The Integration of Indigenous Languages in Virtual Assistants

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Abstract

Language's centrality in technology, or the expression of Artificial Intelligence (AI) through language, should be evaluated to consider whether the Fourth Industrial Revolution (4IR) technologies in banking can be harnessed for equity or whether they risk perpetuating digital divides. A subset of Human Language Technologies (HLT) and Virtual Assistants (VAs) are conversational applications that use machine learning – the use of computers to draw patterns and inferences from large sets of data to provide human-like interactions to customers or users of the software on mobile apps or websites. While assertions that 4IR and its proponents (AI, machine learning, robotics) will have positive and radical impacts, it is crucial to question whether the Virtual Assistants (VAs) used in financial technologies (Fintech) will enable financial access by bridging language barriers rather than risking current forms of exclusion, disparity, and digital gaps. The aim of this paper is to evaluate whether the expression of language in Fintech can be harnessed to promote equity or worsen the digital divide. This is foregrounded by a Critical Discourse Analysis theory to highlight how language manifests in Fintech. Employing an interpretive qualitative methodology, data were collected through semi-structured interviews and focus groups to unearth rich, contextual insights. Thematic analysis was used to unravel imaginaries surrounding VAs and to extract meaningful patterns. This paper demonstrates that, while great in theory, accommodating the rich diversity of languages spoken in South Africa often runs counter to the pressures of the market in practice. Therefore, this study looks to catalyse policy development that will ensure that HLTs, like VAs, incorporate indigenous languages. This can be achieved by subsidising the development of Free and Open-Source solutions for use in the financial sector. These policies and solutions can be developed in collaboration with local communities, who can provide valuable feedback on their experiences with VAs.

Keywords: Human Language Technology, Language, Virtual Assistant, Financial Inclusion.

Introduction

Language is essential for honouring and preserving cultural histories. It is crucial in shaping relationships, worldviews, and identities which are deeply implicated in the

exercise of power (Alexander, 2005; Hao, 2022). To a large part, due to the history of colonialism and dispossession, English was entrenched as a dominant language, a language of power, which liberation movements in post-apartheid South Africa feared that the new constitution would not consider the language rights of non-English speaking people, such as Tshivenda, isiZulu, Sesotho, amongst others (Alexander, 2005). This article interrogates whether the new technological frontier, virtual assistants (VAs), can perpetuate linguistic power disparities or enable financial inclusion in South Africa. It critically examines the dominance of English, the marginalisation of indigenous languages, and the unequal access to justice in language representation within Human Language Technologies (HLTs). The assumption that "English is enough" is problematic (Mwikisa, 2016; Alexander, 2005), particularly in a multilingual society where many South Africans speak English as a second language. The exclusion of Indigenous languages across sectors such as education, media, and digital banking risks erasing cultural legacies and reinforcing systemic inequalities. The prioritisation of English in VA development, driven by market forces and global technology standards, may reproduce neocolonial dynamics instead of promoting inclusive digital transformation.

A subset of HLT, VAs are conversational applications, also referred to as chatbots that utilise machine learning – the use of computers to draw patterns and inferences from large datasets to provide human-like interactions with customers or users of the software on mobile apps or websites (IBM Watson Advertising, 2022). Some of the well-known VAs include OpenAI's ChatGPT, Amazon's Alexa, Apple's Siri, Google's Assistant, Microsoft's Cortana, among others.

The prioritisation of English in developing VAs may be due to the perception that intelligent people speak English and that English is essential for economic development, especially in a global knowledge economy (Brooker, 2018). It is also partially because English is the most spoken language in the world. The dominance of English and other Western languages on VAs reinforces cultural hegemony. As long as Western languages predominate, the spread of HLT and frameworks will perpetuate the neo-colonial status quo (Pardue and Bin, 2022: 3).

This suggests that a sense of inertia may be present when companies look at the evolution of their digital technologies. Big Technology companies often save money by defaulting to English or other Western languages when training models (Pardue and Bin, 2022: 7). Developing and using languages that are sometimes spoken by a small audience with limited resources is costly. Other startups reinforce this dominance, as they are incentivised to implement the same models or ideas when developing VAs to ensure they cater to a larger piece of the paying market.

Against the claims made about the beneficial and the transformative nature of the Fourth Industrial Revolution (4IR), the researcher aims to evaluate the language question (the dominance of English, the status of indigenous languages, as well as the unequal access and justice in languages other than English) and examines whether the VAs will facilitate financial inclusion through language integration instead of reproducing existing exclusions, inequalities, and digital divides.

The article was guided by the following question: What are the experiences and perceptions of company executives, developers, engineers, architects, and clients of HLTs in the banking sector in a multilingual society?

