



Closing the gaps: Wiki Katat, the first social and community mobile virtual network operator in Mexico

Author
Vladimir Cortés Roshdestvensky

Mentor
Claire Craig

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Executive summary

This research document is an approximation into the intricate dynamics of digital inclusion efforts in Mexico, focusing on collaborative initiatives involving Altán Redes (AR), Civil Society Organizations like Indigenous Community Telecommunications (Telecomunicaciones Indígenas Comunitarias, TIC AC), and *Wiki Katat*, the first Social and Community Mobile Virtual Network Operator (SC-MVNO) in the country. Overcoming challenges such as building trust among users in Mobile Virtual Network Operators (MVNO) in Mexico, navigating the integration to the complexities of wholesale mobile network operators, and addressing mobile phone incompatibility with the 700 MHz frequency band, these initiatives represent a paradigm shift in telecommunications models, prioritising community-based approach dynamics over profit-centric motives. The evolving digital landscape underscores a shift towards inclusive, community-centric models, exemplified by collaborations empowering local communities and challenging traditional narratives of large companies. Strategic litigation has played a pivotal role in recognising indigenous rights, marking a turning point in empowering indigenous communities, and contributing to a multistakeholder approach to bridge the digital divide in Mexico.

Glossary Terms

APP	Public Private Association
AR	Altán Redes
ASF	Auditoría Superior de la Federación (Supreme Audit of the Federation)
CFE	Comisión Federal de Electricidad (Federal Electricity Commission)
ENDUTIH	Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (National Survey on the Availability and Use of Information Technologies in Households)
ICT	Information and Communication Technologies
IFT	Instituto Federal de Telecomunicaciones (Federal Telecommunications Institute)
Masewal Nemilis	The indigenous way of life in Nahuatl language
MVNO	Mobile Virtual Network Operator
PROMTEL	Organismo Promotor de Inversiones en Telecomunicaciones (Telecommunications Investment Promotion Telecomm Agency)
Redes AC	Redes por la Diversidad, Equidad y Sustentabilidad (Networks for Diversity, Equity and Sustainability)
SC-MVNO	Social and Community Mobile Virtual Network Operator
SICT	Secretaría de Infraestructura, Comunicaciones y Transportes (Ministry of Infrastructure, Communications and Transport)
Tanawatihkeh	The person in the community who communicates or informs in Nahuatl language
Tapalewihkeh	The act of helping each other in Nahuatl language
TELECOMM	Financiera para el Bienestar (formerly Telecomunicaciones de México)
TIC AC	Telecomunicaciones Indígenas Comunitarias (Indigenous Community Telecommunications)
TOSEPAN	Unión de Cooperativas Tosepan Titaniske

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I. INTRODUCTION

For the past years, the Mexican state has been trying to close the digital divide in Mexico. Despite numerous efforts, in recent years, the country's digital divide has left more than 30 million people without internet access¹, preventing millions of Mexicans from accessing more diverse media sources and fully exercising their rights.

As a part of historical movements for the right of communication and access to Information and Communication Technologies (ICT), indigenous communities and civil society organisations took action to provide internet access. The *Unión de Cooperativas Tosepan Titaniske* (Union of Cooperatives, Tosepan), an emblematic Nahuatl-Totonaca cooperative from the northern highlands of Puebla, launched in October 2022, Wiki Katat. The social and community Mobile Virtual Network Operator (MVNO) that provides affordable mobile telephone and internet services using the Altán Redes backbone network.²

The confluence of Indigenous rights and telecommunications in Mexico represents a salient and multifaceted subject within human rights and technology. "Wiki Katat" (which means "come-come" in Nahuatl and Totonac, respectively) stands as a pioneering endeavour that has emerged as a symbol of local-based initiatives to appropriate technological processes and effectively alleviate the pronounced digital disparities that have historically hindered indigenous communities' access to Information and Communication Technologies (ICTs).

Mexico is a diverse and culturally rich nation, characterised by its multifarious Indigenous communities that account for nearly 10% of its populace³. In the context of accessing telecommunications infrastructure and the internet, indigenous communities have been making a remarkable effort to assure technological autonomy, particularly when the state and big telecommunication companies are not reaching them. Local actions in coordination with civil society organisations, enhanced by public-private initiatives, create the formula for charting the way towards reducing the digital divide and technological appropriation.

¹ Article 19, "Negación [Denial]," April 4, 2022, p. 132. Available at: <https://articulo19.org/negacion/>

² José Soto Galindo, "Wiki Katat: telefonía e internet en náhuatl y totonaco [Wiki Katat: telephony and Internet in Nahuatl and Totonac]", *El Economista*, October 8, 2022, <https://www.eleconomista.com.mx/politica/Wiki-Katat-telefonía-e-internet-en-nahuatl-y-tonaco-20221008-0013.html>

³ INEGI, "Estadísticas A Propósito Del Día Internacional De Los Pueblos Indígenas [Statistics on the occasion of the international day of indigenous peoples]", Mexico, August 8, 2022, Available at: https://www.inegi.org.mx/contenidos/saladeprensa/aproposito/2022/EAP_PueblosInd22.pdf

A lack poses far-reaching implications, as it constrains access to essential information, educational resources, and opportunities for socioeconomic advancement, thereby influencing the realisation of fundamental human rights, particularly the right to communication.

The focal point of this research is to explore the Indigenous initiative, Wiki Katat, to evaluate its influence on Indigenous communities' access to the internet and ICTs in the context of the digital divide in Mexico. Furthermore, it aims to elucidate the broader implications of this initiative for safeguarding fundamental human rights, including the right to communication. And finally, how technological autonomy and public-private initiatives converge as a driving force to guarantee the right to communicate.

