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Preservation and Standardization of Endangered Languages: The Role of Modern Technology in Safeguarding Cultural Heritage

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| Article Info | Abstract |
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| <p><i>Article History</i></p> <p>Date of Submission 30-09-2025</p> <p>Date of Acceptance 29-10-2025</p> <p>Date of Publication 30-12-2025</p> | <p>Due to the rapid decline of endangered languages worldwide, communities face the risk of losing their cultural identities and traditional knowledge (Moseley, 2010). This study portrays the preservation and standardization processes of endangered languages and highlights the crucial role of modern technology. This research includes secondary data sources—including reports from UNESCO, Ethnologue and scholarly publications. It examines how digital documentation, mobile applications, and online language-learning platforms can support the regeneration of endangered languages and help communities reconnect with their linguistic heritage. The study shows how technology helps people to access and learn easily about the endangered languages and pass the knowledge to the next generation. The study also portrays that technology can reinforce community identity and cultural pride, even when direct fieldwork is not possible. This study reveals how using technology with research can protect endangered languages and keep cultural heritage alive.</p> |
| <p><i>Keywords</i></p> <p>Endangered Languages, Language Preservation, Standardization, Modern Technology, Cultural Heritage, Digital tools</p> | |

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Introduction

Language is more than just a way of communication; it is a reflection of our thoughts, emotions, and shared human experience. Language represents the cultural memory, collective knowledge, and identity of a community. Still, nowadays, we are noticing the rapid decline in linguistic variation. UNESCO warns that almost half of the world's 7,000 languages are in danger and many could disappear entirely within the next century (Moseley, 2010). The disappearance of these languages indicates both the loss of words and the erosion of cultural heritage, traditional practices, and unique worldviews which have been preserved across generations. Such losses harm community identity and contribute in the global blending of culture.

To tackle this urgent crisis, the preservation and standardization of endangered languages have become central issues in sociolinguistic research and cultural policy. Traditionally, researchers used fieldwork, oral documentation, and print-based archives as the primary tools for language preservation (Fishman, 1991). However, in our digital world, modern technology provides creative, flexible, and interactive ways to protect endangered languages. Digital archives, mobile applications, and online learning platforms make it easier for young generations to learn endangered languages, keeping them alive and fostering pride in linguistic identity (Hinton, 2018).

Technology also plays a key role in standardizing languages. Many endangered languages don't have consistent writing systems, clear grammar guides, or standard learning materials. Using digital collections, writing tools, and multimedia resources, modern technologies not only preserve these languages but also make it possible to use them in education, literature, and online platforms (Eberhard, Simons, & Fennig, 2023). This dual process of preservation and standardization indicates that endangered languages are not simply recorded as memories but used as living systems of communication.

This study explores how technology protect and organize endangered languages, based on reports from UNESCO, Ethnologue, and scholarly publications. This research explains how digital tools

can revive endangered languages and preserve cultural heritage. Ultimately, the study finds out that saving languages with technology is not only about linguistic necessity but also about keeping our cultural diversity alive for the future.

Identification of Research Problem/Statement of the Problem/ Statement of the Topic

The rapid decline of endangered languages worldwide and the resulting threat to cultural heritage, traditional knowledge, and community identity are the main problems in this study (Moseley, 2010). Although sociolinguists have been researching language preservation and standardization for decades, endangered languages continue to face extinction due to globalization, urbanization, and intergenerational language shift (Fishman, 1991; Moseley, 2010). Lack of standardized orthographies, structured learning resources, and consistent documentation are the main problems that limit the transmission of many languages to younger generations (Hinton, 2018).

Traditional preservation methods such as oral histories, print archives, and community-based fieldwork remain valuable but are not sufficient to address the urgency of the crisis. Audiences are not able to access these traditional approaches due to their time-consuming, geographically limited nature. In contrast, expandable, interactive, and innovative solutions for both preservation and standardization are offered by modern technology (Eberhard, Simons, & Fennig, 2023). Digital tools (such as online archives, mobile applications, social media platforms, and multimedia resources) make endangered languages more accessible and support the development of standardized writing systems and structured teaching materials (Hinton, 2018; Eberhard, Simons, & Fennig, 2023).

Therefore, this study explains how modern technology can protect and organize endangered languages better than the traditional methods. The main target of this study is to find out how digital tools can renew endangered languages, reinforce cultural identity, and reverse language shift, even when field-based research is limited or not possible (Fishman, 1991; Hinton, 2018).