To answer these questions, the researcher employs a critical and in-depth approach to explore the 4IR from various angles. First, this entails examining the design choices in the development process - specifically, interrogating the processes of banks and AI companies in integrating indigenous languages into 4IR technologies. Second, the researcher explores social impacts, uncovering the effects that the advancements in digital technologies can have on banking. Lastly, the researcher considers the external environment, including markets and policies to unpack their implications for emerging technologies and multilingualism. To consider these implications, the researcher presents the experiences and perceptions related to developing, implementing, and utilising virtual assistants in banking, as well as the limitations of these systems in addressing the challenges of financial inclusion and linguistic inequality in the digital age.

Methodology

This section outlines the exploratory qualitative research methodology employed to unveil the experiences and perceptions of stakeholders (CEOs, CIOs, and Lead Engineers) and bank customers regarding language diversity in VAs. An interpretivist approach facilitated the discovery of new insights and concepts, verified assumptions about language-related challenges, and evaluated the effectiveness of practices and interventions. This holistic inquiry enabled a deep dive into the language phenomenon, unveiling the perceptions and lived experiences of participants.

A non-probability, purposive sampling method was appropriate for this interpretive qualitative approach. This would allow the sampling and selection of participants who were informed about the aims. Four individuals were interviewed: two from technology startups, one from a private bank, and one from a big commercial bank. Additionally, a focus group of five university students and bank clients was conducted to gather perceptions and experiences with banking VAs. This format enabled rich, interactive discussions and highlighted diverse viewpoints (Schearer, 1981; Morgan, 1996; Bhandari, 2020).

Desktop research helped identify which banks and companies were actively deploying and developing digital services and platforms (VAs), particularly regarding the integration of native South African languages (e.g., isiZulu and Tshivenda, amongst others) spoken by the user base (Bhandari, 2020). The focus group provided a broad spectrum of ideas and illuminated differences among participants, enhancing the depth of the findings (Rabiee, 2004: 656).

The scope of the questions was

Scope of Questions	Research Methods
What are the company policies in regard to language integration in the company's virtual assistant?	Semi-structured interviews
Is there algorithmic bias?	Semi-structured interviews and secondary literature on algorithmic bias in Human Language Technology
How are the Human Language Technology Models Built	Semi-structured interviews

Scope of Questions	Research Methods
Use open source? Giving companies control to make changes to suit their model? For Tshivenda, for example?	Semi-structured interviews
What Banks do you use?	Focus Group
What are your thoughts on using AI for Banking	Focus Group
What does your language mean to you?	Focus Group

Figure 1: Research Site

The research was conducted around the city of Johannesburg, from the streets of Sandton to the Southeast of Sandton, Rosebank, and finally to the inner parts of Johannesburg, in Marshalltown.

Understanding HLT Through a Critical Discourse Lens

To understand the importance of traversing the gap in Indigenous language integration within VAs, Fairclough's (1992) Critical Discourse Analysis (CDA) was employed. This theoretical framework provides a lens for examining how languages shape access, financial

inclusion, and power in FinTech. According to Wodak (2013: 303), CDA demystifies ideologies and power via systemic and retroductive investigations of 'semiotic' data (written, spoken, or visual).

Fairclough (1992: 193) distinguishes between power in discourse and power over discourse. Power in discourse can be understood as how power manifests, how it is negotiated, and how it is resisted through language in various interactions. This is reflected in interactions between bank clients and financial institutions that are shaped by linguistic choices and capabilities to enable access to banking services. Moreover, power over discourse highlights the control Tech companies have over the language and data used to train VAs, reflecting power over discourse. In FinTech, this manifests in the prioritisation of English by technology companies, which influences who can access banking services. The lack of available Indigenous language data to train VAs reinforces exclusion, making language a gatekeeper to financial participation (Weidinger et al., 2021: 9). According to Fairclough (2013: 30), language is a social practice constructed by and shaping structures (institutions) and the forces of social institutions in which people function.

Linguistic practices determine access and participation in "power forums" like banks and universities. This depends on one's ability to speak the language used in these forums. Those unable to speak dominant languages (such as English, Afrikaans, and French, among others) face exclusion, while the undervaluing of indigenous languages perpetuates inequality (Alexander, 1997: 84). The historically constructed financial architecture reproduces social domination through semiotic hegemony, rules of language, interaction, and access that favour certain groups (Wodak, 2013: 305). Institutions wield power by controlling discourse, determining which languages are legitimised and which are marginalised.

Furthermore, Foucault (1982: 18) expands this view by describing technologies of power not as machines, but as systems that shape behaviour. VAs, when developed primarily in English, can subtly govern user interactions, limiting access for speakers of isiZulu, Tshivenda, and other Indigenous languages. Thus, CDA reveals how language choices in HLTs reflect broader power structures. The dominance of English in VAs is not neutral; it is a product of institutional decisions that shape and determine who participates in digital financial systems. Through this framework, the article uncovers how linguistic exclusion is embedded in the design and deployment of VAs (Fairclough, 2013: 25).

Literature Review

Language and Virtual Assistants

VAs have become an integral part of many sectors, particularly the banking sector. Leveraging Natural Language Processing (NLP) to enhance user experiences and interactions, these systems are trained to understand and respond to human language with high accuracy. According to VA advocates (Srinivas et al., 2018; Access Partnerships, 2018), customer experience has been revolutionised, providing real-time, personalised interactions through semantic analysis and continuous learning from big data used to improve their capabilities.