The central inquiry revolves around the notion that access to communication technologies is intrinsically linked to technology appropriation, use and transformation. Where technology and telecommunications do not reach, communities organise themselves to bring it. Ascertaining the impact of Wiki Katat within this context is of profound significance to identify feasible alternatives to strengthen local initiatives to access the internet and mobile communication services based on particular needs and cultural values.

Within the domain of human rights, the right to communication, access to the internet, and ICTs have progressively assumed pivotal roles as integral components of the broader human rights framework, encompassing freedom of expression, access to information, and cultural participation. The utility of information and communication technologies has transformed into a pivotal avenue through which individuals and communities exercise their rights, partake in societal and political discourse, and engage locally and with the world. For Indigenous communities in Mexico, like those inhabiting the northern highlands of Puebla, access to the internet (and telecommunications) assumes critical importance in revitalising their cultural life (*Masewal nemilis*⁴), expressing their voices, strengthening its organisational framework, and reappropriating their territory.

This research is poised to delve into the narrative of Wiki Katat, scrutinising its accomplishments, challenges, and tangible impact on the lives of Indigenous communities. In examining this

⁴ There are two relevant terms acknowledged in Nahua and Tutunaku indigenous groups from the Sierra Norte de Puebla. The first one is *masewal nemilis*, which refers to the indigenous form of life based on values and principles linked to the language, culture, and territory. The second one is *Yaknemilis*, which refers to the “good living” or “buen vivir” in Spanish. Isabel Bueno & Ana Isabel Moreno-Calles & Juliana Merçon, 2023.

“Yeknemilis: Social Learning and Intercultural Transdisciplinary Collaboration for Sustainable Life,” Sustainability, MDPI, vol. 15(12), pages 1-26, June. Available at: <https://ideas.repec.org/a/gam/jsusta/v15y2023i12p9626-d1171972.html>

initiative through a human rights prism, this research seeks to provide insights and policy recommendations, thereby contributing to a more equitable and comprehensive telecommunications landscape in Mexico. Through this investigation of Wiki Katat, the intention is to unveil its potential as a blueprint for a rights-based approach to telecommunications and internet access, thereby guaranteeing that Indigenous communities in Mexico can fully exercise their fundamental human rights, including the right to communication and access to information.

Methodology

The research aims to address digital inclusion policies in Mexico, focusing specifically on the Wiki Katat project, the first indigenous virtual mobile operator. The study will analyse some factors contributing to the digital divide in Mexico and the Nahua and Totonac communities of the northern highlands of Puebla and assess the impact and prospects of Wiki Katat in expanding digital inclusion in Mexico.

The project will address: i) the context of the digital divide in Mexico; ii) the specific challenges faced by indigenous communities in accessing internet and mobile services; iii) the role of Altán redes as public-private alliance enabling virtual mobile operators and iv) the Wiki Katat project as an initiative for digital inclusion.

Data collection included interviews with three members of Wiki Katat: 1) Angelina Millán Hernández, Mobile Virtual Network Operator (MVNO) Coordinator in Wiki Katat; 2) Nicacia Lino de Jesús partner of Wiki Katat and member of the Board of Directors of Radio Tosepan Limakxtum and 3) Bonifacio Iturbide Palomo, partner of Wiki Katat and member of the Board of Directors of Radio Tosepan Limakxtum. From civil society organisations, 1) Penelope Partida, the Operational Coordinator and Telecommunication Engineer at the civil society organisation (CSO), Telecomunicaciones Indígenas Comunitarias (Indigenous Community Telecommunications, TIC AC); 2) Mayra López, coordinator of right to information and proactive transparency and Martha Tudón, Digital Rights Programme Officer, both from Article 19 Mexico and Central America. Despite numerous efforts, contacting anyone at Altán Redes who could provide further background on their work to expand network coverage was impossible.

The research also includes i) a statistical analysis of the surveys on the availability and use of technologies in Mexico and ii) a thematic analysis of the qualitative data obtained in the interviews.

Key findings

1. **Trust and understanding** are paramount challenges for MVNOs and Wiki Katat in Mexico, requiring concerted efforts to socialise their work and services among users. The dominance of major telecommunication companies in the Mexican mobile market has been a longstanding reality, emphasising the need for alternative approaches to gain user confidence.
2. **The integration process** into Altán Redes proved complex, demanding substantial operator training. While civil society organisations possessed prior experience, the transition to the "big leagues," described by a TIC AC representative, introduced additional challenges, highlighting the intricate nature of becoming a major operator.
3. **Mobile phone compatibility with the 700 MHz frequency band** is a significant challenge to digital inclusion. This obstacle slows the adoption of Altán Redes' services and underscores the technological barriers, necessitating innovative solutions to ensure widespread access.
4. **Wiki Katat faces challenges in expanding its user base**, striving to reach the sustainable threshold of 4,000 users. The potential for faster growth opens up the possibility of providing services to individuals across Mexico and raising other challenges to customer service.
5. **A multistakeholder approach** is pivotal in addressing the digital divide, with state and non-state actors, including civil society organisations, indigenous communities and cooperatives, playing a crucial role in championing the right to access telecommunications.
6. **Strategic litigation has been instrumental** in recognising indigenous rights and securing licenses for social use of the radio-electric spectrum, marking a turning point in empowering indigenous communities.
7. **The collaboration between Altán Redes, TIC AC, and Wiki Katat signifies a paradigm shift** in the telecommunications business model. Moving beyond profit-centric motives, this collaboration prioritises community benefits. The negotiation process, spanning spectrum rentals to crafting accessible offers for rural areas, exemplifies a transformative approach aligned with community needs, challenging the conventional extractivist viewpoint.
8. **Mexico's evolving digital inclusion landscape underscores a shift toward more inclusive, community-centric models.** Collaborations with organisations like TIC AC and the cooperative Tosepan Titaniske exemplify local empowerment, ensuring that the benefits of telecommunications services remain within the community and challenging the traditional narrative of large corporations extracting resources without meaningful community engagement.

