workshops and training programs to educate local communities on MT and its potential benefits for national African languages promotion.

b) *Terminology & Lexicon Development*: Collaborate with terminologists and linguists to develop standardized terminology databases specific to national African languages to improve MT accuracy in technical domains.

c) *Organize Regional Festivals of Translation:* Promote translation activities and increase the visibility of translators by organizing events such as book launches, exhibitions, and festivals dedicated to translation, particularly from and into African Languages.

For Learning Institutions:

a) *Machine Translation Curriculum Development:* Introduce courses on MT technology and applications within language programs, with a focus on National African languages.

b) *Scholarships Schemes & Training*: Establish scholarship and training programs to nurture a new generation of MT developers and linguists specializing in National African languages.

For Language Experts & Machine Translation Developers:

a) *Focus on National African languages Specifics:* Develop MT models specifically tailored to the unique grammatical structures, dialects variations, idiomatic expressions, and cultural nuances of National African languages.

b) *Terminology Integration:* Integrate terminology databases and controlled vocabularies into MT systems to ensure accurate and consistent translations in specific domains.

c) *Contribute to the Development of Translation Tools:* Collaborate with machine translation developers to generate translation tools, such as dictionaries and thesauri, and to develop software for translation and memory in national African languages.

d) *Improve Accuracy and Quality of Machine Translations:* Continuously refine machine translation algorithms and models to enhance the accuracy and quality of translations. Local communities can also contribute by sharing their language usage patterns, enabling the development of more inclusive machine translation systems that reflect their cultural nuances accurately.

data revealed that 73 (22.4%) of respondents prioritized MT systems capable of precisely capturing cultural nuances and idioms, 70 (21.54%) of respondents advocated for improving translation accuracy and quality and 66 (20.31%) deemed expanding language.

6. CONCLUSION

This study investigated the Role of Machine Translation (MT) in the promotion national African languages in the African context. Using a mixed-methods approach, the study involved a questionnaire, which was designed using Google Form and administered to 100 MA translation students via WhatsApp and email and semi-structured interviews conducted with six (6) senior translation lecturers at (ASTI) and (PAUTRAIN), University of Buea. The collected data were analysed using Excel and the Statistical Package for Social Science (SPSS).

The findings reveal a positive perception of the ability of MT to bridge communication gaps, foster cultural exchange, and disseminate knowledge in national African languages. However, challenges such as linguistic complexity of various dialects, data security concerns, accuracy and quality limitations, the inability of MT to capture idiomatic expressions and cultural nuances were identified. Additionally, the absence of reliable literature, linguistic

databases, standardized terminology, and the cost of developing language-specific MT models were highlighted as major obstacles.

To optimize MT for national African languages promotion, the study recommends strategies such as improving linguistic and cultural competence, expanding language coverage, and enhancing user-friendliness. Collaborative efforts, supportive policies, and end-user involvement are crucial for successful implementation.

This study contributes to the growing body of research on national African languages, underscoring the importance of developing MT technologies for their promotion.

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