For banks or financial service providers, the integration of digital technologies and VAs can ensure the enhancement of customer services, operational efficiency and service delivery. For bank users, service can be provided with customised, around-the-clock assistance for transaction challenges, complaints, and inquiries, reducing the time spent waiting

for business hours or long queues (particularly for the elderly). Regarding operational efficiency, the automation of routine tasks enables VAs to reduce costs by requiring fewer human staff, thereby lowering operational expenses.

In the integration of technology, the use of NLP, Natural Language Understanding (NLU), and Machine Learning (ML) enables human language to be understood, thereby enhancing the user experience. However, a lack of sufficient language data to train VAs has been cited as one of the hindrances to the development and deployment of bilingual or multilingual VAs. Although general-purpose chatbots (e.g., OpenAI's ChatGPT and Google's Bard) or VAs (e.g., Apple's Siri, Amazon Echo, and Google Assistant) are widely available to internet users (Reyes et al., 2019), these HLTs are only developed for a small percentage of linguistic communities (about twenty per cent). According to Alexander (1997: 84), African languages are not valued in the commercial marketplace, as speaking outside of one's relevant 'speech community' is not socially or materially beneficial. Furthermore, environments also act as places where culture is embedded and identities are formed. Nevertheless, if developed equitably, VAs can be used to revitalise indigenous languages instead of reinforcing dominant ones (Meighan, 2021).

Language and Data

If virtual assistants are to become linguistically diverse, developers need to devote sufficient resources to developing models for all languages. Myers-Scotton, as cited in Dyers and Abongdia (2014: 6), argues that there are pseudo-differences in language histories, referring to the perception that people who are most closely linked to speaking one language are more likely to do so than those who are not. This perception is exploited in the political and economic arenas. An example of this is seen in the branching out of Nguni languages into separate languages due to political and historical developments, rather than 'fundamental linguistic' differences. This is further exacerbated by the predominant use of English to train virtual assistants. While isiZulu has some data available, it still fares poorly compared to English, and Tshivenda, in turn, is even more underrepresented than isiZulu. For example, isiZulu has newspapers – *UMAfrica* (The African), *Isolezwe* (The Eye of the Nation), *Ilanga* (The Sun), and *Inkazimulo* (The Glory). Salawu, as cited by Tshabangu and Salawu (2022: 37), discovered that digital journalism practices by African-language newspapers, Alaraye (Nigeria) and Isolezwe (South Africa), have a digital presence. There are television news channels (SABC) that use South African languages and data (material) from these channels can be used to train the chatbots.

Although data may be available to train VAs, Koenecke et al. (2020: 7684) highlight the issues of pronunciation that prevent these systems from functioning effectively. In their study, pronunciation disparities were found in some of the most popular applications of VA (Apple, Amazon, Google, and IBM, amongst others) between White Americans and African Americans. This was due to differences in pronunciation, including rhythm, accent, and pitch (Koenecke et al., 2020: 7685). For language to be fully utilised through technology, a vast amount of textual and audio data from other languages must be used to train VAs.

AI in Banking

Digital technology has been widely adopted in various sectors of society, with the banking sector being one of the fastest-growing users of technology, particularly artificial intelligence, to maintain a competitive edge over other banks. Banking in modern society is a crucial factor that can aid in poverty alleviation in African countries.

According to Access Partnership (2014), a company's ability to exploit and use AI to its fullest potential can help open a door to new possibilities, making AI a potentially "powerful tool for development" and poverty alleviation. In addition, in the financial industry (banks), AI can be used to ensure that the unbanked in Africa get access to banking, providing them with financial inclusion (Access Partnership, 2014). This will showcase the possibilities AI can present to banks, uncovering new ways to access financial services, save money, and obtain insurance.

Access Partnership (2014) revealed that African banking markets are the most exciting as they present untapped avenues and are growing rapidly, making them a "hotbed" for innovation with leading players finding contemporary ways to develop business models to respond to challenges Africa faces (low levels of banking penetration, heavy use of notes, and a 'limited credit bureau). Moreover, research conducted by Srinivas et al. (2018) in the Deloitte banking outlook found that approximately 40% of banking customers opt to use digital methods for making transactions – including making payments, checking balances, and receiving alerts about suspicious activities involving their bank cards.

Digitisation and the development of new digital technologies can help banks grow by tailoring their products to meet their customers' requirements and needs, thereby giving them a competitive edge over their competitors. This suggests that banks can leverage AI analytics and big data to establish effective strategies that assist in cutting costs – automating laborious tasks, improving the customer experience, and potentially acquiring new clients.

Although the banking industry is thriving with expected long-term growth, the proliferating claims made by authors (Srinivas et al., 2018; Access Partnerships, 2014) about the potential technologies in banking may have issues of financial exclusion, imperialism, and extractivism that have not been adequately explored. Although technology companies claim that their products can support multiple languages, they often fail to accommodate all non-Western languages, and those that are supported tend to perform less well than the dominant languages. This is where hegemonic dynamics rooted in capitalist production and distribution shape unequal technology outcomes (Pardue and Bin, 2022: 7).