II. THE LANDSCAPE OF THE DIGITAL DIVIDE IN MEXICO

In this study, the digital divide is considered a complex issue that encompasses various dimensions⁵. It involves the gap between individuals who have full access to ICTs and those who are left behind due to the lack of connectivity and virtual communication access, but also the differences in the use of digital technologies across different generations, the gender gap, which disproportionately affects women⁶, indigenous populations and other historically discriminated groups, socioeconomic inequality which in combination reinforces exclusion from information society⁷ and limited access to ICTs.

The digital divide also represents the impossibility of exercising human rights in the digital realm, such as freedom of expression and access to information.⁸ For that reason, states have the responsibility, according to international human rights standards, to adopt distinguishable mechanisms to ensure access to the Internet without discrimination.⁹

For Mayra López, coordinator of the right to information and proactive transparency at Article 19 Mexico and Central America, a project working with local communities to use the right to information as an enabler of other rights¹⁰, “Internet access facilitates the flow of information. It [also] makes it easier for the [state institutions] to improve their information systematisation platforms and bring the information of the obligated subjects closer to the citizens”¹¹.

However, she also acknowledges that whenever there is a discussion about the right to information and its connection to internet access, people also lack the essential “awareness regarding their fundamental rights”.

⁵ Toudert, Djamel, “Brecha digital y contextos de marginación en México: una década de evolución [Digital divide and marginalization contexts in Mexico: A decade of evolution]”. Cuadernos.Info, (53), 318–337, 2022, p. 321 <https://doi.org/10.7764/cdi.53.37763> and Charlie Muller and João Paulo de Vasconcelos Aguiar, “What Is the Digital Divide?”, Internet Society, Available at: <https://www.internetsociety.org/blog/2022/03/what-is-the-digital-divide/>

⁶ Ruiz, Priscilla and Cortés, Vladimir, “Libertad de expresión y brecha digital de género en México [Freedom of expression and the gender digital divide in Mexico], Facultad de Derecho Centro de Estudios en Libertad de Expresión y Acceso a la Información, Universidad de Palermo, October 2020, Available at: https://www.palermo.edu/Archivos_content/2020/cele/octubre/libertad-expresion/Libertad-de-expresion-y-brecha-digital-de-genero-en-Mexico.pdf

⁷ Op. Cit. Toudert, Djamel, “Brecha digital...”, p. 320

⁸ United Nations (UN), “Joint Declaration on Freedom of Expression and the Internet”, UN Special Rapporteur on Freedom of Opinion and Expression, the Representative on Freedom of the Media of the Organization for Security and Cooperation in Europe (OSCE), the Organization of American States (OAS) Special Rapporteur on Freedom of Expression and the Special Rapporteur on Freedom of Expression and Access to Information of the African Commission on Human and Peoples' Rights (ACHPR). Organisation of American States (OAS), “Joint Declaration on Freedom of Expression and the Internet”, June 1, 2011, available at: <http://www.oas.org/es/cidh/expresion/showarticle.asp?artID=849&IID=2>

⁹ CIDH-RELE-OEA, “Estándares para una internet libre, abierta e incluyente”, 15 de marzo, 2017, p. 21, § 35, disponible en: https://www.oas.org/es/cidh/expresion/docs/publicaciones/internet_2016_esp.pdf, último acceso: 31 de agosto de 2020.

¹⁰ Casa de la Mujer Ixim Antsetic (CAM) and ARTICLE 19, “Transparencia proactiva: informe de ARTICLE 19 y Casa de la Mujer Ixim Antsetic (CAM) [Proactive transparency: report by ARTICLE 19 and Casa de la Mujer Ixim Antsetic (CAM)]”, ARTICLE 19, July 11, 2017, <https://articulo19.org/transparencia-proactiva-informe-de-article-19-y-casa-de-la-mujer-ixim-antsetic-cam/>

¹¹ Interview for this research.

The urban-rural¹² digital divide is still high in Mexico, albeit with increasing internet penetration. There are 93 million internet users in Mexico, meaning that 7 out of 10 Mexicans above six years are internet users (78.6 per cent), while almost 3 out of 10 remain unconnected (25 million)¹³.

As of 2022, internet usage was reported at 83.8 per cent in urban areas, while only 62.3 per cent of the rural population had access to the internet¹⁴. The survey in the same year estimated that more than 9 million individuals in rural areas lacked mobile phones, with almost half citing financial reasons, and 2.3 million rural residents may not have internet connectivity through their mobile devices.¹⁵

Regarding economic barriers, approximately 52.9 per cent of lower-income Mexicans could not access the Internet¹⁶. In contrast, internet access was more prevalent in high socioeconomic strata, with 9 out of 10 households having Internet access compared to only 3 out of 10 households in the low socioeconomic stratum¹⁷.

While there are 93.8 mobile phone users, a slightly higher number compared to internet users, more than 24 million people above six years old are without access to a mobile phone. Of those users, 8 out of 10 are in urban areas, while 2 out of 10 are in rural areas.¹⁸ A very similar proportion of people remains for mobile internet-connected smartphone users.

