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THE ROLE OF AI IN PRESERVING ABORIGINAL LANGUAGES

Dr. Shalika Gupta

Associate Professor, Department of Education

GCOE, Canal Road Jammu

Abstract

Once a language is lost, the unique cultural knowledge and traditions tied to it are also at risk of vanishing. Technology can play a key role in preserving and promoting Indigenous languages by offering innovative solutions for documentation, education, and communication. This paper explores how modern technology, such as mobile applications, digital platforms, virtual reality, and artificial intelligence, is being used to document, teach, and revitalize Indigenous languages. It also discusses the benefits and challenges of using technology in this process, including issues of accessibility, digital literacy, and cultural sensitivity. By analyzing different case studies and existing digital tools, the paper highlights how technology can bridge the gap between older and younger generations, making language learning more accessible and engaging. Furthermore, it emphasizes how digital resources can support language immersion programs and provide tools for self-paced learning. This research also considers the role of community involvement, ethical concerns, and the need for collaboration with Indigenous leaders in using technology for language preservation. This research aims to show how technology can be a powerful tool to keep aboriginal languages alive for future generations while respecting the cultural values, traditions, and knowledge systems of Indigenous communities.

Keywords: Aboriginal Languages, Technology, Language Preservation, Digital Tools, Cultural Heritage, Language Revitalization, Community Involvement.

Intorduciton

Aboriginal languages are a vital part of a community's culture and identity. They carry stories, traditions, and knowledge passed down through generations. However, today, of the approximately 7,000 languages spoken worldwide, nearly 40% are at risk of extinction, with the majority being Indigenous languages (UNESCO, 2022). This is happening because of things like globalization (where cultures mix and major languages dominate), urbanization (people moving to cities and leaving their communities), and a decreasing number of fluent speakers. However, despite these challenges, efforts to preserve and revitalize Indigenous languages continue. While traditional methods like dictionaries and audio recordings have helped, they have limitations in accessibility and engagement. This is where technology is stepping in to play a transformative role.

THE ROLE OF TECHNOLOGY IN LANGUAGE PRESERVATION

The decline of Aboriginal languages has accelerated dramatically in recent decades, driven by factors including globalization, colonial legacies, assimilations policies, and economic pressures. Traditional language preservation efforts often relied on printed dictionaries, linguistic field notes, and audio recordings—methods limited in scope, accessibility, and engagement potential. The digital revolution has fundamentally transformed these preservation possibilities, offering new pathways for documentation, teaching, and everyday language use.

Documentation and Archiving

Digital technologies have revolutionized language documentation through:



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Comprehensive Documentation: Modern technology enables the creation of multimodal records including audio, video, text, and interactive materials that capture not just vocabulary and grammar, but also pronunciation, context, cultural practices, and non-verbal elements of communication. The Eastern James Bay Cree Dictionary project exemplifies this approach, incorporating audio recordings, cultural context notes, and dialectal variations in a searchable digital format.

Accessible Archives: Cloud-based storage and online platforms have transformed accessibility, allowing geographically dispersed community members to access language resources. The Digital Library of Indigenous Languages of Mexico exemplifies this approach, providing open access to linguistic materials for dozens of Mexican Indigenous languages.

Metadata and Organization: Digital systems enable sophisticated tagging and organization of linguistic data, facilitating research and practical applications. The Alaska Native Language Archive's digital infrastructure allows users to search materials by language family, geographical region, content type, and cultural context.

Learning and Teaching Tools

Technology has opened new avenues for language education through:

Interactive Learning Platforms: Digital platforms offer immersive, responsive learning environments that adapt to individual progress and learning styles. The Anishinaabemowin Pane immersion app provides progressive lessons with speech recognition to help learners develop conversational skills in Ojibwe.

Mobile Applications: Smartphone apps provide portable, accessible language learning tools that integrate into daily life. The Māori Language Commission's "Kōrero Māori" app includes daily vocabulary, phrase guides, and pronunciation tools designed for practical use in contemporary contexts.

Gamification: Game-based learning approaches have proven particularly effective for engaging younger generations. The "Never Alone (KisimaInjitchuḡa)" video game incorporates the Iñupiaq language and cultural narratives into gameplay, exposing players to Indigenous knowledge systems while developing language familiarity.

Artificial Intelligence and Computational Linguistics

Recent advances in AI offer sophisticated tools for languages with limited resources:

Natural Language Processing (NLP): While major languages benefit from extensive NLP development, Indigenous languages face significant challenges due to limited training data, complex morphological structures, and oral traditions. Nevertheless, emerging approaches in low-resource NLP are showing promise. For instance, the Crúbadán Project has developed techniques for creating basic linguistic tools for under-resourced languages by harvesting online content and applying statistical methods.

