

# The Incorporation of Shikomori to Improve ICT Comprehension, Access, and Uptake by Comorian Communities

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## Abstract

Despite the transformative potential of ICT, the exclusion of Shikomori from digital platforms significantly undermines digital inclusion in the Comoros. This paper explores the incorporation of Shikomori, the indigenous language of the Comoros Islands, into Information and Communication Technologies (ICT) to improve understanding, accessibility, and uptake within Comorian communities. Linguistic differences are acknowledged as a significant impediment to the adoption of ICT. It is posited in this discourse that by leveraging the familiarity and cultural relevance of Shikomori, the digital divide may be bridged and inclusive technological advancement fostered. In the Comorian context, the digital divide refers to the gap between not only urban and rural populations but also young and old users' access to affordable and reliable internet and digital technologies, as compounded by limited digital skills and infrastructure. Digital transformation, on the other hand, focuses on expanding digital access and services, such as e-government platforms and quality internet networks to overcome this divide and foster socio-economic development. This study examines the development and implementation of Shikomori-localised ICT solutions in four key sectors; namely, tourism, administrative documents, education, and national telecommunications. In the tourism sector, the study examines the development of multilingual mobile applications that provide tourist information and navigation in Shikomori, thereby improving accessibility for local guides and community-based tourism initiatives. In the context of administrative documentation, it explores the digitisation of forms and documents in Shikomori with the objective of enhancing bureaucratic processes and fostering greater citizen engagement. In the field of education, the analysis of educational software and online resources in Shikomori is undertaken with a view to enhancing students' comprehension and knowledge retention. Moreover, the study investigates the implementation of Shikomori voice interfaces and text messaging services in national telecommunications to improve accessibility for individuals with limited literacy or fluency in official languages. The study integrates a linguistic-cultural relevance framework, postulating Shikomori integration as essential for achieving inclusive digital transformation with methodologies including linguistic analysis, user-centered design, and participatory development to ensure the solutions' effectiveness and cultural appropriateness. The findings emphasise the significant potential of Shikomori integration to democratise access to ICT, promote digital literacy, and empower Comorian communities.

**Keywords:** Comoros Islands, ICT Solutions, Local Communities Inclusion, Shikomori

## Introduction

The considerable influence of Information and Communication Technologies (ICT) provides opportunities for socio-economic development and societal transformation on a global scale. Nevertheless, the equitable distribution of these benefits is constrained by linguistic barriers, particularly in regions where indigenous languages are marginalised within the digital sphere. In the Comoros Islands, the limited integration of Shikomori, the nation's indigenous language, into ICT solutions presents a significant impediment to widespread digital comprehension, access, and uptake, thereby marginalising a substantial portion of the population with limited proficiency in official languages.

A central premise is that, in today's society, the ability to access, adapt, and create knowledge using information and communication technologies is critical to social inclusion. This focus on social inclusion shifts the discussion of the "digital divide" - from gaps to be overcome by providing equipment - to social development challenges to be addressed through the effective integration of technology into communities, institutions, and societies (Warschauer, 2003: 5).

The Comoros archipelago, influenced by Bantu, Arabic, and Swahili cultures, exhibits a distinctive linguistic landscape where Shikomori, a vernacular language, has a notable presence in daily life despite French and Arabic being the official languages. The Comorian language is called Shimasiwa by its speakers, a word that means 'language of the archipelago'. It is currently known as Shikomori, which means 'language of the Comoros' (Ahmed-chamanga, 2011: 19). Shikomori encompasses four main dialects corresponding to the archipelago's primary islands. This analysis focuses on the dialects prevalent in the Union of the Comoros; namely, ShiNgazidja (spoken on Grande Comore and often considered the standard and official compared to the other dialects due to Moroni as capital and center of Comoros), ShiNdzuwani (Anjouan), and ShiMwali (Mohéli). Though these dialects differ slightly, mainly in vocabulary (e.g., 'moja' and 'montsi,' both meaning 'one'), they are mutually intelligible, enabling seamless inter-island communication. This linguistic interconnectedness is crucial in developing ICT solutions.

Understanding these dialectal nuances allows for designing adaptable digital platforms tailored to each island community's linguistic preferences, ensuring broader adoption and effectiveness. Despite the presence of variations, the shared linguistic root presents a significant opportunity for the development of core ICT solutions that can be readily localised or adapted for specific dialects. This analysis focuses on Shikomori's current integration in ICT solutions within the Comoros, emphasising challenges encountered and the potential benefits of its broader adoption to enhance understanding, accessibility, and adoption within Comorian communities. The research question guiding this study is: How can the strategic integration of Shikomori into ICT effectively bridge the digital divide, foster digital literacy, and empower local communities in the Comoros Islands? It is argued that such linguistic inclusion is not just a convenience, but a fundamental prerequisite for achieving genuine digital transformation and sustainable development in the Comoros.

In order to examine this question, this research uses a multi-faceted methodology, including a comprehensive review of relevant literature, a socio-linguistic analysis of the Comorian context, and the application of user-centered design and participatory development principles to ensure the cultural appropriateness and effectiveness of proposed solutions.

This paper is structured to address the following aims: to examine the current use of Shikomori in ICT and national media, emphasising its underrepresentation in key digital domains; to analyse the principal challenges hindering the broader integration of Shikomori into ICT solutions with critical barriers such as the lack of technical expertise, insufficient funding, limited governmental support, and the absence of a standardised writing system being identified; and lastly, to propose concrete recommendations and actionable ICT solutions leveraging Shikomori to enhance accessibility, promote digital literacy, and empower local communities.

The following solutions are illustrated through specific examples of Shikomori integration across four vital sectors: tourism (e.g., multilingual mobile applications); public administration (e.g., digitised forms and documents); education (e.g., educational software and online resources); and national telecommunications (e.g., voice interfaces and texting services). The anticipated findings of this research emphasise Shikomori integration's potential to democratise ICT access, cultivate digital literacy, and significantly empower Comorian communities. Overall, this study aims to provide a comprehensive roadmap for leveraging Shikomori as a vital bridge toward a more equitable, inclusive, and technologically advanced future for the Comoros, contributing notably to global discussions on language technology and digital inclusion in developing nations.

## Methodology

The study employs a mixed-methods research design, combining qualitative and quantitative approaches to comprehensively investigate the integration of Shikomori into ICT solutions in the Comoros Islands. The methodology is primarily descriptive and exploratory, with the objective of mapping the current landscape, identifying barriers, and proposing actionable solutions. The research process is structured into three interconnected phases: a literature review and documentation analysis, primary data collection through surveys and semi-structured interviews, and a final data analysis.

## Documentation

The initial phase of the project entailed an extensive review of academic literature, including peer-reviewed journals, conference proceedings, and scholarly books. As reported by peer researchers, this specific review focused on several themes: indigenous language technologies, digital inclusion, language revitalisation through ICT, and the socio-linguistic dynamics of multilingual digital environments (Galla, 2018). Concurrently, an environmental scan of the Comorian digital ecosystem was conducted. This involved the analysis of publicly available documents and reports from a variety of national and international organisations (e.g., UNESCO, local NGOs, and companies), as well as existing online platforms (websites, social media groups, and mobile applications). The aim of this phase was to identify key stakeholders, prevailing languages in digital spaces, and the current ICT infrastructure, thereby establishing a robust theoretical framework, understanding global best practices, and contextualising the specific challenges and opportunities within the Comoros.

## Primary Data Collection

Primary data was systematically collected through a combination of online surveys and semi-structured interviews, targeting diverse user groups and key stakeholders.

### Online Survey

An online survey was designed and disseminated to gather quantitative and qualitative insights from local ICT users across the Comoros Islands. The survey's objective was to assess three key areas: (1) access to and usage of ICT among Comorian communities, (2) the need for Shikomori-localised ICT solutions, and (3) Shikomori usage in informal digital communication. The survey utilised a combination of multiple-choice, Likert scale, and open-ended questions to capture both statistical trends and nuanced user perspectives. The dissemination of the survey was conducted through local community networks, educational institutions, and social media platforms to ensure comprehensive reach and inclusive participation.

### Semi-Structured Interviews

Semi-structured interviews were conducted with a purposive sample of key stakeholders and experts to gain in-depth qualitative data. The following representatives were included in the study:

- Linguistic and Cultural Organisations: Prominent examples include a linguist and cultural advocate, a Comorian teacher at INALCO, founder of ORELC, and Collective Shikomori (community initiatives promoting the language).
- ICT professionals and developers: These interviews aimed to establish the technical feasibility of the project considering the challenges with developing Shikomori-based applications.
- Sectoral experts: This group included officials from the Ministry of Tourism and the National Office for Tourism of Comoros, as well as educators, online course providers, and representatives from national telecommunications companies. In-depth interviews were conducted within four key sectors (tourism, administrative services, education, and telecommunications) focusing on identifying specific linguistic barriers within their operations, exploring existing informal adaptations, and measuring the potential and requirements for formal Shikomori-integrated ICT solutions.

The questionnaire was administered in two phases. Firstly, it was distributed in French and English. Secondly, the same questionnaire was redistributed, but this time it was translated into Shikomori. This approach was necessary to test the hypothesis that Comorians would be more willing and committed to answering questions in a language they are familiar with. However, it is important to note that the Comorian version of the questionnaire incorporated vocabulary from French or Arabic due to a lack of total mastery of writing, which is still a matter of debate within the oral user community itself.