Although Fintech may be cited as an impact approach to help previously disadvantaged communities access financial services, such as mobile money, microloans, among others (Kampani, 2024; Matias, 2023; Lin and Lee, 2025), various scholars argue that Fintech may be a false messiah as access to banking services may create new challenges that arise due to predatory inclusion. Taylor (2019) provides an examination of a predatory inclusion case involving African Americans in homeownership. Taylor (2019) discovered that homeownership (for individuals who were previously excluded), sponsored by private lenders and the Federal Housing Administration, enabled lenders and sellers to sell subpar and unsafe houses to homebuyers. Instead of protecting homebuyers, Black families were exposed to risky loans and poor housing quality. Consequently, homebuyers found themselves in debt.

Raji (2020) explores another example of predatory inclusion through predatory lending practices. Although under project M-Pesa, financial inclusion for previously unbanked Kenyans increased, with digital loans taken out amounting to fourteen per cent for adults, this tokenistic approach was a "perfected form of digital mining". This allowed the extraction of "small tributes" from every transaction made by the poor, through microloans, money

transfers, grant disbursements, and credit card usage (Raji, 2020; Bateman et al., 2019; Achieng, 2023; Bateman et al., 2019; Kimani, 2020).

On the other hand, in South Africa, the unbanked were assisted by the South African Social Security Agency (SASSA) in collaboration with Net1's subsidiary, Cash Paymaster Services (CPS), which provided financial services to the previously unbanked. A 2020 study by Black SASH uncovered predatory inclusion by Net1. Net1 was given sole power to disburse grants and further advance the financial inclusion agenda. NET1, through its subsidiaries (uManje Money, Smartlife, and Moneylife), made the purchase and access to electricity, insurance, and credit easy to obtain (James et al., 2020). However, control over biometric information and financial data also gave Net1 control over recipients' monies, as debit orders for insurance, for instance, were deducted before grantees had access to their monies.

The above cases highlight that while financial inclusion or other forms of inclusion (such as homeownership) may increase, such gains can serve as a double-edged sword; either enabling access for previously excluded communities or functioning as a predatory instrument that exploits their vulnerability. This suggests that while the inclusion of indigenous languages may increase access to banking services, this may also result in the decrease of the financial health of bank clients, as it did with South Africans, Kenyans, and African Americans. While digital technology may improve banking and financial transactions, various harms must be considered in the deployment and development VAs, especially in the chase for profits over ethical and social good.

Harms

Language and Cultural Imperialism

According to Ngũgĩ wa Thiong'o (1987), the use of African languages maintains the richness of literature, culture, philosophy, and other treasures that African languages possess. The choice of language used in banking, education, and media is, therefore, central to how people define themselves and preserve their identities. However, the definition of African people and who they are is under the continuous control of the West due to its influence and control over Africa's economy, politics, and cultures. This stronghold is perpetuated by the neo-colonial design of AI, as evidenced by the lack of diversity in the digital space, which leads to the underrepresentation of minority languages (Wa Thiong'o, 1987; Kupfer and Muyumba, 2022).

Indigenous societies are challenged to preserve their cultures and represent their people. Africans define themselves in terms of the languages of the colonial era and then imperialist imposition. Wa Thiong'o (1987) stated that we should interrogate these due to the abandonment of indigenous languages in favour of European languages (Kupfer and Muyumba, 2022). Neo-colonial cultural impositions force Africans to distance themselves while identifying with something "furthest" from themselves when using languages other than their own. Alexander (1997: 840) argues that the fatality of losing one's self-esteem, confidence, and dignified self-image is an "important aspect of the syndrome of a colonised mind." The lack of integration of indigenous languages means English, French, and Portuguese retain social control and represent the exertion of neo-colonial power over Africans, their cultures, and languages. This is evident in the linguistic barrier created using "industry-standard language," i.e., English and other Western languages, to program virtual assistants (Dahal et al., 2022). By virtue of owning the hardware, software, and data

used to build VAs, Big Tech corporations in the Global North are digitally exercising a new form of colonialism.

Language and Digital Colonialism

Considering the above challenges, harms, and opportunities related to technological advancements and changes, technology should be scrutinised and viewed as more than just changes and advancements. According to Sutherland (2019: 2), "4IR is not the result of careful historical analysis; it is a flag to rally and a rhetorical device for those trying to create particular economic and commercial futures, hoping to ride waves of Schumpeterian economic disruption caused by 'extreme automation and extreme connectivity.'" In addition, he critiques the slow and inadequate drafting of legal and policy frameworks surrounding cybersecurity, data protection, education, infrastructure, and skills, all of which are essential for the "4IR". In addition, a warning in the context of South Africa is placed on the gap this provides, pushing South Africa to rely on privately owned and international organisations such as the World Economic Forum (WEF), which blurs the distinctions between the impacts and benefits of "4IR" (Sutherland, 2019: 2).