¹² Rural is defined here as communities with less than 2500 inhabitants. INEGI, "Población rural y urbana [Rural and urban population], INEGI, Available at: https://cuentame.inegi.org.mx/poblacion/rur_urb.aspx

¹³ "Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2022. (Comunicado de prensa)", [National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH) 2022. (Press release)], Instituto Federal de Telecomunicaciones (IFT) and Instituto Nacional de Estadística y Geografía (INEGI), June 19, 2023, https://www.inegi.org.mx/contenidos/saladeprensa/boletines/2023/ENDUTIH/ENDUTIH_22.pdf

¹⁴ Op. Cit. "Encuesta Nacional sobre Disponibilidad..."

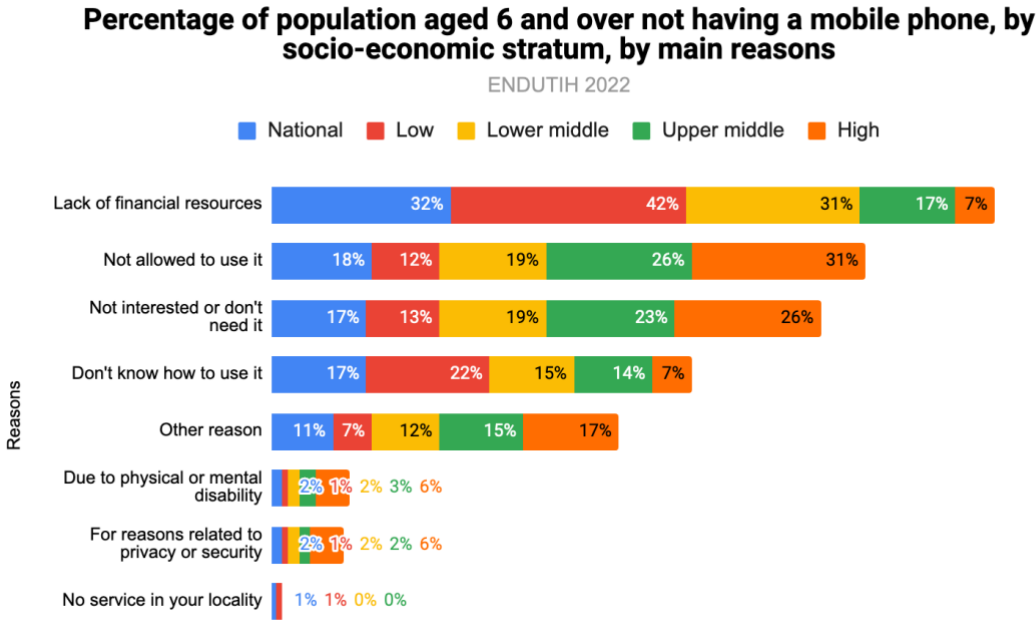
¹⁵ Instituto Nacional de Estadística y Geografía (INEGI), "Población que no dispone de telefonía celular en áreas urbano rural, según principales razones" [Population without mobile telephony in urban and rural areas, according to primary motivations], *Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2022* [National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH) 2022], accessed June 20, 2023, https://www.inegi.org.mx/contenidos/programas/dutih/2022/tabulados/2022_u2ur670.xlsx; Instituto Nacional de Estadística y Geografía (INEGI), "Usuarios de teléfono celular inteligente con conexión móvil a internet, en áreas urbano rural, según condición, 2022 [Smartphone users with internet access, in urban and rural areas, by their status, 2022]," *Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2022* [National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH) 2021], accessed June 20, 2023, https://www.inegi.org.mx/contenidos/programas/dutih/2022/tabulados/2022_uaur670.xlsx

¹⁶ "Hogares que disponen de computadora que no cuentan con conexión a Internet, por estrato socioeconómico, según principales razones, 2022 [Households that have computers but no Internet connection, by income level, according to primary reasons, 2022]," *Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2022* [National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH) 2021], accessed June 20, 2023, https://www.inegi.org.mx/contenidos/programas/dutih/2022/tabulados/2022_hest119.xlsx.

¹⁷ Ibid.

¹⁸ Ibid.

There are multiple reasons for not having a mobile device; for example, in the "low" and "lower middle" socio-economic stratum, the first reason was the “lack of economic resources”, 42 and 31 per cent, respectively. In the "high" and "upper middle" strata, the main reason was "not interested or not needed" (26 and 23 per cent, respectively). The second main reason why people in the "low" strata do not have a mobile phone is that they "do not know how to use it", while for the "lower middle" stratum, it is because they are “not allowed to use it” or “not interested or don’t need it”. An interesting fact in the “high” socioeconomic stratum is that the second main reason for not having a mobile phone is that it is “not allowed to use it”.¹⁹