## Ethical considerations, sampling, and recruitment

The study was conducted in accordance with ethical standards, with informed consent obtained from all 60 participants from the Shikomori communities and confidentiality was ensured by anonymising all data. Participants were selected based on their professional roles and expertise in linguistic, technological or sector-specific fields relevant to the study; namely, in tourism, education, administration, and telecommunication. To gain deeper qualitative insights, purposive sampling was employed for semi-structured interviews with experts in linguistics and technology. The interviews used flexible thematic prompts or avenues for reflection to encourage open and honest dialogue, enabling participants to share insights that went beyond the preset questions and deeper highlight on issues that we might have overlooked such as the political role of a language in the case of administrative conflict between the Comoros (with Shingazidja, Shimwali, and Shindzuwani) and Mayotte (with Shimaore).

In addition, local university students were engaged as co-researchers in a focus group to help collect data from their peers and family members who were mostly Shikomori speakers. Meanwhile, an online survey was distributed through community networks and social media using convenience sampling to reach participants with varying technological skills, ages, and levels of education. A stratified sampling method was opted for, as the population was divided into four distinct subgroups based on the tourism, public administration, education, and telecommunications sectors. The questionnaire was distributed to voluntary agents within these subgroups, ensuring representativeness across all four sectors.

The survey questions were co-designed with students and linguistic experts to reflect user-centred design principles and ensure that the voices of end users were included. While the sample leaned towards younger, tech-savvy users, efforts were made to include all social groups by adapting communication channels (e.g., mobile audio and voice transcripts) for users with varying literacy levels, including those who did not receive formal education in reading French or Shikomori at school, as they only attended madrasas (Arabic schools). The data collection instruments, including the survey and interview questions (available on Appendix 1 and 2) were designed to assess ITC usage and the need for Shikomori-localised solutions. The questionnaire was translated and validated into French and English at first, and then into Shikomori, with the process reviewed by local linguistic experts to ensure cultural appropriateness and avoid bias. This two-phase approach was a deliberate methodological choice, designed to test the hypothesis that respondents would be more committed if the language was familiar, thereby ensuring consistency in the research. A pilot test of the questionnaire was conducted with peers, students during a focus group, and linguists to refine the survey tool before distributing the final version to a broader sample, strengthening trust in its reliability.

## Data Analysis

The quantitative data obtained from the online survey was analysed using descriptive statistics (e.g., frequencies, percentages) to identify trends in ICT access, usage, and perceived needs. Cross-tabulations and correlation analyses via Xlstat examined relationships between demographic variables and digital inclinations related to Shikomori language use. Analysing the relationship between participants' dialect and their preferred ICT tool language revealed whether language preference varies significantly by dialect, helping to ensure that digital solutions are appropriately tailored. Exploring correlations

between digital literacy and attitudes towards Shikomori ICT tools helped to understand acceptance patterns. Thematic analysis was employed on the qualitative data derived from both the open-ended survey responses and the semi-structured interviews. This entailed the systematic coding of the transcribed data to identify recurring themes, patterns, and key insights related to the challenges and opportunities associated with Shikomori integration. To enhance the validity and reliability of the findings and to ensure a comprehensive understanding of the research problem, data triangulation from the literature review, survey, and interviews was performed.

## Conceptual and Theoretical Framework

This study proposes a conceptual framework for the strategic integration of Shikomori into Information and Communication Technologies (ICT) within the Comoros Islands. This framework synthesises findings from an extensive literature review and a sectoral analysis, drawing on recommendations specifically tailored to the socio-linguistic and technological landscape of the Comorian context (e.g., Tahmasebi, Osborn, and Warschauer). By synthesising established best practices, it provides a compelling case for policymakers, developers, educators, and private sector stakeholders. The study is fundamentally grounded in two pivotal theoretical frameworks: User-Centered Design (UCD) and the Technology Acceptance Model (TAM). These models are adapted to explain the specific dynamics influencing technology adoption and usability within the Comorian socio-linguistic environment.

## Prioritising the Comorian User

User-Centred Design (UCD) is an iterative design philosophy that posits the ultimate success of any technological solution is contingent upon its design being intrinsically aligned with the needs, wants, and inherent limitations of its end-users (Norman & Draper, 1986)

User-Centred Design (UCD)	Technology Acceptance Model (TAM)
<p><b>This framework begins by prioritizing the end-user. It posits that for technology to succeed, it must be intrinsically aligned with the user's needs, wants, and cultural context. In the Comoros, this means designing technology around the primary language: Shikomori.</b></p> <p><b>The Goal: Create ICT solutions that are intuitive, accessible, and culturally resonant for all Comorians.</b></p>	<p><b>This model explains *why* people choose to adopt new technology. It identifies two key factors that directly influence a user's decision: how useful they believe the tech is, and how easy it is to use.</b></p> <p><b>The Goal: Address both factors to increase technology adoption and utilization.</b></p>

**Figure 1:** User-Centred Design and the Technology Acceptance Model Drive Shikomori Integration in ICT. Source: Model of The Framework for Digital Inclusion

In the Comorian context, where Shikomori serves as the primary language of daily communication for the vast majority of the population, a rigorous UCD approach necessitates the profound incorporation of the indigenous language into digital interfaces, content, and services. This principle extends beyond mere linguistic translation to advocate for comprehensive localisation, including culturally specific metaphors, nuances and communication practices. By prioritising the linguistic and cultural context of the Comorian user, UCD principles become instrumental in guiding the development of ICT solutions that are not only intuitive and accessible but also deeply resonant and culturally relevant, thereby fostering genuine engagement and utility. Therefore, the goal is to create ICT solutions based on Shikomori use that are intuitive, accessible, and culturally resonant for all Comorians.

## The enhancement of usefulness and ease in Comoros context.

The Technology Acceptance Model (TAM) provides a comprehensive framework for analysing the multifaceted factors that collectively influence an individual's intention to adopt and consistently utilise a new technology (Davis, 1989). TAM identifies two principal beliefs that are critical determinants of technology acceptance: perceived usefulness, the degree to which an individual believes that using a particular system will enhance their job performance or improve their life; and perceived ease of use, the degree to which an individual believes that using a particular system will be free of effort (Davis et al., 1989: 985). The prevailing linguistic barrier, characterised by the dominance of official languages in contemporary ICT solutions, imposes a substantial cognitive burden and plays a pivotal role in the perception of challenges and apprehension associated with technology adoption in the Comoros (World Bank, 2021).

The integration of Shikomori into ICT is a strategic approach that directly addresses and enhances the fundamental tenets of the Technology Acceptance Model. This linguistic integration has been demonstrated to enhance the perceived usefulness of digital content by rendering it more comprehensible, relevant, and directly applicable to the daily lives of Comorian citizens. The provision of digital interfaces, applications, and content in Shikomori is intended to reduce the cognitive burden on the user. This linguistic alignment serves to render the technology less intimidating, more intuitive, and significantly easier to navigate and interact with, thereby lowering the barrier to entry for a substantial segment of the population (Duran et al., 2019).

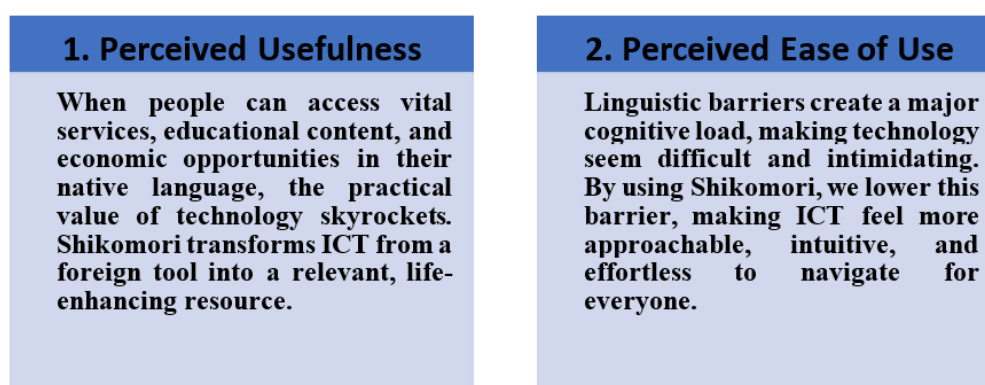
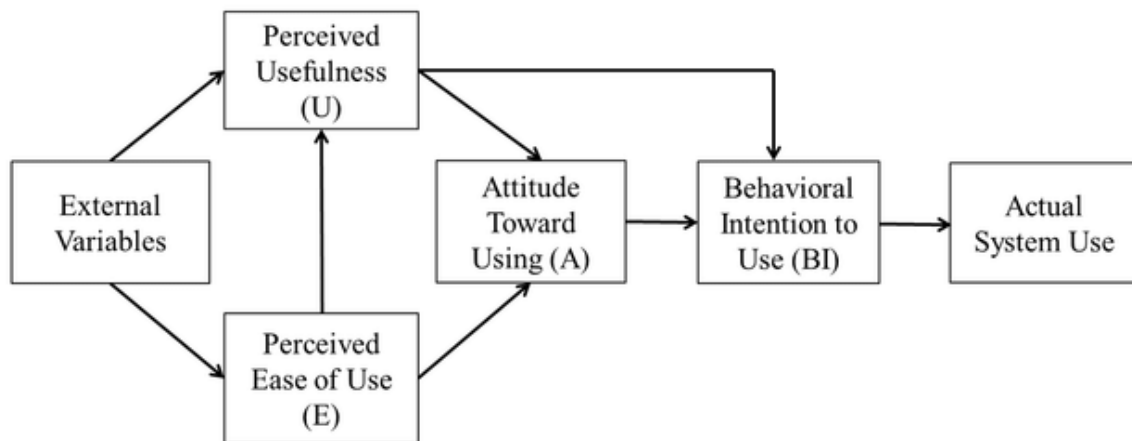


Figure 2: Integrating Shikomori directly strengthens both core tenets of the Technology Acceptance Model. Source: Model of The Pillars of Acceptance



**Figure 3:** Technology acceptance model. Source : Technology acceptance model (Davis et al., 1989 : 985)

For Comorian people, the perceived usefulness of Information and Communication Technologies (ICTs) is hypothesised to increase substantially if the ICTs are perceived to deliver valuable information, essential services, and tangible opportunities in a language that is comprehensible to the population (i.e., Shikomori). For instance, the ability to seamlessly access critical government services, comprehend vital public health information, or engage with educational materials directly in Shikomori profoundly elevates the practical value and relevance of digital tools in their daily lives.