Although Africa has the largest deposits and producers of raw materials for cobalt, dysprosium, terbium, lithium, and graphite (Baskaran, 2023), which are mostly used in 4IR technologies, the economic benefits are disproportionately captured by Big Tech corporations, resulting in low and unevenly distributed benefits for African nations. This extractive process has taken a new form, digitally. According to Kwet (2019), the ownership and control of digital technologies by Big Tech corporations, which enables them to exercise power and control over societies, constitutes a new form of colonialism, known as digital colonialism. This power and control are achieved through the means of computation (software, hardware, and network connectivity) and knowledge (intellectual property and data) owned and controlled mainly by countries in the West, led by the United States of America.

Various authors (Kwet, 2019; Sutherland, 2019; Schelenz & Schopp, 2018) explore the effects of foreign players on African countries, highlighting the extractivist nature of Big Tech corporations. Foreign countries covet data to develop facial recognition systems, credit check systems, surveillance systems, and LLMs leading to heavy investments from their financial sector. While China has a notable global presence, it remains far behind the US in the Global South. As Kwet (2019) observes, many core functions of the digital ecosystem are dominated by transnational corporations.

Digital colonialism is not limited to the infrastructure used and data collected, but also encompasses the ideas and frameworks employed in the development of digital technology or systems. An example is South Africa's attempt to replicate and replace Silicon Valley products and services via Showmax (a Netflix clone), Mr D (akin to Uber Eats), and inDrive (South Africa's "Uber"). One can similarly argue that the frameworks and LLMs designed by US corporations have hegemonic features which may lead to biases in the algorithms used in virtual assistants.

Digital Divide

The continuous development of technologies presents new opportunities for businesses and their clientele. However, the focus should be extended to social inequality in terms of access to resources, participation, and various forms of capital (van Dijk, 2018), as well as

the use of technologies. This must be done while exploring attitudes and motivations in relation to adopting new technologies and digital and information literacy.

Van Dijk (2018) argues that the digital divide should not be limited to physical access (hardware and software), but also encompasses other considerations, such as skills, various ways of using technology, and the "complexity of access," redefined as the conclusive use of technology beyond physical access. In addition, digital inequality should not be viewed as a matter of individual experiences but as categorical disparities between people or communities; workers and executives, males and females, Black people, and White people – whereby certain groups seek to attain and use technology first, harnessing opportunities that are present with the use, thus reinforcing power disparities and positions in relation to other groups or communities.

Furthermore, these categorical differences may lead to the unequal distribution of resources, which in turn results in unequal access to emerging technologies (Dijk, 2018). This suggests that the differences that reinforce power dynamics result in unequal participation, consequently leading to reinforced inequalities and the distribution of resources, which mostly affect marginalised communities or people who have not advanced beyond the initial stage, such as physical access.

Moreover, the literature on the digital divide (van Dijk, 2018; Aksoy et al., 2020; Hechanova & Dioquino Jr., 2004; Nimrod, 2018; Faloye et al., 2022) presents an essential factor that is less commonly discussed, technophobia. Van Dijk (2018) and Faloye et al. (2022) define technophobia as the avoidance of using any form of technology, as well as the perceived distrust users have in the beneficial effects or potential threats. The complexities that users perceive in emerging technologies make them anxious and apprehensive about appropriating them (Aksoy et al., 2020; Hechanova & Dioquino Jr., 2004; Nimrod, 2018; Faloye et al., 2022), thus leading to technology avoidance, resulting in a more widening gap of an existing digital divide, which various literature (Cox et al., 2018; Nyahodza & Higgs, 2017; Robb, 2020) found is deepening in South Africa. This gap can be bridged through localisation of digital technologies, thus putting language at the heart of technology development.

VA Localisation

Dr Ngubane (former Minister of Arts and Culture, Science and Technology), through the Language Plan Task Group (LANGTAG), discovered that the management of language diversity in post-apartheid South Africa was made problematic by the lack of a clear and defined linguistic policy, consequently leading to "undue reliance on the utilisation of non-indigenous languages as the dominant, official languages of the state" – where English and Afrikaans were used as the most dominant languages in socio-economic and political spheres of society (National Language Framework Policy, 2003: 10).

Alexander (1997: 85) posits that to resolve the language issue, institutions and the government must develop policies that ensure the standardisation of community dialects by promoting them through media, technology, and education. Heeding this message can help ensure that a wide diversity of languages and dialects are used in virtual assistants. This should also be applied to schools by teaching science and technology-related subjects in students' native language. Through the phenomenon of localisation, using Free and Open-Source Software, the integration of Indigenous languages in VAs may be possible.