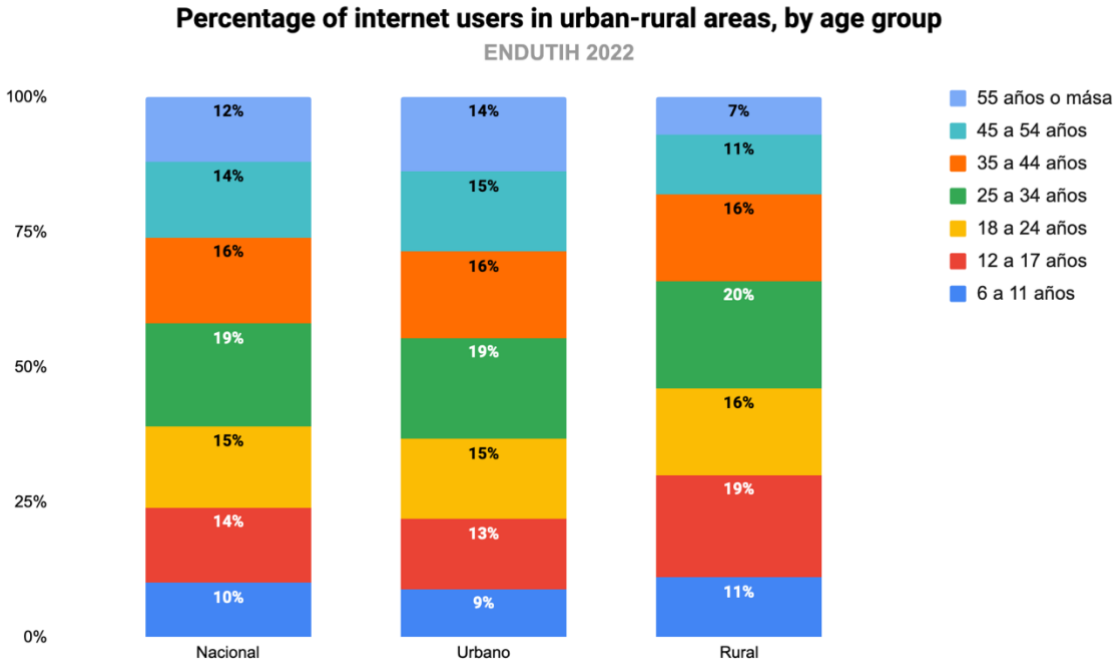


Source: own elaboration with ENDUTIH 2022 data.

These numbers show at least three possible emerging characteristics when analysing the digital divide in Mexico. First, the economic burden still limits access to mobile devices. Socioeconomic disparities remain as a core element of inequality. This is a tendency that, despite efforts to reduce it, continues to be a barrier to accessing ICTs. Other needs must be covered first rather than having a mobile phone and immersing in the digital world. In the second term, it shows a sector of the society that is also deciding to disconnect. So, when thinking about the digital divide, there should also be a recognition for those who consciously decide to remain unconnected. Third, even if someone is willing to have a mobile phone, they simply don’t know how to use it.

¹⁹ Ibid.

The digital divide in Mexico has another dimension, which is also visible, particularly in rural areas and is linked to age. For example, in rural communities, the population between 25 and 34 years represents the highest group of internet users (20 per cent), while the 55 years and above group is the lowest (7 per cent)²⁰.



Source: own elaboration with ENDUTIH 2022 data.

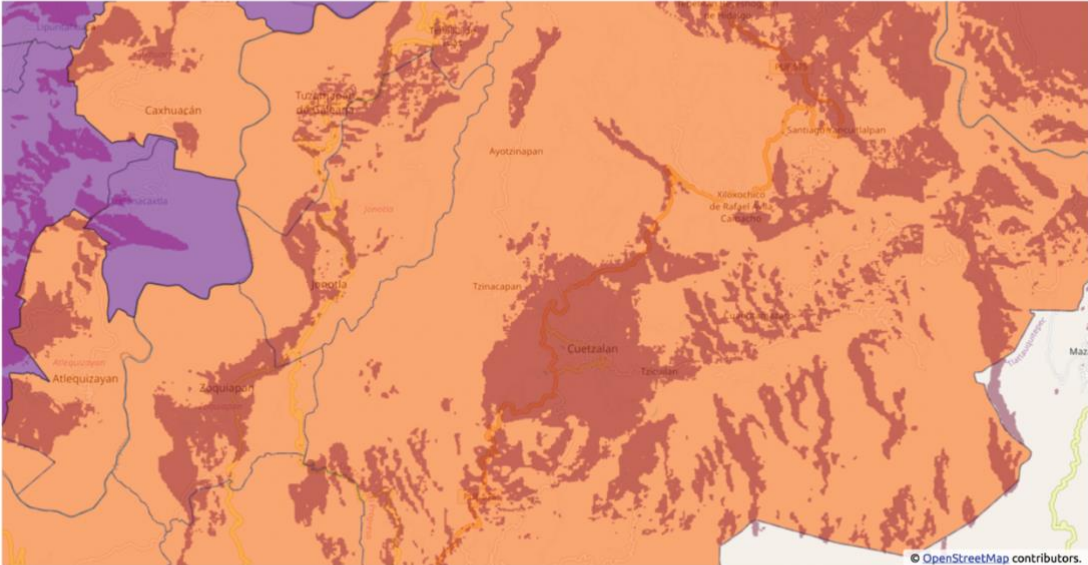
Indigenous communities, accounting for almost 10 per cent of the country's population, also encounter challenges with mobile coverage. A report by the Federal Telecommunications Institute (Instituto Federal de Telecomunicaciones, IFT) in August 2022 revealed that 80 per cent of the Indigenous population had access to 2G, 3G, or 4G technology. Still, this figure dropped to 62 per cent in localities classified as historical indigenous settlements.²¹

Although the state is responsible for ensuring that indigenous rural communities are not excluded from digital connectivity, according to Bonifacio Iturbide Palomo, partner of Wiki Katat and member of the Board of Directors of Radio Tosepan Limakxtum, they must also respect their autonomy without interference or any other type of pressure to decide what they are willing to do

²⁰ Ibid.
²¹ Lucas, Nicolás, “Telecomunicaciones Indígenas Comunitarias gana espectro que será pilar de su red 4G” [Telecomunicaciones Indígenas Comunitarias wins bid over spectrum that will be a pillar for its 4G network], *El Economista*, November 30, 2020, <https://www.eleconomista.com.mx/empresas/Telecomunicaciones-Indigenas-Comunitarias-gana-espectro-que-sera-pilar-de-su-red-4G-20201130-0047.html>; REDES A.C., Association for Progressive Communications, “Las redes comunitarias ante el COVID-19 en Latinoamérica” [Community networks on the face of COVID-19 in Latin America], *Comunicares*, May 28, 2020, <https://comunicares.org/2020/05/28/redes-comunitarias-covid/>.

with the resources or the training they received. “I would say that the government should support indigenous communities to make their technology, infrastructure, software, hardware, but that it should be autonomous”, Iturbide Palomo expressed.