#### UCD and TAM limit critical for our research

The User-Centered Design (UCD) and Technology Acceptance Model (TAM) provide valuable frameworks for individual experience; however, they overlook the socio-cultural dynamics of perceived usefulness and ease of use in the Comorian context. Comorian society is communal and group-oriented, especially regarding traditions and changes in social behaviour and consumption. Most changes occur through community approval, meaning user experience alone is not sufficient within the community. Instead, if leaders promote the digital use of Shikomori in everyday solutions, for example, it is more likely to succeed, as role modelling is critical for community acceptance. Therefore, addressing collective dynamics – and simultaneously technical barriers such as the lack of a language policy, infrastructure limitations, or the variety of Shikomori dialects can lead to more effective digital inclusion. As this study also recommends, this requires a co-designed process and implementation that include local communities, the public and private sectors, and researchers. This strategic linguistic inclusion transforms technology from an unfamiliar tool into a practical resource that improves daily life, provides critical access to administrative and educational content, and ensures professional and economic improvements, as seen in the tourism sector, which supports sustainable development goals within Comorian communities.

#### Thematic Literature Review

The integration of indigenous languages into ICT is a subject addressed by various researchers who seek to explain the digital divide and promotion of sustainable development, particularly in linguistically diverse nations. A significant body of research underscores language as



a primary barrier to ICT adoption, asserting that true access encompasses the ability to interact with and create content in one's native tongue (Warschauer, 2003). Organisations like UNESCO (2003) consistently advocate for linguistic diversity in cyberspace, recognising that the dominance of a few languages online marginalises a vast portion of the global population and contributes to the erosion of cultural heritage.

## Linguistic description and complexity of Shikomori

Research by Mohamed Ahmed-Chamanga (2011: 19–35; 2022: 79–98), including his manual on Comorian conjugation and other grammatical works provides an in-depth understanding of the linguistic features of Shikomori. Shikomori is an agglutinative language with complex syntactic structures that are closely tied to Comorian cultural identity. The main dialectal variations, such as Ngazidja and Ndzuwani, highlight this linguistic diversity. Djohar Abdou and the National Centre for Comorian Language Documentation (CNDRS) (2010) further expand on this by emphasising the language's rich lexical complexity and writing rules. This confirms that, despite external influences, Shikomori remains a fundamental pillar of local communication.

## Shikomori Language in the Digital and Resource Scarcity

While specific academic research on the integration of Shikomori into ICT may be limited, the broader literature and recent scientific contributions provide an updated framework for the Comorian context. Key challenges include a lack of resources in local languages, including the three main dialects. Naira et al. (2024) have directly addressed this issue by focusing on dataset creation and empirical evaluations of cross-lingual learning for Comorian dialects. Their work, presented at the 18th Linguistic Annotation Workshop (LAW-XVIII) in “Datasets creation and empirical evaluations of cross-lingual learning on extremely low-resource languages: A focus on comorian dialects”, underscores the foundational work required to enable digital linguistic processing for such languages. This demonstrates a promising approach to overcoming the scarcity of localised data. Their research supports the view that successful integration of local languages within ICT requires active community engagement in creating digital content, rather than merely consuming content in dominant languages such as French or English.

## Cultural Valorisation and Sociopolitical Challenges

Despite being deeply rooted in Comorian culture, Shikomori faces challenges from globalisation and the dominance of languages such as French and Arabic. Comorian institutions, including the CNDRS, actively promote the language through education, literature, and cultural activities in order to preserve this linguistic heritage within a changing national and regional socio-political context. Additionally, in “Harnessing Transfer Learning from Swahili: Advancing Solutions for Comorian Dialects”, at the 6th Deep Learning Indaba Conference (DLI 2024), Naira et al. (2024) explore the efficacy of transfer learning from resource-rich languages like Swahili to overcome data scarcity in Comorian dialects. These scientific efforts align with the broader understanding of local language integration in ICT. The Comorian community must actively create and engage with digital content in Shikomori, including its dialects to overcome the digital divide, rather than just consuming French or English-language content.

## Integration of Shikomori in ICT and Digital Education

The literature emphasises the importance of adapting digital content for local languages, particularly to improve educational accessibility. Projects supported by international organisations such as UNICEF have experimented with integrating Shikomori into digital educational platforms, thereby enhancing access to education and helping to reduce social inequalities. Studies such as those by Obikudon (2022) demonstrate the importance of developing digital lexicons for African languages as a foundational step for ensuring their viability in the digital space. Furthermore, it has been shown that such efforts encourage greater engagement in the dissemination of local knowledge and cultural expressions.

## Institutional and Political Framework

Official documents emphasise the importance of considering the political and administrative context of the Comoros to effectively implement ICT solutions in Shikomori. They emphasise the importance of involving public actors and linguistic communities through a participatory approach that is adapted to the country's sociolinguistic realities. This study also builds on Naira et al.'s (2004) work to analyse technology acceptance in specific cultural contexts. Based on Venkatesh and Bala's (2008) TAM3 model, their research provides a robust theoretical framework that highlights perceived usefulness and ease of use, emphasising adaptation to local cultural and socio-economic particularities. This approach enriches the current study by providing a contextualised understanding of the factors that encourage the sustainable adoption of digital technologies in Comorian communities.

## Sustainable Development as a framework for Shikomori Integration in ICT

The integration of Shikomori into ICT solutions directly advance the Sustainable Development Goals (SDGs) by anchoring development in the Comorian context – prioritising cultural preservation and community benefit alongside economic growth. For example, providing educational content in Shikomori on digital platforms supports SDG 4 (Quality Education) by enabling Comorian citizens to learn in their native language, significantly boosting understanding and retention, mirroring the success observed in local Quranic schools (madrassas). Furthermore, granting Shikomori speakers access to digital public administration and tourism services promotes SDG 9 (Industry, Innovation, and Infrastructure) and SDG 10 (Reduced Inequalities) through inclusive service provision and enhanced school inclusion for children. Ultimately, fostering Shikomori in digital technologies strengthens social cohesion and local identity, supporting SDG 11 (Sustainable Cities and Communities) by cultivating united and supportive digital communities. These findings confirm that linguistic inclusion in technology is not a mere convenience, but a culturally rooted mechanism essential for driving sustainable development in the Comoros.

## Research gap

Despite the general advancement of African language digitisation, a significant research gap remains because prior work, such as that by Naira et al. (2004) does not address the distinct sociolinguistic and political context of the Comoros. Specifically, there has been a lack of comprehensive, evidence-based studies demonstrating the necessity of

integrating Shikomori into ICT given the Shikomori dialects spoken across the islands and the marginalised socio-political perception of Ngazidja as the main island, therefore Shingazidja as the standard dialect to be referred into ICT solutions. This gap is critical as it shapes language standardisation and adoption in key sectors. Closing this research gap, which this study begins to address, is essential to enable future ICT solutions to be co-designed and properly tailored for effective communication, education, and digital inclusion within Comorian communities, ultimately paving the way for initiatives like a dedicated language and culture laboratory for Shikomori. This should start with its implementation as a language taught in local schools, alongside French and English, and ultimately as a language used to teach all subjects, as with any sovereign language in any sovereign country worldwide.

## Analysis of Findings and Recommendations

The analysis of the Comorian digital landscape, informed by UCD and TAM, reveals that the dominance of French and Arabic in ICT creates a significant barrier to equitable digital participation for much of the population. Integrating Shikomori is a fundamental requirement, not just a linguistic preference, to ensure access to information and services. Despite being deeply embedded in the daily life and oral communication of Comorian society – even being the primary medium on national TV – Shikomori is largely excluded from international ICT solutions, hindering digital inclusion. This study uses survey and interview data focused on education, tourism, public administration, and telecommunications to evaluate the demand for and barriers to integrating this culturally significant language into digital platforms.

## Findings from interviews

Interviews conducted with teachers, linguistics, IT developers, digital entrepreneurs, and professionals, in four key sectors, reveal significant findings regarding the integration of the Shikomori into ICT solutions. Analysis of the responses allows for conclusions to be structured around three main themes (high demand from the diaspora, standardisation challenges, lack of political will and investment in promoting Shikomori across various sectors).

## Interest in ICT for Shikomori online learning as an identity driver for diaspora

There is a high diaspora demand on learning Shikomori due to quest of linguistic identity and cultural or community inclusion. This proves that ICTs are more than just learning tools for them and allow reconnection to culture and language that is not locally available or taught at schools. As stated by Nasser (Interview, September 26, 2025), ORECL founder, “ICT solutions, particularly ORELC’s online courses are massively adopted by the diaspora (90% of learners) seeking to reconnect with their identity and overcome geographical distance”. The success of platforms like ORELC (with its A1-B2 certifications) grants Shikomori *de facto* recognition and professional value, which is denied by the formal education system. In the case of Shikomori, digitisation precedes institutionalisation. It is paradoxical that Shikomori is an official language in the Comoros, yet it is not taught at local schools and in France – it is on high demand and taught through ORELC or INALCO. That reveals that the

legitimation of Shikomori is currently driven in a decentralised manner by the diaspora and the private sector, not by the state. According to Nusbati (Interview, September 18, 2025), linguist and teacher of Shikomori, “The prohibition or punishment for speaking Shikomori in class or at home contributes to its unconscious devaluation and perception as a ‘non-legitimate language’, reinforcing the appeal of French”.