The use of Free and Open-Source Software is a good way to ensure that language communities play an active role in using, changing, and adapting localised software to their benefit. Issues of digital colonialism were developed by policymakers in the early 2000s. South Africa was the first leading supporter of FOSS for use in the public sector on the African continent (Kwet, 2019: 180). Early studies of policy exposed the threat of proprietary software to local interests, with Microsoft at the centre. Proprietary software serves the profits of (primarily foreign) Big Tech corporations at the expense of marginalised communities, which cannot afford to pay for proprietary software. Moreover, proprietary ownership prevents local communities from controlling and customising their own computer-mediated experiences. On the other hand, FOSS grants individuals and communities control over their software, giving them the power to modify it for their own purposes and benefits. It can also be used and shared free of charge, making it more accessible to the poor.

Nichols et al. (2005: 140) argue that the FOSS license encourages the participatory design of software with a community-based end-user interface for localising various languages (of which there are many). Because language is the driver of thought, communication, and cultural identity, the active participation of FOSS systems in VAs for other languages can assist in the preservation and dissemination of language, knowledge, and culture to speakers of different languages (Jimerson and Prud'hammeaux, 2018: 4161; Nichols et al., 2005: 139).

According to Nichols et al. (2005: 145), most software or technologies owned by Big Tech have restrictions due to the unavailability of source code. Consequently, language localisation is hindered. However, through the implementation of the FOSS policy, preference can help fuel the development of open VAs. FOSS is affordable, which enables less affluent organisations and developer communities to make suitable changes to software that will cater to the needs of a given community.

In addition to implementing FOSS in the public sector, the government could adopt a comprehensive, intersectional approach to language and technology policy. This may be achieved through localised technologies – where products are adaptable and customised for specific languages or markets. Osborn and Osborn (2010: 19) propose the term "localisation ecology" to identify the factors affecting localisation and the specific efforts to localise software. The localisation of software depends on sufficient standardisation in terms of dictionaries, terminology, and orthographies. Efforts to develop and enrich standards can benefit from government language policies or institutional programs in healthcare, education, and financial systems, as well as VAs developed in local languages. Educational institutions also play a vital role in the process of localisation ecology, where the installation of localised software or programmes (VAs) on computers in various languages can offer multiple ways of studying and interacting with technology, thus providing people access to various services (Osborn and Osborn, 2010: 125).

For the financial sector, a combination of policies and governmental initiatives that encourage the use of FOSS, localisation, and multilingualism can enable the use of diverse languages in VAs, allowing various language communities to benefit from using them in their own languages. As language exclusion can manifest into digital inequality, creating measures to bridge the financial digital divide is essential. Giving language communities control over how to manage their languages and for what purposes they are used is essential to ensuring that language communities play an active role in maintaining the integrity of their languages and culture, bridging the digital gap, and thus enabling access to financial

services. This will ensure every language and linguistic community is respected, and robust policies are created. Therefore, this review addresses a significant gap in the inclusion and accessibility of Fintech-linked language.

Findings and Discussion

As humanity has entered a new era, with a surge in AI use in various sectors, the use of VAs – a human's new best friend, able to assist with anything, is now a fingertip away. However, the slow pace at which South Africa has absorbed new technologies through its parts, such as language, has added another element to the already existing division, the 'digital divide' (Mallikarjun, 2004). Banks need to consider a few aspects in relation to the development of virtual assistants for the benefit of everyone, not just privileged clients.

Challenges with VA Development

There are various challenges that come with the development of multilingual VAs. Participant 2 disputes the idea that the lack of diverse language use in VAs is an issue, highlighting that "*first, we need to close the digital divide. Get people comfortable with technology, and once they're comfortable with it, it becomes easier to start. So, I don't think it is a language barrier thing, it's a trust thing*."

This is reiterated by Faloye et al. (2022: 4) who state that technophobia arises when users view new technology as a threat due to the complexity, leading to fear, anxiety, and avoidance (Faloye et al., 2022; Aksoy et al., 2020; Hechanova & Dioquino Jr., 2004; Nimrod, 2018). Faloye et al.'s (2022: 8) study also discovered that users with no former employment have high levels of technophobia, while young adults exhibit low- to mid-levels. However, beyond access and anxiety, the researcher argues that language is a crucial factor. Using native languages in digital technologies like VAs can ease apprehension and foster comfort and adoption.

When asked how language would be a challenge or major issue for bank clients when using the bank's virtual assistant, Abby, Participant 1 responded: *"In terms of language, 100% [there are challenges], because if you don't know English, then you are stuck." They explained that the VA are "looking for those trigger words like airtime, and may not understand alternative language like "please recharge for me," even though the intent is the same*.

The above highlights that challenges still arise even within the English language. At the bare minimum, without sufficient training data, the VA will fail. This sentiment is echoed by Participant 2 who emphasises that without sufficient "intelligence", VAs struggle to interpret user requests, leading to access barriers. When asked about challenges in using VAs, focus group participants highlighted challenges with pronunciation. Participant 5 explained, "*Our accents are borrowed. They are not our own, sir. If I want to send money to Boikanyo, and it would send to Boikano, you see that's gonna [going to] be a problem…It's Boikanyo and not Boikano*.