Altán Redes coverage and marginalisation index (CONAPO 2015) in the municipality of Cuetzalan, Puebla and part of the Sierra Norte



Source: PROMTEL and SICT

To reduce the digital divide, a more balanced coordination between the different state, non-state and private actors should be promoted to generate processes of technological appropriation. And a reflexive and critical use of technology that allows people to inhabit the digital territory with the maximum protection of human rights.

III. ACCESS TO INTERNET AND MOBILE SERVICES IN INDIGENOUS COMMUNITIES

The digital divide has pushed different non-state actors, like civil society organisations, indigenous communities, cooperatives and small private companies²² to start implementing projects that address the absence of the state and large telecommunications companies. While universal connectivity still represents a challenge from a state perspective, local projects allow people to access information.²³

In some indigenous communities in Mexico, intranets are crucial for creating and accessing content without an internet connection. In the Triqui region, in the southern state of Oaxaca, Mexico, some projects are promoting the use of a Linux-based operating system called "endless"²⁴—a preloaded system with information and tools that do not require the internet. In total, about 600 families have had access to this operating system in the whole Triqui region. As it is a Linux-based operating system, it is also modifiable.

During an interview, Penelope Partida, the Operational Coordinator and Telecommunication engineer at the civil society organisation Telecomunicaciones Indígenas Comunitarias (Indigenous Community Telecommunications, TIC AC), explained how they work with local communities to provide mobile and internet services in areas where the state and private companies are not reaching. They accompany the communities in creating and implementing the communication service themselves. “Not just waiting for a service to arrive but being active actors to create our network that we are going to operate, and we are going to supply that need”, she explained.

Mayra López, from Article 19, also expressed the interest of communities in which they work in Oaxaca, Chiapas and Yucatán to expand telecommunication services. “We see this more in our work with [community] radio stations. They want to continue to have access to the radio spectrum to generate their networks and other tools to improve their work and have more information”.

²² “Lucas-Bartolo, Nicolás, “¿Qué son los WISP y cómo pueden ayudar a AMLO para llevar Internet a los mexicanos? [What are WISPs and how can they help AMLO bring internet to Mexicans?]”, <https://www.economista.com.mx/empresas/Que-son-los-WISP-y-como-pueden-ayudar-a-AMLO-para-llevar-Internet-a-los-mexicanos-20190811-0002.html>

²³ J. Bidwell, Nicola and Jensen, Michael, “Bottom-Up Connectivity Strategies: Community-led small-scale telecommunication infrastructure networks in the global South”, APC, 2019, P. 93, https://www.apc.org/sites/default/files/bottom-up-connectivity-strategies_0.pdf

²⁴ “Endless OS Foundation”, <https://www.endlessos.org/>

The history of Wiki Katat couldn't be understood without Telecomunicaciones Indígenas Comunitarias TIC AC (Indigenous Community Telecommunications A.C.)²⁵, Redes por la Diversidad, Equidad y Sustentabilidad²⁶ (Networks for Diversity, Equity and Sustainability, Redes AC) and Rhizomatica²⁷. A group of civil society organisations have advocated for indigenous access to telecommunications in Mexico for at least ten years, from community radio stations to mobile services and internet access.

In 2016, TIC AC received the first license from the Federal Institute of Telecommunications (IFT in Spanish) to use the radio spectrum under a novel figure of *indigenous social use*²⁸. This was a turning point regarding access to the radioelectric spectrum for indigenous communities in Mexico to promote a community-based approach to building up radio stations and promoting mobile cellular telephony. This meant that social action and grassroots community efforts made it possible in a context where neither the state nor the large telecommunications companies had any interest in bringing information and communication technologies closer to the people. Moreover, the articulation between local grassroots organisations and strategic litigation carried out by civil society organisations pushed the state to recognise the right of indigenous communities to use the radio-electric spectrum for their purposes.

The path of building multistakeholder alliances

For Penelope Partida, there was a key element during the process of the state recognition of the social use of the radio-electric spectrum, “without the organisation of the communities, this effort to access information and communication technologies and the use of the radio-electric spectrum could not be carried out”²⁹.

The license TIC AC, accessed among 16 other indigenous communities, allowed them to “manage and operate autonomous telecommunications and broadcasting networks, including cellular telephony”³⁰. Before this, according to Penelope, telecommunications providers were

²⁵ “TIC AC”, <https://www.tic-ac.org/> “[...] is a civil association made up of indigenous and rural communities in Mexico and an operational team accompanying people and communities seeking to build, manage and operate their communication networks.”

²⁶ “Redes por la Diversidad, la Equidad y la Sustentabilidad AC”, Available at: <https://redesac.org.mx/que-hacemos/>

²⁷ “Rhizomatica”, Available at: <https://www.rhizomatica.org/> “Rhizomatica began in 2009 as a quest to make alternative telecommunication infrastructures possible for people around the world facing oppressive regimes, the threat of natural disaster, or the reality of living in a place deemed too poor or isolated to connect.”