## Digital Standardisation Challenges and Partnership

Although the spelling has been officially formalised, the acceptance of a single digital standard remains difficult due to dialectal bias and non-uniform writing practices (e.g., writing “oi” instead of “wa”). The major technical challenge has shifted from basic feasibility to scaling up digital resources and databases, requiring consensual linguistic harmonisation and innovation investment to integrate AI tools like voice translation. This advanced development is significantly hampered by the lack of financial means for acquiring technology and the massive data corpora needed (e.g., 10,000 *open source* words from ORELC), apps (Luha), and basic tools (keyboard) are accessible, creating an initial digital foundation for developers (Nasser, founder of ORELC). Furthermore, private initiatives face institutional instability among public stakeholders, making public-private partnerships unpredictable. The private sector’s preference for private-to-private arrangements highlights a structural governance weakness hindering national linguistic innovation.

## Integration and Social Impact

Integrating the mother tongue into technology is considered a fundamental tool for mental decolonisation, fostering cultural pride, and promoting effective learning. ICTs are uniquely positioned to redefine Shikomori’s social role by making it professionally and culturally relevant, thereby helping to rebuild linguistic self-esteem proved by the high demand for our translation services by local companies such as Telma and Rotary (Nasser, founder of ORELC). Beyond utility, technology serves as a powerful vector for transmitting culture and literature (like poetry and slam). Successful digital integration is essential for human development, leading to improved cognitive efficiency and greater civic inclusion (e.g., decentralisation of administrative services). However, Mkandzile (Interview, July 10, 2025), Shikomori language and culture promoter, concludes that without a concerted effort to institutionalise these ICT tools within the public education and administration sectors, the current digital divide risks evolving into a new form of linguistic inequality.

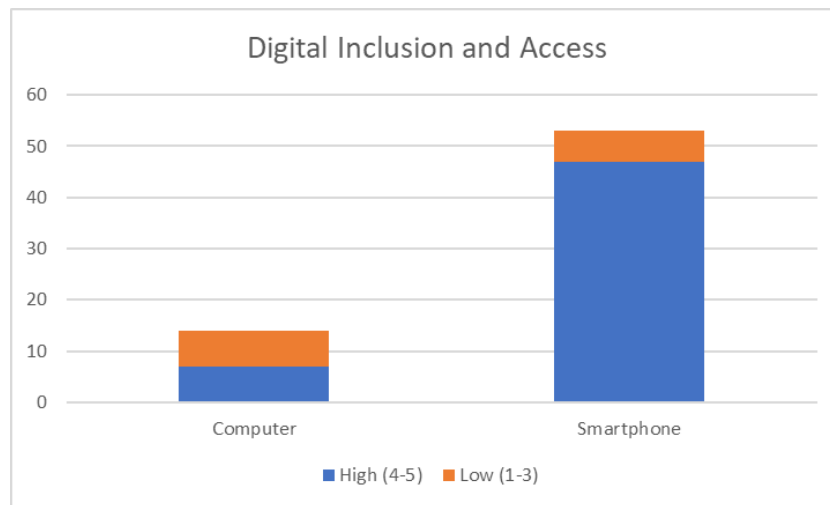
In conclusion, although ICTs offer an opportunity for Shikomori integration, inclusion, and cultural recognition, the institutionalisation of digital tools and resources (e.g., through a national laboratory for Comorian language and culture) is requested to ensure long-term transmission.

## Findings from Survey

From the collected data, the following approach was used to create pivot tables and dynamic charts for a study on the integration of Shikomori in ICT solutions across tourism, public administration, education, and telecommunications sectors. The results will be presented with interpretations based on 60 respondents.

## Current Landscape and Language Use in ICT

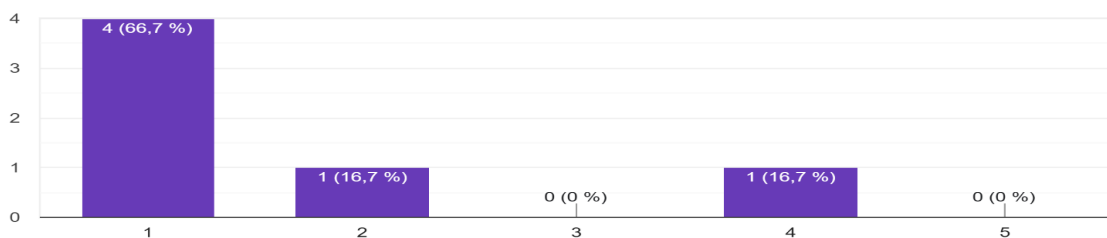
This objective assesses how the community currently interacts with digital technology and the linguistic environment they operate in.



**Figure 4:** Digital inclusion and internet access device. Source: Author, September 2025

With 79% of usage citations belonging to the Smartphone, all ICT strategies for sectors like Education and Public Administration must be mobile-first, especially since the population most capable of engaging with Shikomori content shows even higher reliance on these devices. This dominance confirms that relying on traditional computer literacy or complex website interfaces will exclude the majority of the population.

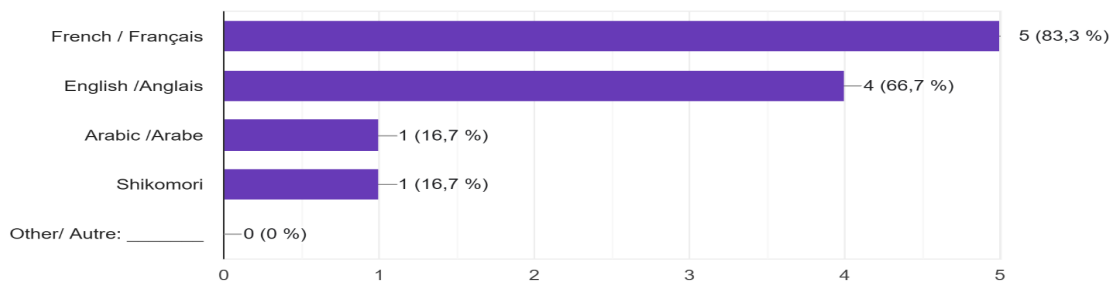
Quelle importance accordez-vous à l'accès à des sites web, applications et contenus numériques en Shikomori ? / How important is it for you to hav...o websites, apps, and digital content in Shikomori?  
6 réponses



**Figure 5:** Importance of access to Shikomori for digital content. Source: Author, June 2025

A majority of respondents (66.7%) assigned the lowest rating (1), confirming a predominant and high degree of dissatisfaction with the current integration of Shikomori into ICT solutions. This distribution, lacking any neutral or highly positive feedback, indicates that the current level of integration is widely considered substandard and inadequate.

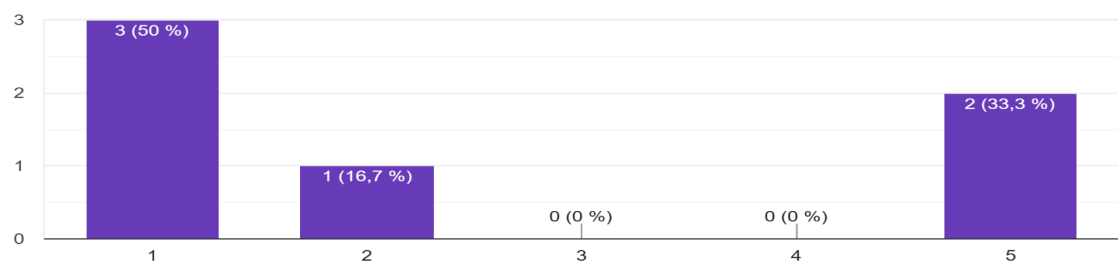
Quand vous utilisez Internet ou des applications mobiles, quelle langue rencontrez-vous le plus souvent ? /When you use the internet or mobile apps, what language do you encounter most often?  
6 réponses



**Figure 6:** Language most encountered while using Internet. Source: Author, June 2025

The provided chart demonstrates the prevalence of French and English in ICT solutions, with 83.3% and 66.7% representation respectively. However, it also indicates a limited integration of Shikomori, which currently stands at only 16.7%. This finding suggests that, despite its recognition as a language, Shikomori is significantly underrepresented in current ICT offerings, which may potentially limit access and usage to a segment of the population.

J'utiliserais plus souvent les TIC (Internet, applications) si elles étaient disponibles en Shikomori. /I would use ICT (internet, apps) more often if they were available in Shikomori.  
6 réponses



**Figure 7:** More use of ICT solutions if available in Shikomori. Source: Author, June 2025

The data shows a sharp divergence in satisfaction, with 50% of respondents assigning the lowest rating (1), while a significant 33.3% assigned the highest rating (5). This absence of moderate or neutral responses indicates that opinions are firmly split between those who see adequate integration and those who see little to none.