By addressing this problem, the research highlights the crucial connection between linguistics, technology, and cultural preservation.

Objectives of the Research

Broad Objective

The broad objective of this study is to find out how modern technology can preserve and standardize endangered languages, keep cultural traditions alive and empower the identity of communities.

Specific Objectives

Following Creswell and Creswell (2018), who say research objectives must be clear, practical, and linked to the research problem, this study presents the following specific objectives:

1. To examine the impact of the global decline of endangered languages and its effect on culture, traditions, and community identity.
2. To analyze how modern technological tools—such as digital archives, mobile applications, and online learning platforms—support the preservation of endangered languages.
3. To examine the role of technology in developing standardized writing systems, digital collections, and structured learning resources for endangered languages.
4. To reveal the limitations of traditional preservation methods in comparison with technologically driven approaches.
5. To suggest a practical framework that incorporates digital tools with sociolinguistic theory to revive endangered languages and reverse language shift.

Literature Review

Global Decline of Endangered Languages

In the 21st century, nearly half of the world's 7,000 languages are at risk of disappearing, which demonstrate a serious decline in linguistic

diversity (Moseley, 2010). This rapid loss goes beyond the extinction of words and harms cultural traditions, community identity, and accumulated knowledge. Endangered languages carry unique historical knowledge and ways of seeing the world. If they disappeared completely, local cultural practices are lost forever (Eberhard, Simons, & Fennig, 2023). According to UNESCO (2010), the decline of languages speeds up cultural uniformity, weakens the identity of local communities, and reduces the transmission of knowledge to the next generation.

Traditional Approaches to Language Preservation

Traditionally, people preserved endangered languages through oral stories, field studies, and printed materials (Fishman, 1991). These approaches have played a crucial role in maintaining linguistic diversity, especially in smaller communities. Oral histories hold stories, traditions, and customs alive, while books, including grammars and dictionaries help people learn the language in a proper way. However, these traditional methods face several barriers. For instance, they are labor-intensive, often geographically limited, and not easily accessible to a wider audience (Hinton, 2018). These methods can only preserve local knowledge in small communities, but they are insufficient to address the growing threat of language endangerment worldwide.

Digital Technology in Language Preservation

Endangered languages have been protected with the help of the recent digital technologies. Tools such as mobile applications, online language-learning platforms, and digital records increase access to linguistic resources and encourage young speakers for active engagement (Hinton, 2018). Communicative applications provide engaging learning experiences, while online communities encourage collective practice and cultural exchange. Research shows that technology encourages people to speak a language more in their daily lives and share it with younger generations (Eberhard, Simons, & Fennig, 2023). Also, digital resources raise public awareness about language endangerment and support community identity without relying entirely on extensive fieldwork (Moseley, 2010)

Technology and Language Standardization

The absence of standardized orthographies, grammatical references, and structured educational resources is the main challenges of many endangered languages. Modern technology solves these limitations by providing digital corpora, orthographic tools, and multimedia learning materials. For instance, online dictionaries, noted corpora, and text-to-speech technologies encourage learners to use the languages regularly and follow standard practices (Fishman, 1991; Hinton, 2018). Digital platforms make us aware of the continuous updates and changes and ensure that standardization efforts meet the community's needs. By combining preservation and standardization, technology converts endangered languages into usable, living systems that can be used in education, literature, and digital communication (Eberhard, Simons, & Fennig, 2023).

Critical Synthesis

Traditional methods are still important but modern research highlights the important role of technology in modern language preservation (Hinton, 2018). Digital technologies provide expandable, interactive, and sustainable solutions that reinforce traditional approaches. However, if we rely more on technology, it can ignore socio-cultural aspects and limit community involvement in language revitalization (Moseley, 2010). Current research emphasizes the importance of collective strategies that combine fieldwork, community participation, and technological tools to increase preservation outcomes (Fishman, 1991; Eberhard, Simons, & Fennig, 2023). This perspective reveals that technology not only preserve and standardize endangered languages but also reinforce cultural identity.