Participant 6 agreed, noting that "*there are certain pronunciation [differences] in our pronunciations that can make using these systems difficult*." These concerns are echoed by Koenecke et al. (2020: 7685) who found in their study that pronunciation variations between white and black communities affect VA, as models are trained on "standard English" often

spoken by White users. The biases in chatbot pronunciation perpetuate racial disparities (Weidinger et al., 2021: 17).

Supporting studies (Keniston, 2003; Mallikarjun, 2004; Warschauer, 2002; Baasanjav, 2014) emphasise that language influences access to the digital ecosystem, an often-overlooked aspect of the digital divide. Therefore, language integration should be considered holistically, including how the structural features of capitalism shape the development and accessibility of VA in banking.

Ownership and the Market as the Dictator

Western imposition has shaped polices and technological frameworks of various countries, including South Africa, often aligning them with neoliberal ideas. According to Heugh, as cited by Phaahla (2015: 185), this is based on linguicism, privileging those fluent in English in systems of power. Consequently, Western languages like English have a better chance of being used to train Large Language Models (LLMs), thereby sidelining South Africa's indigenous languages due to global market pressures.

When asked about the possibilities of integrating isiZulu and Tshivenda, Participant 3 acknowledged the difficulty:

> "We're definitely struggling with other languages. We sort of only focusing on English on for now, just simply because other languages aren't on the scale of what it is. It's super hard, especially for that switch-code in the South African context – where we can switch what language you speak quite a lot. We don't have experience with it that much because our things are for more English products at the moment."

They emphasised that this challenge extends beyond individual companies. Given English's global dominance and extensive digital footprint, startups like Participant 3's, naturally gravitate toward it for VA development. Participant 3 reinforced this by highlighting that English's widespread use and digital footprint make it a default choice, even if it means excluding other languages.

This suggests that, considering all factors, the development of virtual assistants is market-driven, with language choices influenced by commercial viability. However, the researcher argues that this is also due to the dominance of Western ideologies embedded in the design of LLMs. With the West leading the AI race, languages used to train LLMs may give a particular tech giant a competitive edge due to their profitability and digital saturation.

As Africa becomes more digitised, the process warrants critical scrutiny. The growing dominance and influence of US-based Big Tech corporations and other foreign players bring not only their technologies but also their values, models, perspectives, and ideas. These are deeply embedded in the software, hardware, and AI systems sold to African nations, reinforcing Western paradigms and limiting integration of local linguistic and cultural contexts.

When asked about products used for their company's core products, Participant 3 explained that:

> "Our real products is our own LLMs with that system around it but we do heavily use OpenAI and ChatGPT to test our things and even do our small little things in our entire pipeline. But not extensively".

This reflects a hybrid approach that leverages Western frameworks while maintaining some independence. The researcher argues that while it is potentially acceptable to use established models to assess practicality and feasibility, the context in which the products are developed and deployed is crucial. Companies like OpenAI design systems primarily for languages (English, French, Chinese, German) with extensive digital footprints, making their frameworks effective for those markets. However, in South Africa, deploying VAs requires consideration of the country's nine indigenous languages. Tailoring these models to reflect South African's linguistic diversity demands collaboration with language communities and research initiatives such as Masakhane, ensuring VAs are developed by and for South Africans.

When asked about data storage for business operations, Participants 1 and 3 revealed their reliance on Western cloud infrastructure. Participant 2 stated, "*…its [Microsoft] Azure*". They further explained "*there's no services which are free, specifically if you've got an enterprise agreement…whether it's Amazon, or whether it's Microsoft, you have enterprise agreements that you would pay for*."

For their company, Participant 4 stated that:

> "We use [Amazon] AWS. A lot of our stuff is done and stored on there. We try to store all of our data in encrypted forms of data. We really don't have sensitive data. There's no personal data that we use."

These responses underscore Western imposition and dominance in the development of and deployment of VAs. The reliance on paid cloud services like Azure and AWS fills the pockets of Western tech giants and reinforces their control over the technology market in South Africa. This reflects a broader pattern of Western impositions where technological platforms, frameworks and data ecosystems are shaped by foreign interests, limiting local independence and innovation.

Toward a Localised Virtual Assistant

As Africa becomes increasingly exposed to the digital ecosystem through digitisation, the process of digitisation should be scrutinised, given the growing dominance of US-based Big Tech corporations and other foreign players. Additionally, the US-based Big Tech corporations' dominance is accompanied by their values, models, perspectives, and ideas, which are deeply embedded in the technologies imported to African countries – including software, hardware, and artificial intelligence sold to these countries. The participants were asked if an immense amount of data is required for VAs to work efficiently, and their responses were that:

> "The more data you have, the better the engine gets. 'Cause you would filter it if you created a model for a language with 5 people, compared to making a language model that is getting inputs not from 5 people, but from a million people." (Participant 3).

> "Remember, chatbots and AI require intelligence; you need to be feeding it intelligence on a continuous basis, so that it can pre-empt what Sanele's next question is going to be or what his requirements are going to be." (Participant 2).