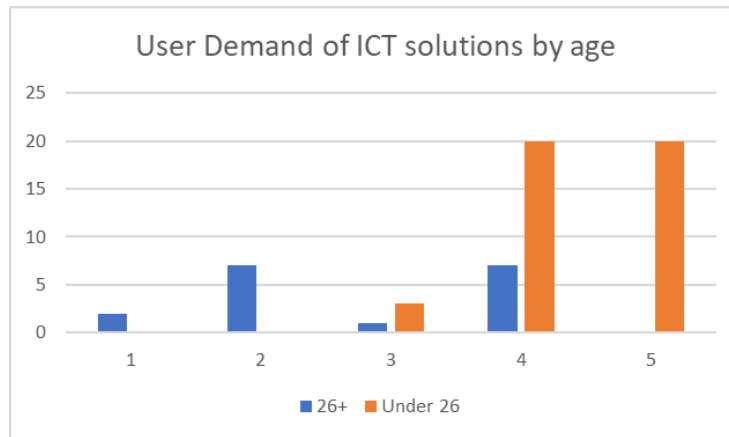
Despite the limited formal integration of Shikomori on many digital platforms, ICTs have permeated various aspects of daily life in the Comoros, often in informal ways. The term “Shikomori” is employed in a variety of informal settings, including residential areas, public spaces such as markets and transportation hubs, office environments, and even educational institutions. Its primary function is not in the context of formal education, but rather in facilitating conversation. For instance, the Shikomori language is utilised by customers and vendors in business transactions, by families in communication, and by educators in the clarification of lessons to ensure full comprehension, despite the official curricula being in French. It is evident that students are naturally drawn to Shikomori

as a forum for collaborative work and concept discussion. This common informal usage underscores a pressing need for formalised Shikomori-based ICT applications.

- **In transportation:** Mobile phones are used extensively for the organisation of transportation, the coordination of travel, and the dissemination of real-time road information. Despite the absence of formal ride-sharing applications, informal communication via telephone and text message (frequently in Shikomori) serves as a crucial means of facilitating transportation. However, there is a lack of formal public transport apps or digital navigation tools with Shikomori interfaces. While drivers may utilise French-based GPS systems, communication with passengers regarding routes or destinations is predominantly conducted in Shikomori. This underscores a functional disparity wherein informal linguistic interactions are lacking in support from formal digital tools.
- **In local markets:** Mobile money services are gaining traction for transactions, especially for larger purchases. Although negotiations frequently take place in Shikomori, the digital transaction itself is usually facilitated by a French or Arabic interface. Furthermore, vendors utilise social media platforms for the purpose of advertising. Informal communication among market vendors, including voice notes or text messages in Shikomori, is common for sharing information on product availability or market trends. This indicates a strong existing user base and a clear need for localised financial and commercial ICT tools.
- **At school:** Despite the predominance of French and Arabic in educational content and administrative communication, mobile devices are frequently utilised by students and teachers for informal learning, research, and communication. The utilisation of social media platforms, particularly WhatsApp groups, has become a dominant method for facilitating group discussions and the distribution of supplementary materials. It has been observed that communication frequently occurs in either Shikomori or a blend of Shikomori and French. However, there is a significant absence of dedicated educational software or online learning platforms with Shikomori content. It has been observed that students may engage in information seeking in French, yet their discourse with peers on the subject tends to occur in Shikomori. This informal adaptation of existing technologies for Shikomori communication demonstrates a strong demand for mother-tongue educational resources.

This exclusion of Shikomori **marginalises most of the population**, holding back education, economic growth, and civic participation. For true digital transformation to happen, it is essential to embrace the language of the people.

An overwhelming 81% of respondents rate access to Shikomori content as high or highest importance (scores 4 or 5), confirming a massive market demand that justifies immediate investment in localised digital content creation for sectors like Education and Tourism. This demand serves as a critical proxy for content needs, highlighting the importance rating across both the under 26 group (Education/Youth) and the 26+ group (Professionals/General Public).

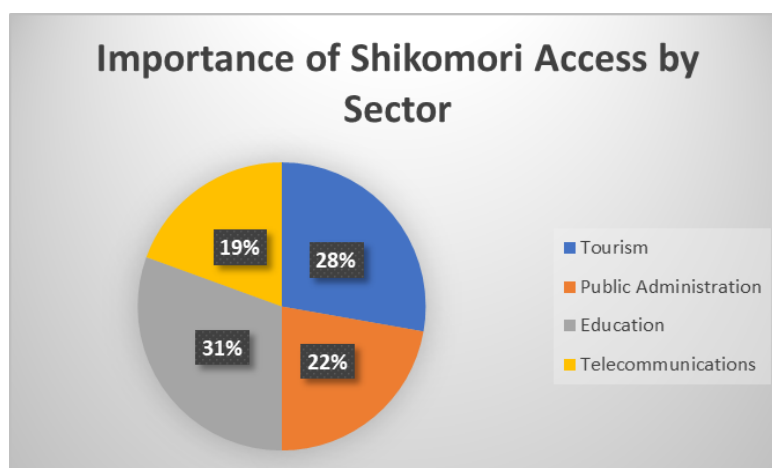


**Figure 8:** User Demand of ICT solutions by age. Source: Author, September 2025

The findings effectively mapped the current digital landscape by confirming the necessity of a mobile-first strategy and highlighting device dependency across sectors, thus directly answering the research question regarding current ICT access methods and platforms within Comorian communities. Users are forced to navigate system in languages that are not their mother tongue, particularly for formal applications. This informal adaptation highlights the pressing need for a more deliberate and comprehensive integration of Shikomori into ICT solutions to achieve true democratisation of access and enhance utility. The absence of culturally and linguistically appropriate digital tools in key sectors severely limits the potential for ICT to drive democratise digital access, empower communities, foster digital literacy, and significantly enhance the overall impact of ICT on national development.

### Sector-Specific Gaps and Informal Adaptations

This objective identifies where the need for Shikomori is greatest and how the lack of integration affects access in key sectors like Education, Tourism, Public Administration, and Telecommunications.

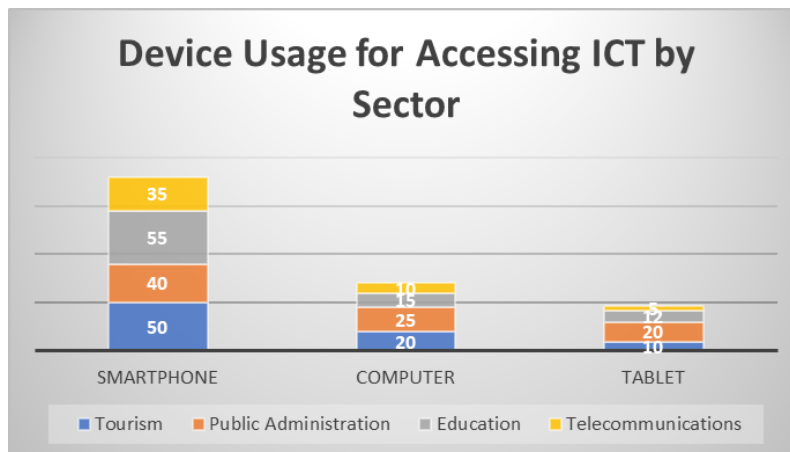


**Figure 9:** Importance of Shikomori Access by Sector. Source: Author, September 2025

Tourism and education sectors show highest importance for Shikomori access, suggesting these are top priority areas for digital language integration. While it is evident that



international visitors require information in global languages such as French and English, it is equally important to recognise the necessity of empowering local tourism stakeholders through Shikomori-based digital resources. The creation of mobile applications featuring localised maps, historical narratives, and service directories in Shikomori has the potential to substantially enhance the operational capacity of local guides, small-scale entrepreneurs, and community-based tourism initiatives. This approach not only enhances the visitor experience by facilitating more authentic and culturally immersive interactions but also ensures a broader and more equitable distribution of economic benefits within local communities.

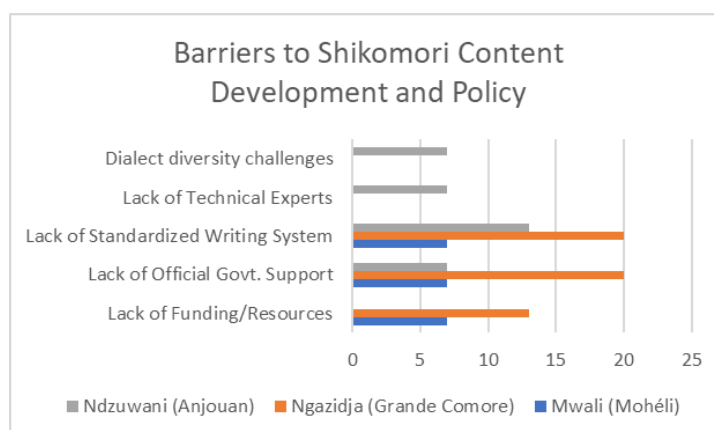


**Figure 10:** Device Usage for Accessing ICT by Sector. Source: Author, September 2025

Smartphones dominate as primary device for accessing ICT, especially in tourism and education, underlining the importance of mobile-friendly Shikomori content.

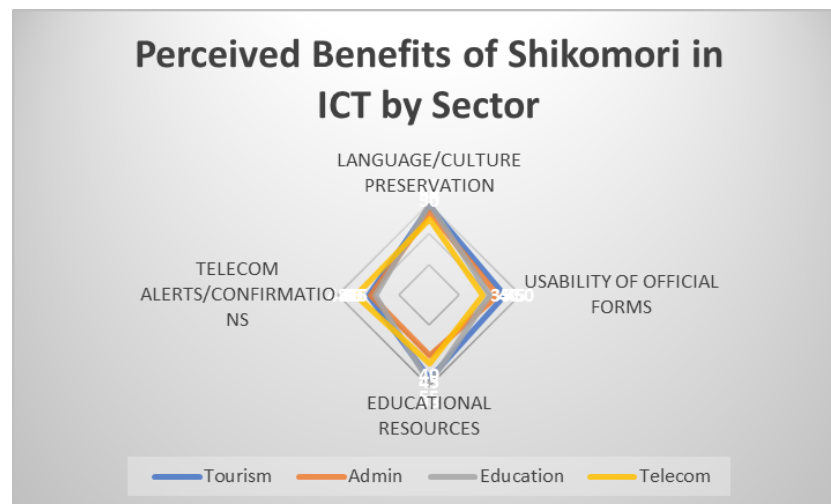
### Barriers and Challenges to Integration

This objective isolates the key hurdles – technical, institutional, and linguistic – that prevent effective Shikomori ICT integration. The vast majority of ICT tools, software applications, and online content is developed in globally dominant languages such as French, Arabic, and English. This creates a considerable accessibility obstacle for the Comorian population, a significant proportion of whom demonstrate higher proficiency in Shikomori.