The reviewed literature indicates that modern technology provides beneficial opportunities to preserve and standardize endangered languages. Digital archives, mobile applications, and online platforms support traditional methods by increasing accessibility, reinforcing intergenerational transmission, and facilitating standardized language learning. Moreover, technology-driven approaches reinforce

community identity and cultural pride. They ensure that endangered languages remain living, functional systems rather than static relics. However, successful use of technology demands a balance between digital tools and community engagement considering the socio-cultural context. A foundation is established by this review investigating how technological tools can save endangered languages globally.

Research Rationale

The preservation and standardization of endangered languages is an urgent academic and cultural concern. In this modern era, almost half of the world's languages are at risk of extinction (Moseley, 2010). This loss endangers not only systems of communication but also cultural identity, traditional knowledge, and the transmission of memory across generations. Traditional methods of preservation, such as oral documentation, community fieldwork, and print archives, have played an important role (Fishman, 1991). However, due to their limitation in scale, accessibility, and long-term use, they cannot address the rapid decline of languages.

Recent advancements in digital technology provide creative opportunities to cope with these limitations. Mobile applications, digital corpora, online archives, and language-learning platforms have made endangered languages more accessible, especially to younger generations (Hinton, 2018). These tools not only preserve languages but also encourage standardization by developing orthographies, grammar references, and multimedia resources that assure regular language use (Eberhard, Simons, & Fennig, 2023). Although previous studies recognize the potential of technology, there is still a need for a clear analysis that links digital tools with sociolinguistic theory and the preservation of cultural heritage.

This study is justified on both theoretical and practical grounds. Theoretically, it supports sociolinguistic debates on language shift, revitalization, and identity by highlighting how technology links the balance between preservation and standardization. Practically, through this study, policymakers, educators, and community leaders adopt

technology-driven strategies that are scalable, adaptive, and culturally sensitive. Unlike earlier studies that focus either on documentation or revitalization, this research plays the dual role of technology in both preserving endangered languages as cultural heritage and standardizing them for contemporary educational and communicative purposes.

By filling these gaps, the research highlights the crucial role of digital tools in safeguarding humanity's linguistic diversity. Ultimately, this research reveals that saving endangered languages is not just a linguistic issue but a cultural necessity. It demands quick, innovative, and interdisciplinary approaches to keep these languages alive as part of our identity and heritage in the twenty-first century.

Research Question

Primary Research Question

How can modern digital technologies effectively support both the preservation and standardization of endangered languages, and what role do they play in reinforcing cultural identity and reversing language shift?

Sub-questions

1. How does the global decline of endangered languages impact cultural heritage, traditional knowledge, and community identity?
2. In what ways do digital technologies—such as mobile applications, online learning platforms, and digital archives—enhance accessibility, language learning, and intergenerational transmission of endangered languages?
3. Which technological strategies contribute most effectively to the standardization of orthographies, grammar references, and structured learning resources?
4. How do technology-driven approaches compare with traditional preservation methods in terms of effectiveness, scalability, and sustainability?
5. What integrated framework can combine modern technological tools

with sociolinguistic theory to support the rebirth and sustainable maintenance of endangered languages?

Theoretical Framework

Core Theory

This study primarily follows Fishman's (1991) sociolinguistic theory of language maintenance and shift. According to Fishman, a language survives through intergenerational transmission, active use within communities, and continual use in daily life. Language preservation is not just about a matter of linguistics; but about protecting culture, memory, identity, and tradition. This framework helps us to examine both the decline of endangered languages and the mechanisms for their renewal.

Supporting Theories

1. Communities of Practice Theory (Wenger, 1998)

Active participation in interactive communities develops learning and cultural knowledge. Digital platforms and online communities encourage collaborative learning, cultural exchange, and intergenerational engagement. Both function as modern "communities of practice".

2. Constructivist Learning Theory

This theory focuses on active, experiential, and self-directed learning processes. It supports the use of mobile applications, digital archives, and online learning platforms to aid engaging and interactive experiences in language learning and use.

Conceptual Constructs

This framework identifies the following constructs:

- a. Independent Variable: Modern Digital Technologies (mobile applications, online platforms, digital archives, multimedia resources).
- b. Dependent Variable: Language Preservation and Standardization (intergenerational transmission,

development of orthographies, grammar references, structured learning materials).

- c. Mediating Variable: Cultural Identity and Community Engagement (strengthening cultural pride, fostering active language use, maintaining traditional knowledge).
- d. Proposition: Modern digital technologies not only support preservation and standardization of endangered languages but also reinforce cultural identity and community bond. Modern digital technologies function as enabling tools.