Speech Recognition and Synthesis: Voice technologies can support both documentation and learning. The First Voices Keyboard app incorporates speech recognition for several Indigenous languages of British Columbia, allowing users to dictate in their language despite limited training data through transfer learning techniques.

Machine Translation: While full machine translation remains challenging for most Indigenous languages, basic translation tools are emerging. The Canadian Indigenous Language Technology Project has developed prototype translation systems for Inuktitut by leveraging parallel texts and adaptive training methods.



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Community Communication Platforms

Technology also supports everyday language use through:

Social Media: Platforms like Facebook, Twitter, and Instagram have become unexpected allies in language revitalization, providing spaces where Indigenous language speakers connect, share, and normalize language use in contemporary contexts. The Hawaiian language has seen significant growth in social media usage, with dedicated groups facilitating daily conversation.

Community Radio and Podcasts: Digital broadcasting extends the reach of oral language traditions. Radio Yandê, Brazil's first Indigenous web radio station, broadcasts in multiple Indigenous languages, creating both language learning opportunities and contemporary domains for language use.

Messaging Applications: Platforms like WhatsApp enable immediate, private communication in Indigenous languages. The "WhatsApp for Māori" initiative encourages users to communicate in te reo Māori, providing vocabulary assistance and cultural context for everyday conversations.

The technological landscape for language preservation continues to evolve rapidly. What distinguishes successful initiatives from less effective ones is not merely technological sophistication, but rather how well technologies align with community needs, cultural contexts, and practical realities. The following sections explore specific implementations through case studies, examining both successes and challenges in technological interventions for Indigenous language preservation.

CASE STUDIES AND EXISTING TOOLS

Technological interventions in Indigenous language preservation vary significantly across regions, reflecting diverse linguistic needs, technological access, and cultural contexts. This section examines notable case studies from different geographical areas, highlighting innovative approaches and their specific implementations.

Asia: Technological Approaches to Linguistic Diversity

Ainu Language Preservation (Japan)

The critically endangered Ainu language of northern Japan has benefited from targeted technological interventions:

Ainu Times Digital Archive: This searchable repository digitizes the Ainu Times, a bilingual Ainu-Japanese periodical, making historical materials accessible to new generations of learners and researchers.

"AkorItak" Digital Storytelling: This project combines traditional Ainu narratives with interactive digital media, allowing users to engage with stories while learning vocabulary and cultural context simultaneously. The platform particularly emphasizes the oral tradition central to Ainu culture.

Indigenous Languages of Taiwan

Taiwan's Austronesian languages have seen innovative preservation approaches:

Formosan Language Digital Archive: This comprehensive collection preserves materials in Taiwan's 16 officially recognized Indigenous languages, incorporating audio, video, and text resources (Huang, 2018).



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E-Learning Center for Aboriginal Languages: This online platform offers structured courses in multiple Indigenous languages, utilizing video conferencing to connect learners with native speakers from remote communities (Tang & Yang, 2017).

The following sections will explore the benefits and challenges of these technological approaches in greater detail, examining how they function within specific community contexts.

Indigenous Languages of India

India is home to **over 450 Indigenous languages**, many of which are endangered. In recent years, several technological initiatives have emerged to document and revitalize these languages:

People's Linguistic Survey of India (PLSI) Digital Archive: This project has created a digital database documenting linguistic and cultural diversity across India. It collects oral histories, folk stories, and linguistic records to preserve and promote endangered languages.

Bhasha Research and Publication Centre: This initiative uses digital storytelling and mobile-based applications to document tribal languages such as Bhili, Gondi, and Korku. Their multilingual online resources support language learning and cultural preservation.

Virtual Tribal Museum: Launched by the Ministry of Tribal Affairs, this platform features Indigenous languages, cultural practices, and oral traditions. It offers audio-visual materials that highlight endangered languages and provide learning resources.

Google's Project Navlekha: This initiative helps local publishers digitize content in regional and Indigenous languages, making these languages more accessible online and ensuring digital inclusion for speakers of marginalized languages.

Adivasi Academy's Language Documentation Project: This grassroots initiative documents and archives endangered tribal languages using digital platforms. It collaborates with local communities to preserve language and cultural practices through multimedia resources.

BENEFITS OF TECHNOLOGICAL SOLUTIONS

Technological interventions offer distinct advantages for Indigenous language preservation and revitalization efforts. This section examines these benefits through three critical lenses: accessibility, engagement, and documentation.