**Figure 11:** Barriers to Shikomori integration by Island. Source: Author, September 2025

The primary barriers are non-technical and institutional: Standardisation (40 citations) is the most critical technical barrier preventing advanced ICT integration, and the lack of official government support (34 citations) urgently demands a cohesive national policy. Furthermore, lack of funding is a significant financial constraint for local development, particularly in Ngazidja.



**Figure 15:** Perceived Benefits of Shikomori in ICT by Sector

The chart shows the perceived benefits of Shikomori in ICT by sector as consistent, high perceived value across all sectors (Tourism, Admin, Education, Telecom) for educational resources and language/culture preservation, suggesting these are the most widely agreed-upon benefits of integrating Shikomori into ICT solutions. Conversely, the sectors show a lower and more variable perceived benefit for usability of official forms and telecom alerts/confirmations.

By isolating both user-driven adoption patterns (driven by youth and literacy) and macro-level structural barriers (standardisation and political will), the analysis provided a comprehensive diagnosis required to answer the research question regarding challenges and adoption drivers in Shikomori ICT integration.

## Community Needs and Aspirations

This objective captures the emotional, cultural, and practical goals of the community regarding Shikomori integration into technology. The community's aspiration for Shikomori integration is rooted in a unanimous mandate for cultural preservation, with 60 out of 60 respondents (100%) of respondents agreeing it is crucial for linguistic survival, not just convenience. This high demand is paired with the overwhelming dominance of the smartphone across all sectors, making a mobile-first strategy mandatory. However, achieving effective integration and bridging the digital divide requires immediately addressing key obstacles: the lack of specialised technical expertise, standardisation, and funding, through targeted, collaborative, and interdisciplinary interventions. The results reinforce that despite the sample size, the trends are consistent for broader application in Comoros. Addressing these issues requires targeted interventions focused on digital literacy, the creation of content in local dialects, and collaborative efforts among academic, institutional, and community stakeholders to bridge the digital and linguistic divide.

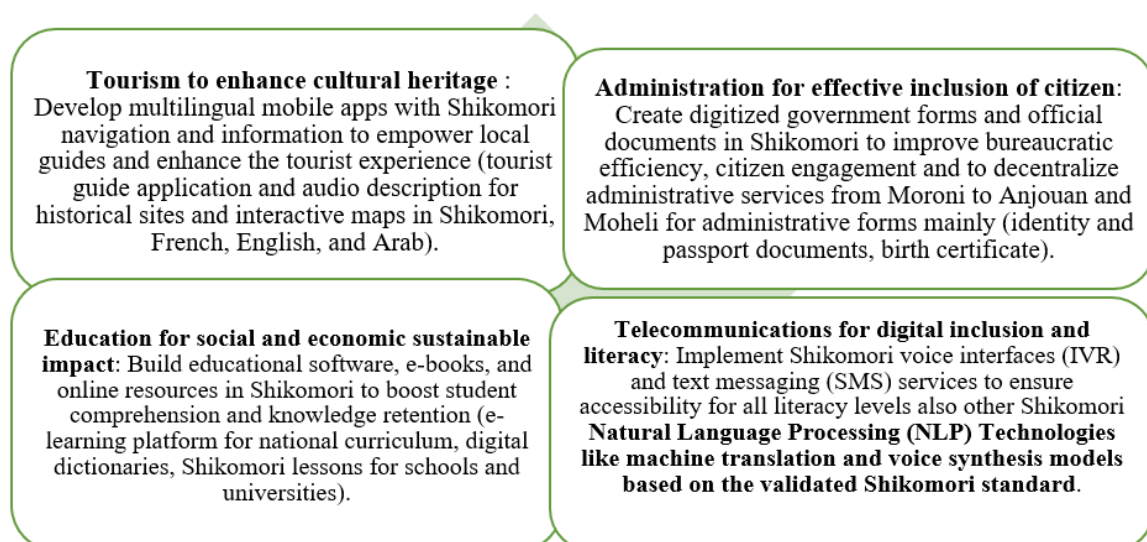
This affirms the need for an interdisciplinary approach and a framework for policy recommendations and implementation plans involving professionals, government, local communities, and researchers.

## Recommendations for Shikomori Integration in Comorian ICT

To effectively integrate the Shikomori language into digital tools and address the challenges discussed, a strategic plan is needed. This plan must focus on creating culturally specific solutions, fostering collaboration among diverse stakeholders, and ensuring sustained community involvement to promote lasting digital access. These recommendations are structured to address the identified challenges while leveraging the strong community support and adapting to the dominant mobile landscape.

### Sectoral and Technical Focus

Given that **79%** of internet access is via **Smartphone**, all solutions must be lightweight, fast, and user-friendly mobile applications that meet the specific needs of each sector.



**Figure 16:** A Roadmap for Inclusive Technology. Source: Author, June 2025

### Institutional and Linguistic Leadership

A strategic approach requires three prioritised interventions to overcome structural barriers. The most critical need is institutional support (34 responses), mandating the creation of a National Digital Language Committee and a legal framework to officially recognise and budget for Shikomori in digital public administration. Parallel to this, the lack of standardisation (40 responses) must be solved by having the Committee finalise and deploy a single standardised writing system, a technical prerequisite for developing advanced AI and e-learning tools in both education and telecommunications. Finally, the lack of funding (20 responses) should be addressed by launching an innovation fund for digital inclusion, leveraging public-private partnerships (PPP) to subsidise the development of essential Shikomori utility applications for commerce and public services.



**Figure 17:** Collaboration between government, Academia, and Local Communities. Source: Author, May 2025

The successful integration of the Shikomori language into the digital world requires a collaborative effort from all stakeholders. The government must take the lead by establishing policies for Shikomori’s use in public online services, funding research into language technology, ensuring widespread internet access, and incentivising companies to develop Shikomori-based solutions. Academia plays a crucial role by conducting research on language technologies, creating digital linguistic tools, developing curricula to teach digital skills in Shikomori, and training future experts. Furthermore, local communities (including elders, youth, and cultural experts) must be involved at every stage to ensure that the technology is culturally appropriate and user-friendly. Their participation is vital for providing valuable knowledge, feedback, and advocacy for Shikomori’s inclusion in the digital sphere.



**Figure 18:** Active participation of local communities. Source: Author, May 2025

The success of Shikomori integration into ICT relies on a two-pronged approach: first, resolving the institutional crisis through standardisation and political backing from public administration, and second, building highly targeted mobile solutions for education, tourism, and public services. The enthusiasm and need expressed by the community guarantee that these investments will have an immediate and lasting impact. Furthermore, to improve technology use within Shikomori-speaking communities, it is essential to provide digital literacy training in Shikomori, tailored for all demographics, from young people to elders. It is also crucial to encourage individuals to create their own online content, such as videos and blogs, in their native language, thereby shifting from passive consumption of foreign content to active contribution. By teaching communities how to critically evaluate information and use social media responsibly, it will empower them to fully participate in the digital world in their own language.

## Conclusion

The integration of Shikomori into Information and Communication Technologies (ICTs) is not merely a technical option but a fundamental imperative for equitable national development and the empowerment of Comorian communities. The findings of this study reveal a critical paradox: while strong, self-driven demand exists from the diaspora, private sector, and younger users – evidenced by the overwhelming reliance on smartphones and the high perceived value of Shikomori for cultural preservation – this momentum is severely constrained by structural and political barriers.

This study systematically highlights that progress is primarily hampered by techno-linguistic impediments, chiefly the lack of complete spelling standardisation and orthographic inconsistencies across dialects, alongside the critical absence of a national language policy and sufficient political will or funding. Furthermore, the minimal use of computers underlines a digital divide that risks excluding users from engaging in higher-literacy administrative and educational tasks.

To transition from mere linguistic inclusion to genuine digital empowerment, a paradigm shift is required. The path forward demands moving beyond models focused on individual experience (UCD/TAM) toward a strategy that embraces collective socio-cultural dynamics and inclusive co-design practices. Achieving sustainable integration requires a mandatory, multi-stakeholder approach to institutionalise digital resources and implement targeted interventions that boost digital literacy and foster collaboration across academic, governmental, and community sectors.

By proactively addressing these linguistic and structural disparities, the Comoros can leverage its distinctive heritage to strengthen social cohesion, enhance administrative efficiency, and fully unlock its citizens' potential, thereby firmly rooting its digital transformation in culturally relevant and sustainable development goals (SDGs). The success of this transformative endeavour rests upon an unwavering national commitment to endorse Shikomori as a cornerstone of the country's digital future.