Although the above responses demonstrate the idea that more and more data are required to have the 'best' language model, a Western-based idea of building LLMs, Participant 4 provides differing views from those presented by Participants 2 and 3 – that language models require astronomical amounts of data to function effectively.

> No, I really don't believe that's the future. I have my own AGI (artificial general intelligence) beliefs and there I can see scale and a lot of data can get you very far but then in terms of product building then definitely not that amount of data.

If Participant 4 is correct, enormous amounts of data are not necessary for chatbots to function effectively. The reliance on Western-based tech companies further illustrates the neocolonial status quo, as foreign tech giants develop core features of the digital ecosystem and extract rent in the form of intellectual property, access to infrastructure, and licenses to use proprietary software (Coleman, 2021: 21; Kwet, 2019: 88).

Moreover, Kwet (2019: 79) states that FOSS gives the users control over how software is used or adapted to benefit them. The researcher argues that Western influences are prevalent in the development of technologies such as virtual assistants. This is highlighted by the systems used to store data, where these cloud computing infrastructures are paid for monthly, filling the pockets of Western tech giants while giving them control over the technology market in South Africa. This echoes the dominance of technology and software, thus preventing, for example, language communities that may use LLMs deployed by tech companies from collaborating with them to adapt the LLMs to meet their ever-changing requirements and needs.

Participant 4 provided a view on the use of FOSS in LLMs, when asked about their perceptions on using FOSS in VAs:

> "I support it a lot. I really do believe that language models can be open source. The good outweighs the bad…and in this case for and just the progress that has been made and sort of the good that can come. There will come products that will help millions of people in ways we've not seen and it's purely because it was open source, and the technology was driven forward miles than if it was just constantly being kept behind walls."

Therefore, to add to the argument against the use of Western ideologies to develop South African LLMs, the use of FOSS and working with people on the ground (language communities) and linguists will assist in handing control over to relevant stakeholders and communities to ensure that the people develop LLMs for the people. This is supported by banking clients who argue that:

> Why are we not included like other languages as well? Because mina [me] I'm a Zulu native, I think it will be easier for me to access the banking app using my own language because, in sports there are sports commentators, there are Afrikaans

> commentators, there are English commentators … there's that inclusiveness for everyone. So why not apply that to banking as well? (Participant 8).

All participants shared the same view that using their native language is essential. Participant 6 explained that "*Venda should also be there…let's say when you include another language, English should also be there or let's say there's an option that says you can change*." Similarly, Participant 9 stated, "Yes, *they just need to accommodate everyone*." The participants' responses highlight the importance of having language diversity in banking applications. Although some of them may opt to use English, it is still crucial to include all languages to accommodate non-English speakers.

Conclusion

In agreement with Fairclough's (1992) critical discourse analysis, stakeholders may perpetuate access issues by prioritising the more profitable English language in their product lines rather than developing technologies that meet the needs of a diverse population. This practice risks excluding financially marginalised excluded (unbanked) from accessing online banking services such as virtual assistants (VAs). CDA reveals how language can both enable and inhibit participation in social institutions, reinforcing its role as a social practice essential for equitable access.

To make the Fourth Industrial Revolution (4IR) inclusive, the integration of indigenous languages must be central to technological development. In South Africa, the digital divide is not only infrastructural, marked by unreliable internet, loadshedding, and high data costs, but also linguistic. The lack of language diversity in digital services disproportionately affects low-income, non-English-speaking communities in townships and rural areas, as highlighted by focus group participants. Policies and practices must be revised to more accurately, appropriately, and respectfully represent Indigenous peoples and their languages, removing barriers to banking access (Farnel et al., 2018: 15).

This article proposes that beyond technological innovation, VAs and the concept of 4IR more broadly should be critically examined through the lens of socioeconomic justice. Indigenous language integration in banking LLMs should be taken seriously. If English continues to predominate, hegemonic dynamics that marginalise African communities will be further perpetuated through the spread of VAs. Using CDA, this article reveals the interplay between HLT, power, and language in banking, challenging the surface meanings of such communication technologies (Wodak, 2013: 305).

Localisation through Free and Open-Source Software (FOSS) offers a pathway to linguistic representation. As illustrated by the findings, the "free" market dictates how and for whom LLMs are developed, favouring those with economic power. The capitalist bias places profit above people. While integrating Indigenous languages into VAs is promising in theory, accommodating the rich diversity of languages spoken in South Africa runs counter to the pressures of the market. This often hinders practical implementation.

To counter these, policies are required to mandate the inclusion of Indigenous languages in HLTs. Government support, such as subsidising FOSS development for the public sector, can help. These efforts should be co-designed with local communities, universities, and linguists, incorporating their feedback to ensure relevance and accessibility. Ultimately,

technology should be viewed through a lens that explores how the creation of a seemingly benign technology, such as virtual assistants, can act as a keyhole to explore and unveil the entire background set of considerations and motivations of why and how certain languages and communities are included in the fruits of digital society, and why others are not.

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