²⁸ Flores, Ana Lydua, “First licences for indigenous social use granted in Mexico [Se otorgan en Mexico las primeras concesiones para uso social indígena]”, Universidad Iberoamericana Puebla Repositorio Institucional, July 13, 2016, Available at, <https://repositorio.iberopuebla.mx/bitstream/handle/20.500.11777/1782/Se%20otorgan%20en%20M%C3%A9xico%20las%20primeras%20concesiones%20para%20uso%20social%20ind%C3%ADgena.pdf?sequence=1>

²⁹ Interview

³⁰ *Op. Cit.* TIC AC.

reluctant to provide telecommunication services, considering that indigenous communities are located in remote areas, and it is very costly to provide infrastructure. This meant indigenous communities were unable to access these services. "It is not a business to build a lot of infrastructure to serve communities of less than a thousand people", Partida said.

In this context, Penelope explained, TIC AC started to contact Altán Redes approximately four years ago when TIC started its mobile community network offering mobile services. However, over time, there was a demand from communities to receive calls "but also information and internet access".

With this in mind, TIC AC started working with a 4G community network technology that requires more spectrum. This is how they began the first talks with Altán Redes, recognising their availability of spectrum concessions not used in remote areas. However, Penelope noted that the initial negotiation was not possible. "Altán Redes wanted to rent us the spectrum, but it did not work out then," she said.

In 2018, following the change of government at the federal level, Altán Redes became an integral part of the Mexican state effort to guarantee internet access to remote areas and indigenous communities³¹. In that sense, they were required to expand their coverage in rural areas, not only in large, populated areas.

The second negotiation between Altán Redes and TIC AC occurred around 2020 and 2021. They knew the work from TIC AC and approached them because Altán Redes was gaining users in rural areas, but their sales scheme was not working. In other words, they distributed their coverage in cities, making it easy for users to top up in shops. But that did not exist in rural areas.

In this scenario, Altán Redes started to give TIC AC accessible offers at rates of around 50 to 70 Mexican pesos (3 to 5 US dollars). At this point, Penelope acknowledges, "We saw, as an organisation, to become a virtual operator as an alternative for the communities".

The new stage also opened the door for a profound change in the usual business model held by companies explained to me, Penelope—a shift from an extractivist perspective of seeing users as consumers and focusing primarily on business.

³¹ Sheridan, Mary Beth, "The wildly ambitious plan of Mexico's President AMLO", The Washington Post, December 1, 2018, Available at: <https://www.washingtonpost.com/world/2018/12/01/crazy-ambitious-plan-mexicos-president-amlo/>

This is how, together with the cooperative Tosepan Titaniske, TIC AC began to shape the idea of building a virtual mobile operator with other social and communal aims so that the benefits stay in the community. “That the growth stays there, not just a service that takes money and time from the people and that can be operated from the community,” Penelope said.

With this background process to demand state responsibility to assure access to telecommunications, a new open emerged to expand the possibility of using the Fourth Generation (4G) network. As will be addressed in the following chapters, indigenous communities and civil society organisations began different attempts to build a relationship with Altán Redes, the ambitious project by the government of Enrique Peña Nieto to build up a wholesale mobile network operator. To begin, the role of Altán Redes, its challenges and relation to MVNOs will be explored in the next section.

IV. ALTÁN REDES: THE PUBLIC-PRIVATE ALLIANCE FOR VIRTUAL MOBILE OPERATORS

Altán Redes (AR) is a wholesale shared mobile network operator in Mexico that began operations in 2018³² to provide extensive and reliable mobile broadband coverage, especially in remote and underserved regions. It has the particular characteristic of being an entity with a public and private partnership (Asociación Público Privada, APP)³³. The public structure is composed of the Ministry of Infrastructure, Communications and Transport (secretaría de Infraestructura, Comunicaciones y Transportes, SICT), the Telecommunications Investment Promotion Agency (Organismo Promotor de Inversiones en Telecomunicaciones, PROMTEL), Financiera para el Bienestar (formerly Telecomunicaciones de México, Telecom) and the Federal Electricity Commission (Comisión Federal de Electricidad, CFE), the latter of which provides the fibre optic network. According to their information, more than 79 million Mexicans are covered by the Altán’s Network³⁴.



Source: Altán Redes, Public-private partnership contract

³² Love, Julia, “Mexico’s wholesale mobile network launches without major carriers”, Reuters, March 22, 2018, Available at: <https://www.reuters.com/article/us-mexico-telecoms-idUSKBN1GY2N8/>

³³ Altán Redes, “How we operate”, Altán Redes, <https://www.altanredes.com/en/who-we-are/how-we-operate/>

³⁴ Altán Redes, “Why the Red Compartida?”, Altán Redes, Available at: <https://www.altanredes.com/en/why-the-red-compartida/#1589568379878-ae5531ec-ca28>

According to the Supreme Audit of the Federation (Auditoría Superior de la Federación, ASF), the dates on which it is supposed to achieve the goal of 92.2% coverage are unclear²⁹. It was planned to be completed in 2024, but Altán's declaration of bankruptcy³⁰ and the consequent government intervention³⁵ postponed it to 2028.