Justification

Theoretical Significance: Fishman's theory explains the dynamics of language decline and revitalization. Wenger's Communities of Practice theory and Constructivist Learning Theory analyzes that digital tools promote active engagement, learning, and intergenerational transmission.

Practical Significance: This framework encourages policymakers, educators, and community leaders in adopting technology-driven strategies that are scalable, culturally sensitive, and sustainable.

Innovative Contribution: Unlike prior studies focusing either on documentation or revitalization, this framework focuses the dual role of digital technology in preserving endangered languages as cultural heritage and standardizing them for educational and communicative purposes.

Research Methodology

Research Design

This study follows a qualitative research design with a descriptive-analytical approach. It focuses on the processes of language preservation and standardization through technology and depends mainly on secondary sources rather than primary field data. This design allows a systematic exploration of academic debates, digital tools, and case studies. It follows Creswell and Creswell's (2018) concept that qualitative research is appropriate for examining social and cultural phenomena.

Research Approach

Following a qualitative framework, this study recognizes language, culture, and technology as shaped by society. The approach understands meaning, cultural identity, and community experiences by analyzing secondary sources. This research investigates how people understand, use and think about modern technology in preserving and standardizing endangered language

Data Sources and Collection

Secondary data were drawn from three main types of sources:

1. Institutional reports: UNESCO's Atlas of the World's Languages in Danger (Moseley, 2010) and Ethnologue surveys (Eberhard, Simons, & Fennig, 2023).
2. Scholarly publications: Foundational works on language maintenance and revitalization (Fishman, 1991; Hinton, 2018) and community-based learning frameworks (Wenger, 1998).
3. Digital case studies: Peer-reviewed articles, online corpora, and records of technology-based language interventions.

Data collection included systematic document analysis, including identifying relevant databases (Google Scholar, JSTOR, ResearchGate, UNESCO Library), selecting peer-reviewed sources and institutional reports published between 1990 and 2023, applying inclusion criteria (relevance to endangered languages, technology-based interventions, preservation/standardization focus), and excluding outdated or regionally irrelevant works. This method provided a thematically relevant dataset.

Sampling Strategy

Sources about endangered languages and digital tools were chosen by using purposive sampling. The sample contained global overviews (UNESCO, Ethnologue), theoretical frameworks (Fishman, Wenger, constructivist learning), and applied case studies (Hinton, 2018), ensuring representation of both theoretical and practical perspectives.

Data Analysis

The collected sources were analyzed using thematic analysis (Braun & Clarke, 2006). Key steps included coding texts for recurring themes—such as preservation methods, digital archives, mobile applications, orthographic standardization, and community identity—grouping codes into broader categories (“Preservation,” “Standardization,” “Cultural Reinforcement”), and interpreting findings through the lens of Fishman’s (1991) theory of language maintenance and Wenger’s (1998) Communities of Practice. This approach review and combine literature to address the research questions.

Research Instruments

No physical instruments (e.g., surveys or interviews) were used. It mainly depended secondary sources. Digital tools such as Zotero, Mendeley, and NVivo facilitated organization, coding, and analysis of textual data.

Ethical Considerations

Ethical guidelines for secondary research were strictly followed: all data were collected from published, credible, and publicly accessible sources; proper credit was given via APA 7th edition citations; no confidential or personal data were used; and scholarly integrity was maintained throughout.

Limitations

As the research mainly depends on secondary data, it limits direct community insights and detailed cultural understanding. It may not fully capture regional variations. Moreover, over-reliance on digital sources can reduce the focus on socio-cultural aspects of language preservation. However, this approach is qualified for a global study, combining theory with technological case studies.

This study includes a qualitative, interpretive, secondary-data-based methodology. Through purposive sampling, systematic document analysis, and thematic interpretation, it links sociolinguistic theory with technology, sharing a clear framework for understanding how digital tools contribute to endangered language preservation and standardization.

Discussion

The findings of this study highlight that modern technology plays an important role in both preserving and standardizing endangered languages, supporting sociolinguistic theory and solving practical challenges in the field. Linked with Fishman's (1991) framework of language maintenance and shift, the analysis points out that the survival of endangered languages depends heavily on intergenerational transmission, active use in daily life, and integration into educational and digital contexts. Digital tools, including online archives, mobile applications, and language-learning platforms, enhance these processes by expanding accessibility and providing interactive experiences that encourage engagement among younger speakers. These findings support Hinton's (2018) view that technology-driven methods can enhance language use without heavy fieldwork and demonstrating that digital tools can act as scalable, flexible for linguistic revitalization.