Accessibility: Breaking Geographic and Temporal Barriers

Technology fundamentally transforms who can access language learning opportunities and how they do so:

Geographic Dispersal: Many Indigenous communities face diaspora challenges, with speakers scattered across wide geographic areas. Digital platforms enable connection despite this dispersal. The Lakota Language Consortium's online courses connect urban Lakota youth with reservation-based elders, maintaining linguistic ties despite physical separation (Siekman et al., 2017).

Flexible Learning: Digital tools accommodate diverse schedules and learning paces, particularly important for community members balancing language learning with work and family responsibilities. The "Anishinaabemowin Pane" app allows users to engage in short, focused learning sessions that fit into daily routines rather than requiring dedicated class time (Hermes et al., 2016).



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Intergenerational Bridges: Technology can facilitate language transmission between generations despite modern living patterns that often separate elders from youth. The "Words from the Elders" project in Northern Canada records elders' knowledge and language in digital formats that young people can access independently, creating virtual forms of traditional knowledge transmission (Moore & Hennessy, 2006).

Documentation: Creating Permanent and Evolving Records

Digital documentation helps preserve Indigenous languages in powerful ways. It can capture complex details like tone and pronunciation that traditional methods miss. For example, the *Zapotec Talking Dictionary* records the unique sound patterns of the Zapotec language. It also allows for better organization through tagging and cross-referencing. The *Digital Himalaya Project* connects language samples with maps, speaker information, and cultural notes, giving a fuller picture of the language (Turin, 2012). Beyond language, digital tools can save traditional knowledge. In India, the *Traditional Knowledge Digital Library* records Indigenous medicinal terms in tribal languages, protecting both the words and the knowledge they hold. While technology offers these benefits, it is not a perfect solution. Successful language preservation needs careful planning and community involvement.

CHALLENGES AND CONSIDERATIONS

While technology helps preserve Indigenous languages, it also brings challenges. These can be grouped into four key areas: infrastructure, cultural appropriateness, language complexity, and ethical concerns.

Infrastructure

Many Indigenous communities face poor internet access, especially in remote areas. For example, online Inuktitut learning in the Canadian Arctic struggles due to slow and expensive satellite connections (O'Donnell et al., 2016). Access to devices is also uneven—elder speakers in Oaxaca, Mexico, couldn't use digital materials without community access points (Lillehaugen, 2016). Some areas lack reliable electricity, so projects in the Amazon Basin use solar-powered tools (Stenzel, 2014). Even when technology is available, maintaining it requires technical support, which many communities lack (Fish & Gibbons, 2019).

Cultural Appropriateness

Technology must respect Indigenous cultural practices. Some knowledge is sensitive and should only be shared with certain people. For example, the Aaraititja digital archive restricts content by age, gender, and clan. Cultural timing also matters—the Ojibwe Winter Storytelling app only shares certain stories during winter. Many Indigenous communities value collective ownership of knowledge, which digital platforms must reflect. The Mukurtu system allows community-based access and permissions.

Language Complexity

Indigenous languages often have features that are hard to capture digitally. Oral traditions rely on gestures and tone, as seen in the Hawai'i Sign Language project (Carleton, 2016). Many languages also have multiple dialects—Quechua documentation preserves these differences rather than enforcing one version (Rios, 2015). Some languages, like Inuktitut, have complex word structures that need specialized digital tools (Micher, 2018).

Practical and Ethical Considerations

Sustaining language projects is difficult without long-term funding. For instance, the Eastern James Bay Cree Lexical Database struggled after its initial funding ended (Junker, 2018). Leadership changes can disrupt projects, so the



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Wayuunaiki Digital Archive uses shared leadership to ensure continuity. Community training is also essential—the First Peoples' Cultural Council trains Indigenous language workers to manage their own digital projects (Galla, 2018). Addressing these challenges requires more than just technology—it demands community involvement, cultural sensitivity, and long-term commitment.

CONCLUSION AND FUTURE DIRECTIONS

Technology alone cannot save Indigenous languages—revitalization ultimately depends on communities choosing to speak their languages and pass them to new generations. However, thoughtfully designed and community-led technological approaches can create powerful supports for these efforts.

The most successful initiatives share critical characteristics:

1. **Aboriginal leadership** throughout the development process
2. **Cultural appropriateness** that respects knowledge systems and protocols
3. **Accessibility** considerations that address community infrastructure realities
4. **Integration** with existing language initiatives rather than technological isolation
5. **Sustainability** planning that ensures long-term resource viability

When these principles guide development, technology becomes not just a preservation tool but a revitalization partner—helping Indigenous languages thrive in both traditional contexts and new digital domains. As one Māori technologist describes: "We're not preserving our language in digital amber. We're creating new domains where our language can live and grow for generations to come."

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