## References

- Ahmed-Chamanga, M. (2010). *Introduction à la grammaire structurale du comorien: Le shiNgazidja*. Moroni, KomÉdit – Ya Mkobe publications.
- Ahmed-Chamanga, M. (2011). « La langue comorienne ». In F. Laroussi & F. Liénard (éds.), *Plurilinguisme, politique linguistique et éducation*. Presses universitaires de Rouen et du Havre, 19–35. <https://doi.org/10.4000/books.purh.5186>
- Ahmed Chamanga, M. (2022). « Chapitre 4 Shikomori, la langue bantoue des Comores : statut et perspectives ». In *Manuel de politique linguistique et d'éducation dans les pays de la Communauté de développement de l'Afrique australe (SADC)*, 79–98. Leyde, Pays-Bas: Brill. [https://doi.org/10.1163/9789004516724\\_006](https://doi.org/10.1163/9789004516724_006)
- Ajibade, P. (2018). 'Technology Acceptance Model Limitations and Criticisms: Exploring the Practical Applications and Use in Technology-related Studies, Mixed-method, and Qualitative Researches', *Library Philosophy and Practice (e-journal)*, (Paper 1941). <https://digitalcommons.unl.edu/libphilprac/1941/>

- Bhattacharya, S., Panyam, S., Deshmukh, G., Gatala, S., Vemoori, V. & Seth, D. (2024). 'Integrating User Experience and Acceptance in Authentication: A Synthesis of Technology Acceptance Model and User-Centered Design Principles', *International Journal of Computer Trends and Technology*, 72(4), 15–23. <https://doi.org/10.14445/22312803/IJCTT-V72I4P102>
- Borthwick, M., Tomitsch, M., & Gaughwin, M. (2022). 'From human-centred to life-centred design: Considering environmental and ethical concerns in the design of interactive products', *Journal of Responsible Technology*, Vol (10), Article 100032. <https://doi.org/10.1016/j.jrt.2022.100032>
- Chauvet, A. (2015). Statuts des langues et éducation de base aux Comores. *Revue internationale d'éducation de Sèvres*. 70, 77–84. Available at : <http://journals.openedition.org/ries/4499>. <https://doi.org/10.4000/ries.4499>. Accessed: November 14, 2025.
- Cheshire, E., & Kipkebut, A. (2024). 'Current state, challenges and opportunities for natural language processing research and development in Africa: A systematic review', *Africa NLP workshop at ICLR 2024, Kabarak University*, 1–8.
- Creswell, J. W., & Creswell, J. D. (2022). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (6th ed.), Thousand Oaks, CA: SAGE Publications.
- Daniel, R. S. (2024). Le shikomor pour enseignement / apprentissage du français langue étrangère : issue interculturelle de l'insularité de Ndzuani, *Revue Internationale du Chercheur*. 5(2), 734–757. <https://www.revuechercheur.com/index.php/home/article/view/984/818>
- Davis, F. & Davis, F. (1989). 'Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology', *MIS Quarterly*, 13, 319–339. <https://doi.org/10.2307/249008>
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). 'User acceptance of computer technology: A comparison of two theoretical models', *Management Science*, 35(8), 982–1003. <https://doi.org/10.1287/mnsc.35.8.982>
- Duran, N. D., Paxton, A., & Fusaroli, R. (2019). 'ALIGN: Analyzing linguistic interactions with generalizable techniques—A Python library', *Psychological Methods*, 24(4), 419–438. <https://doi.org/10.1037/met000206>
- Galla, C. (2018). 'Digital Realities of Indigenous Language Revitalization: A Look at Hawaiian Language Technology in the Modern World', *Language and Literacy*, 20, 100–120. <https://doi.org/10.20360/langandlit29412>
- Gay, J. C. (2001). 'La diffusion du tourisme dans l'archipel comorien', *Mappemonde*, 64(4), 15–18. <https://doi.org/10.3406/mappe.2001.1699>
- Goosen, M., Prinsloo, D., & Taljard, E. (2023). 'Creating electronic resources for African languages through digitisation: A technical report', *Journal of the Digital Humanities Association of Southern Africa*, 4(1), 1–7. <https://doi.org/10.55492/dhasa.v4i01.4441>
- Halidi, A. (2018). 'Comores: Colonisation, insularité et imaginaire national', *Comoros: Colonization, insularity and national imagination. Les Cahiers d'Outre-Mer*, 71(278), 403–432. <https://doi.org/10.4000/com.9692>
- Kukutai, T., & Taylor, J. (2016). *Indigenous data sovereignty: Toward an agenda*. Australian National University Press. Canberra. <http://press.anu.edu.au/publications/series/centre-aboriginal-economic-policy-research-caepr/indigenous-data-sovereignty>
- Mugane, J. M. (1997). 'Learning African Languages with Evolving Digital Technologies', *Africa Today*, 44(4), 423–441. <http://www.jstor.org/stable/4187190>
- Naira, A. M., Bahafid., A., & Erraji, Z. (2024). Datasets creation and empirical evaluations of cross-lingual learning on extremely low-resource languages: A focus on Comorian dialects. In S. Henning & M. Stede (Eds.), *Proceedings of The 18th Linguistic Annotation Workshop (LAW-XVIII)*, 140–149. Association for Computational Linguistics.

- Naira, A. M., Bahafid., A., Benelallam,I., & Erraji, Z. (2024). 'Harnessing Transfer Learning from Swahili: Advancing Solutions for Comorian Dialects. *6th Deep Learning Indaba Conference (DLI 2024)*. Available at: <https://arxiv.org/abs/2412.12143>. Accessed: June 21, 2025.
- Obikudo, E. F. (2022). 'Digitizing African languages: Building a digital lexicon', *Journal for Translation Studies in Nigeria (JTSN)*, 1(1), 38–52.
- ONTC. (2024). *Catalogue of hotel investment sites in the Comoros*. Moroni: ONTC Publications.
- ORELC, *Online dictionary of Shikomori*. Availabe at: <https://orelc.ac/academy/ShikomoriWords/?i=kmWords>. Accessed: September 24, 2025.
- Osborn, D. (2010). *African languages in a digital age: Challenges and opportunities for indigenous language computing*. IDRC-funded African Network for Localization, Cape Town: HSRC Press. <http://hdl.handle.net/20.500.11910/4355>
- Panicker, P. (2020). *Embedding Culture and Grit in the Technology Acceptance Model (TAM) for Higher Education*. Available at: <https://arxiv.org/abs/2005.11973>. Accessed: June 21, 2025.
- Pea, R., (1987). 'User centered system design: New perspectives on human-computer interaction', *Journal of Educational Computing Research*, 3(1), 129–134.
- Pinch, T. J., & Bijker, W. E. (1984). 'The Social Construction of Facts and Artefacts: or How the Sociology of Science and the Sociology of Technology might Benefit Each Other', *Social Studies of Science*, 14(3), 399–441. <https://doi.org/10.1177/030631284014003004>
- Salawu, A. (2019). *African language digital media and communication*. Routledge Contemporary Africa. <https://doi.org/10.4324/9781351120425>
- Smith, L. T. (2021). *Decolonizing Methodologies: Research and Indigenous Peoples* (3rd ed.). London: Zed Books. <https://doi.org/10.5040/9781350225282>
- Soihili, S. (2011). La langue française dans l'archipel des Comores : statut, usages et pratiques de langue. In F. Laroussi & F. Liénard (eds.), *Plurilinguisme, politique linguistique et éducation*. Mont-Saint-Aignan: Presses universitaires de Rouen et du Havre. 175–185. <https://doi.org/10.4000/books.purh.5210>
- Tahmasebi, F. (2023). 'The Digital Divide: A Qualitative Study of Technology Access in Rural Communities', *AI and Tech in Behavioral and Social Sciences*. 1 (1). 33–39. <https://doi.org/10.61838/kman.aitech.1.2.6>
- Thompson, R. & Berko Gleason, Jean. (2001). *Language death*. David Crystal. Cambridge: Cambridge University Press, 2000. <https://doi.org/10.1017/S0142716401212077>
- UNESCO. (2003). *Language vitality and endangerment*. Unesco Ad Hoc Expert Group on Endangerment Languages. Available at: <https://ich.unesco.org/doc/src/00120-EN.pdf>. Accessed: September 24, 2025.
- UNESCO. (2003). *Recommendation concerning the promotion and use of multilingualism and universal access to cyberspace*. Available at: <https://unesdoc.unesco.org/ark:/48223/pf0000153336> Accessed: September 24, 2025.
- Van Velsen L, Ludden G, Grünloh C. (2022). 'The Limitations of User- and Human-Centered Design in an eHealth Context and How to Move Beyond Them'. *Journal of Medical Internet Research*. 24(10):e37341. <https://doi.org/10.2196/37341>
- Warschauer, M. (2003). *Technology and social inclusion: Rethinking the digital divide*. Cambridge: MIT Press. <https://doi.org/10.7551/mitpress/6699.001.0001>
- Wilson, S. (2008). *Research Is Ceremony: Indigenous Research Methods*. Black Point, Nova Scotia: Fernwood Publishing.

World Bank (2021), *Comoros integrated development and competitiveness project: Promoting Technology Adoption to Raise Productivity, Supporting Entrepreneurship and SME Growth*. Available at: <https://documents1.worldbank.org/curated/en/556041518192665327/Comoros-Integrated-Development-and-Competitiveness-Project.docx>. Accessed: September 27, 2025.

## Appendix 1: Interview reflection themes on Shikomori integration into ICT solutions

### 1. Relationship with the Comorian Language and the Socio-linguistics of Shikomori in ICTs

- What is your professional background related to Shikomori, and what motivates your choice to work primarily in this language (activism, writing, entrepreneurship)?
- How do you perceive the influence of technologies (applications, software) on the learning, preservation, and dissemination of the Comorian language and culture?

### 2. Applications in Key Sectors

- How can Shikomori be used to improve digital services in tourism, culture, education, and public administration?
- What specific needs does your sector have regarding the use of Shikomori and its integration into ICTs?

### 3. Accessibility and Inclusion

- What concrete ICT solutions (applications, dictionaries, *open source* resources) are currently available or under development?
- What challenges do you face in developing inclusive and accessible solutions for better integrating Shikomori into ICTs?

### 4. Socio-economic and Political Impact

- How could the use of Shikomori in ICTs strengthen linguistic transmission and community identity?
- What socio-economic or political factors do you believe influence the adoption of ICTs by communities (political will, funding, stability of public-private partnerships)?