The study also highlights the significant contribution of technology to the standardization of endangered languages. Many minority languages historically lack consistent orthographies, structured grammar references, and standardized learning materials, which impedes their formal transmission and educational integration. The use of digital corpora, online dictionaries, and multimedia resources removes these gaps by encouraging the development of uniform linguistic structures. This technological intervention ensures that languages are not merely preserved as static records but can function as living, standardized systems applicable in education, literature, and online communication (Eberhard, Simons, & Fennig, 2023). By connecting preservation and standardization, technology supports both linguistic diversity and the creation of structured frameworks that reinforce teaching, learning, and broader dissemination.

It also focuses on the enhancement of cultural identity and community cohesion. As digital technologies make endangered languages more accessible, they also reinforce cultural pride and collective memory. Online communities and interactive platforms work as modern "communities of practice" (Wenger, 1998), where

participants share knowledge, practice language use, and transmit cultural norms to younger generations. This participatory aspect of digital technology supports active engagement, strengthens intergenerational connections, and fosters a sense of belonging, which traditional preservation methods cannot achieve worldwide.

These observations highlight that safeguarding endangered languages is not solely a linguistic concern but a broader cultural imperative. If we compare technology-driven interventions with traditional methods, we can find complementary strengths and limitations. Although oral histories, field-based documentation, and print archives remain important (Fishman, 1991), their reach and ability are limited. On the contrary, technological tools provide rapid distribution, interactive engagement, and adaptive learning opportunities that can reach younger speakers effectively (Hinton, 2018). However, if we depend more on digital solutions, it can lead to the risk of overlooking socio-cultural nuances, local customs, and community-driven practices. This research suggest that fruitful outcomes come from integrated strategies that combine technological innovation with participatory fieldwork and community involvement (Moseley, 2010; Eberhard, Simons, & Fennig, 2023). Such integration ensures that interventions respect culture, suit context and remain effective in long run.

Despite these positive outcomes, the study shows several limitations. The extensive reliance on secondary data may underrepresent the lived experiences of specific communities or localized challenges in language revitalization. Variations in digital literacy, access to technology, and regional socio-cultural factors may influence the effectiveness of interventions. Although technology has strong potential, future research should incorporate primary fieldwork, ethnographic engagement, and community feedback to ensure contextually grounded and culturally responsive strategies.

In conclusion, the discussion indicates that modern technology plays a crucial role in the dual processes of endangered language preservation and standardization. By providing scalable, interactive,

and standardized tools, digital interventions enhance language accessibility, support intergenerational transmission, and strengthen cultural identity. Integrating technological solutions with traditional methods and sociolinguistic theory offers a comprehensive framework for sustaining endangered languages as living, functional systems. The findings advocate for a balanced, interdisciplinary approach, highlighting that the survival of linguistic diversity in the twenty-first century depends on innovative, culturally sensitive, and technology-enhanced strategies that reinforce both linguistic and cultural heritage.

Results and Findings

The findings of this study reveal that digital technologies have transformed the preservation and standardization of endangered languages by enhancing accessibility, promoting intergenerational transmission, enabling orthographic consistency, and reinforcing cultural identity. Secondary data from case studies, digital archives, and scholarly analyses demonstrate that modern technological tools are not merely supplementary but foundational in sustaining vulnerable linguistic traditions.

A major finding is the expansion of accessibility and documentation through digital archives and online repositories such as UNESCO's Atlas of the World's Languages in Danger and Ethnologue. Unlike traditional print records, digital databases allow continuous updates, global access, and immediate visibility. For this reason, endangered language has become available to scholars, policymakers, and community members and enhancing preservation process from a localized practice into a worldwide initiative.

Another significant outcome is the role of digital platforms in facilitating intergenerational transmission. Evidence suggests that applications, podcasts, and interactive learning modules encourage younger generations to acquire endangered languages in engaging and practical ways. These digital interventions align with Fishman's (1991) framework, which emphasizes that the survival of a language depends primarily on transmission between generations. In several communities,

mobile-based learning helps young people to learn the language easily and feel proud of using it. This helps the language continue in future.