### 5. Implementation Strategies and Partnerships

- What strategies would you recommend to foster the successful integration of Shikomori?
- Which partnerships between linguists, public stakeholders, tourism professionals, and digital specialists are necessary to achieve this?



## Appendix 2: Survey form on The Role of the Shikomori Language in Information and Communication Technologies (ICT) in the Comoros

This survey is part of a research study on the importance of integrating the Shikomori language into digital technologies (websites, mobile applications, etc.) in the Comoros. Your participation is voluntary and your responses will be kept anonymous and confidential. The goal is to better understand the needs and perspectives of Comorian communities in order to promote better access to information and digital services. Thank you for your time and valuable contribution.

General Information (Please check the appropriate box or fill in the blank)

<b>1. Age:</b> _____
<b>2. Gender:</b> <input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Other
<b>3. Island of Residence:</b> <input type="checkbox"/> Ngazidja (Grande Comore) <input type="checkbox"/> Ndzuwani (Anjouan) <input type="checkbox"/> Mwali (Mohéli)
<b>4. What is your primary language spoken at home?</b> <input type="checkbox"/> Shikomori <input type="checkbox"/> French <input type="checkbox"/> Arabic <input type="checkbox"/> Other: _____
<b>5. Please rate your proficiency in the following languages (1=Beginner, 5=Fluent):</b>
<b>Shikomori:</b> <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
<b>French:</b> <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5
<b>Arabic:</b> <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5

ICT Usage and Language

<b>6. Which devices do you use to access the internet? (Select all that apply)</b> <input type="checkbox"/> Smartphone <input type="checkbox"/> Computer (desktop/laptop) <input type="checkbox"/> Tablet <input type="checkbox"/> I do not use the internet
<b>7. How often do you use the internet?</b> <input type="checkbox"/> Daily <input type="checkbox"/> A few times a week <input type="checkbox"/> Once a week <input type="checkbox"/> Less than once a week
<b>8. When you use the internet or mobile apps, what language do you encounter most often?</b> <input type="checkbox"/> French <input type="checkbox"/> English <input type="checkbox"/> Arabic <input type="checkbox"/> Shikomori <input type="checkbox"/> Other: _____
<b>9. I sometimes find it difficult to use websites or applications because they are not in a language I fully understand.</b> <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree
<b>10. How important is it for you to have access to websites, apps, and digital content in Shikomori?</b> <input type="checkbox"/> Very Important <input type="checkbox"/> Important <input type="checkbox"/> Neutral <input type="checkbox"/> Not Very Important <input type="checkbox"/> Not Important at All
<b>11. I would use ICT (internet, apps) more often if they were available in Shikomori.</b> <input type="checkbox"/> Strongly Agree <input type="checkbox"/> Agree <input type="checkbox"/> Neutral <input type="checkbox"/> Disagree <input type="checkbox"/> Strongly Disagree

## Shikomori Integration in Key Sectors

(For the following questions, please indicate how useful you would find each service)

<b>12. Tourism Sector</b>
A mobile app for tourists with information and audio guides in Shikomori (in addition to French, etc.).
Response: <input type="checkbox"/> Very Useful <input type="checkbox"/> Useful <input type="checkbox"/> Neutral <input type="checkbox"/> Not Very Useful <input type="checkbox"/> Not Useful at All
<b>13. Administrative Services</b>
Being able to fill out official online forms (e.g., ID card, passport application) using a Shikomori interface.
Response: <input type="checkbox"/> Very Useful <input type="checkbox"/> Useful <input type="checkbox"/> Neutral <input type="checkbox"/> Not Very Useful <input type="checkbox"/> Not Useful at All
<b>14. Education Sector</b>
Digital educational resources (e-books, interactive apps) for children in Shikomori.
Response: <input type="checkbox"/> Very Useful <input type="checkbox"/> Useful <input type="checkbox"/> Neutral <input type="checkbox"/> Not Very Useful <input type="checkbox"/> Not Useful at All
<b>15. National Telecommunications</b>
Receiving SMS alerts and transaction confirmations from your mobile operator or mobile money service in Shikomori.
Response: <input type="checkbox"/> Very Useful <input type="checkbox"/> Useful <input type="checkbox"/> Neutral <input type="checkbox"/> Not Very Useful <input type="checkbox"/> Not Useful at All
<b>16. News and Media</b>
Accessing national news (digital newspapers, Facebook Live broadcasts) in Shikomori.
Response: <input type="checkbox"/> Very Useful <input type="checkbox"/> Useful <input type="checkbox"/> Neutral <input type="checkbox"/> Not Very Useful <input type="checkbox"/> Not Useful at All

## Benefits and Challenges

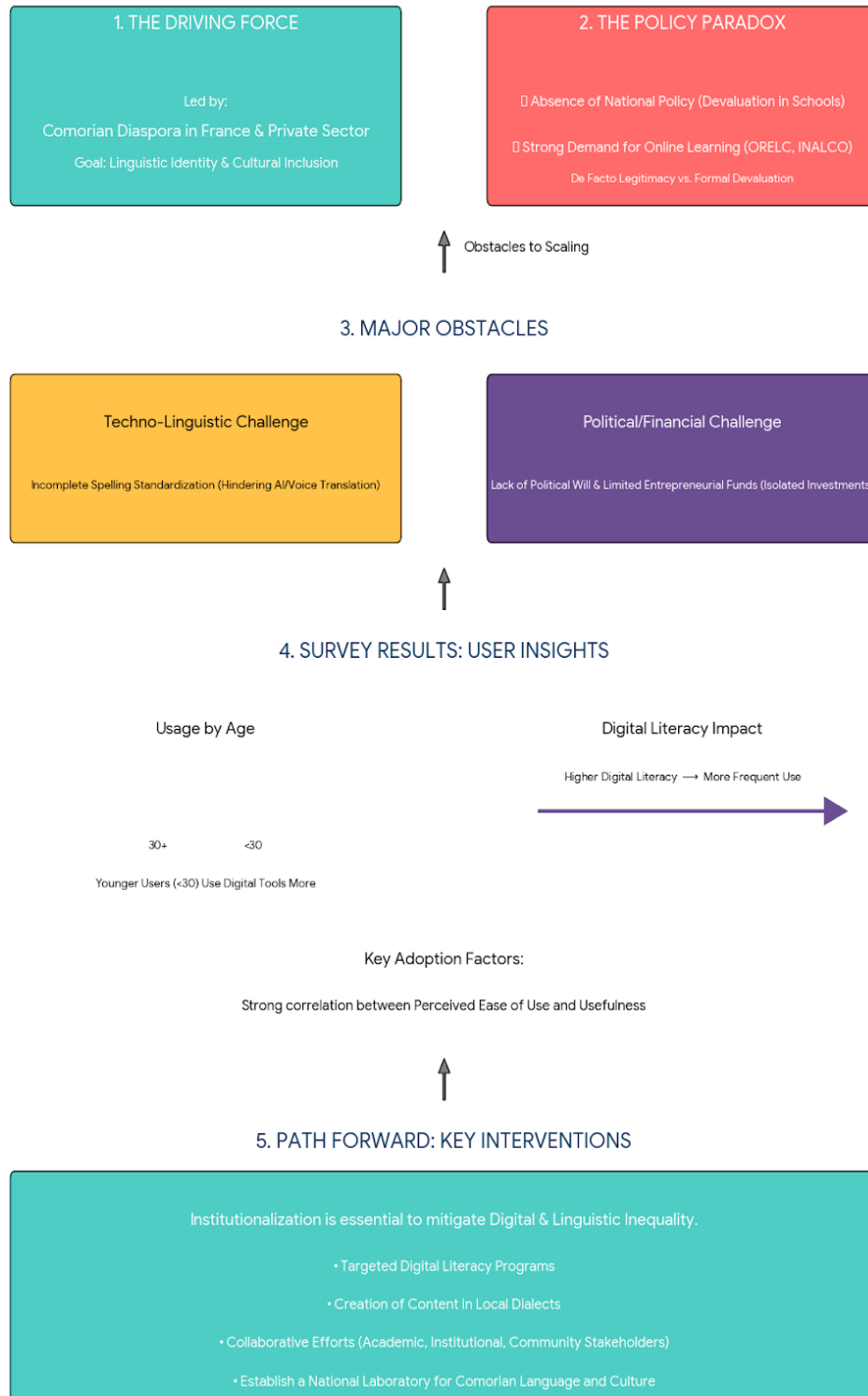
<b>17. Do you believe that using Shikomori in technology would help preserve the Comorian language and culture?</b> <input type="checkbox"/> Yes, a lot <input type="checkbox"/> Yes, a little <input type="checkbox"/> I'm not sure <input type="checkbox"/> No, not really <input type="checkbox"/> No, not at all
<b>18. Shikomori has four dialects (Shingazidja, Shindzuwani, Shimaore and Shimwali). Do you think these differences would be a major challenge for creating standardised digital content?</b> <input type="checkbox"/> Yes, a major challenge <input type="checkbox"/> Yes, a minor challenge <input type="checkbox"/> I'm not sure <input type="checkbox"/> Not a significant challenge
<b>19. In your opinion, what is the biggest obstacle to developing more digital content in Shikomori?</b> <input type="checkbox"/> Lack of funding/resources <input type="checkbox"/> Lack of technical experts <input type="checkbox"/> Lack of official government support <input type="checkbox"/> Lack of a standardized writing system <input type="checkbox"/> Other: _____

## Comments

20. Do you have any other comments or suggestions regarding the use of the Shikomori language in technology in the Comoros?

## Appendix 3: Summary of the findings on Shikomori integration in ICT solutions

### Shikomori Integration in ICT: Key Findings & Challenges



Source: Author, September 2025