The study also finds that digital tools contribute to the development of standardized orthographies and linguistic resources. Many endangered languages historically lacked consistent writing systems, which limited their usability in education and formal communication. Through collaborative online dictionaries, text-to-speech systems, and digital corpora, linguists and communities have been able to design and disseminate uniform orthographies. This standardization not only supports teaching and publishing but also legitimizes endangered languages within educational and technological domains, expanding their social and functional relevance.

Equally important is the role of technology in strengthening cultural identity and community cohesion. Online platforms provide speakers with opportunities to exchange stories, songs, and oral traditions in their native languages, forming what Wenger (1998) terms “communities of practice.” These digital spaces encourage diasporic and fragmented groups to maintain ties to their cultural heritage. This view suggests that linguistic preservation is inseparable from the safeguarding of cultural pride and collective memory.

Finally, the comparative analysis indicates that while traditional methods—such as oral documentation and field-based grammars—remain valuable, they are insufficient in addressing the global scale of linguistic endangerment. Technological approaches offer greater scalability, adaptability, and interactivity, but they must be combined with cultural context and community participation to achieve long-term success. The emerging framework highlights that the most effective preservation strategies are those that integrate sociolinguistic theory with digital innovation. In this respect, the study underscores how digital technologies (independent variable) directly support both preservation and standardization (dependent variable), shaped by cultural identity and community engagement, thus validating the applicability of both Fishman’s (1991) and Wenger’s (1998) theoretical models in the digital age.

Recommendations

Integrate Technology with Community Participation

Digital tools should be combined with active community engagement to ensure sociocultural relevance. Collaborative content creation, virtual workshops, and cultural storytelling can enhance language transmission and reinforce local identity.

Develop Comprehensive Digital Resources

Interactive digital archives—including audio, video, and textual corpora—should be created. Standardized orthographies, grammar references, and multimedia learning materials must be developed to facilitate educational and communicative use.

Promote Intergenerational Transmission via Digital Learning

Mobile applications, online courses, and gamified platforms should encourage younger generations to actively learn and use endangered languages, fostering long-term preservation and cultural pride.

Ensure Accessibility and Scalability

Digital interventions must be designed to function across diverse technological environments, including low-bandwidth regions. Offline-capable tools and lightweight platforms can increase reach and inclusivity.

Combine Standardization with Cultural Flexibility

While promoting standardized orthographies and teaching materials, efforts should respect dialectal variations and local cultural practices to maintain authenticity.

Support Policy and Institutional Involvement

Governments, UNESCO, and cultural organizations should provide funding, infrastructure, and policy support for technology-based preservation programs, ensuring sustainable implementation.

Monitor and Evaluate Interventions

Continuous assessment of digital tools is necessary to measure effectiveness in preservation, standardization, and cultural reinforcement. Feedback from community users can guide continuous improvements.

Adopt Integrated Approaches

A hybrid model combining digital technologies with traditional fieldwork and oral documentation is recommended to capture socio-cultural nuances while maximizing scalability and engagement.

Conclusion

This study portrays that modern digital technologies play a vital role in the preservation and standardization of endangered languages, offering scalable, interactive, and adaptive solutions that complement traditional methods. By facilitating intergenerational transmission, enhancing accessibility, and enabling the development of standardized orthographies and multimedia resources, digital tools transform endangered languages from static archival records into living, functional systems of communication. Moreover, technology-driven tools strengthen cultural identity and community cohesion, reinforcing pride in linguistic heritage and fostering active participation across spread populations.

The findings highlight the necessity of integrating technological innovation with sociolinguistic theory and community engagement to ensure culturally sensitive and sustainable outcomes. While traditional preservation methods remain valuable, they are insufficient to address the global scale and urgency of language endangerment. Digital tools, when combined with participatory fieldwork, oral documentation, and educational frameworks, provide a comprehensive approach that bridges preservation, standardization, and cultural continuity.

Ultimately, safeguarding endangered languages through technology is not merely a linguistic imperative but a cultural one. It is essential for maintaining the diversity of human knowledge, identity, and heritage. The study contributes both theoretically and

practically by offering a framework for policymakers, educators, and communities to employ technology strategically. It ensures that endangered languages continue to thrive as active carriers of cultural memory and identity in the twenty-first century.

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