The mission of AR is to connect people who have previously lacked access to its 4.5G telecommunications technology network.³⁶ The initiative, along with other governmental programs (which have not been without criticism³⁷), has enabled local connectivity actions like Wiki Katat and other community network initiatives³⁸, in addressing the digital divide and ensuring the right to access information and communication technologies (ICTs), as prescribed by international human rights standards³⁹ and Article 6 of Mexican Constitution.⁴⁰

As previously mentioned, it has also faced critical moments in terms of financial sustainability⁴¹ and technical problems.⁴² For this research, contacting anyone at Altán Redes who could provide further background on their work to expand network coverage was impossible.

How Altán Redes Operates in Mexico?

It operates by constructing and managing a national shared network infrastructure called “Red Compartida” (Shared Network) that provides 4.5G mobile broadband services to various Mobile Virtual Network Operators (MVNOs) and retail providers.⁴³ This wholesale model allows multiple MVNOs to lease network access from Altán Redes, enabling them to extend their services to customers without the need to build their network infrastructure.

³⁵ Hilaire, Valentine, “Mexico's Altan Redes emerges from bankruptcy with govt's help”, Nasdaq, November 03, 2022

<https://www.nasdaq.com/articles/mexicos-altan-redes-emerges-from-bankruptcy-with-govt-help>

³⁶ Milenio Digital, “Altán Redes, the company with which the 4T seeks to bring internet to all of Mexico”, Milenio, June 10, 2022, <https://www.milenio.com/negocios/altan-redes-historia-empresa-desarrolla-red-compartida>

³⁷ Castañares, Itzel “IFT, SCT y CFE Telecom, sin coordinación para mejorar conectividad en México [IFT, SCT and CFE Telecom, without coordination to improve connectivity in Mexico]”, El Ceo, April 26, 2022, Available at: <https://elceo.com/politica/ift-sct-y-cfe-telecom-sin-coordinacion-para-mejorar-conectividad-en-mexico/>

³⁸ Álvarez Malvido, María, “De autonomía y redes comunitarias en México [On autonomy and community networks in Mexico]”, ISOC, <https://www.internetsociety.org/es/blog/2018/03/community-networks-mexico-resources/>

³⁹ UNESCO, “ROAM-X Indicators”, Available at: <https://www.unesco.org/en/internet-universality-indicators/roam-x>

⁴⁰ Constitución Política de los Estados Unidos Mexicanos [Political Constitution of the United Mexican States], Cámara de Diputados, Available at: <https://www.diputados.gob.mx/LeyesBiblio/pdf/CPEUM.pdf>

⁴¹ Christopher Calderón, “Government 'saves' Altán Redes from bankruptcy and takes control of it”, El Financiero, June 13, 2022, <https://www.elfinanciero.com.mx/empresas/2022/06/13/gobierno-salva-de-la-quebra-a-altan-redes-y-asume-su-control/>

⁴² Saldaña, Steve, “Users report failures in Altán Redes' MVNOs in Mexico: some cannot make calls and others cannot surf the internet.”, Xataka, <https://www.xataka.com.mx/telecomunicaciones/usuarios-reportan-fallas-omvs-altan-redes-mexico-algunos-no-pueden-hacer-llamadas-otros-no-pueden-navegar-internet>

⁴³ Saldaña, Steve, “Mobile virtual network operators already win more lines than Telcel, Movistar and AT&T combined in Mexico.” Xataka, August 2, 2022, <https://www.xataka.com.mx/telecomunicaciones/operadores-moviles-virtuales-ganan-lineas-que-telcel-movistar-at-t-juntos-mexico>

Altán Redes currently comprises some 119 MVNOs, which are divided into three main service groups: 1) mobile telephony, 2) home connectivity, and 3) internet of things.⁴⁴

The operations of AR cover both urban and rural areas, and its focus on rural connectivity is essential as a first step to deploying infrastructure and bridging the digital divide. This is because it helps ensure that Indigenous communities and residents in remote regions have access to the Internet, which is an enabler for exercising rights such as freedom of expression, access to information, and participation in society.

The challenge to provide internet connectivity

Altán Redes faces several challenges in extending telecommunications services to underserved areas. These include: 1) **Infrastructure Deployment.** Building and maintaining network infrastructure in remote and rugged terrain can be logistically challenging and costly⁴⁵; 2) **Regulatory Compliance.** Adherence to national and international regulations and addressing spectrum allocation and usage issues are critical challenges; 3) **Financial Sustainability.** Maintaining economic viability while offering services in less densely populated regions is a recurring challenge⁴⁶; 4) **Security and Resilience.** Ensuring the security and resilience of the network, especially in areas vulnerable to natural disasters, is essential for uninterrupted service⁴⁷ and 5) **Competition.** Altán Redes operates in a competitive market alongside other major telecommunications companies, which adds complexity to their operations⁴⁸.

The Digital Rights programme officer from Article 19 Mexico and Central America, Martha Tudón, recognised the role of Altán Redes in that many communities, especially remote ones, have gained access to the internet through high-quality networks. The solution to bridging the digital divide goes beyond simply providing infrastructure.

⁴⁴ Altán Redes, “Súmate a la red [Joi the network], <https://www.altanredes.com/sumatealared/>

⁴⁵ López, Zyanya, “Altán Redes: la promesa de conectar México está en riesgo [Altán Redes: the promise of connecting Mexico is at risk]”, *Expansión*, July 16, 2021, Available at: <https://expansion.mx/empresas/2021/07/16/altan-redes-concurso-mercantil-futuro-conexion>

⁴⁶ “Gutiérrez, Ana Luisa, “AMLO anuncia que el Estado mexicano ‘compra’ Altán Redes [AMLO announces that the Mexican state ‘buys’ Altán Redes], *Expansión*, June 10, 2022, <https://expansion.mx/empresas/2022/06/10/amlo-anuncia-que-el-estado-mexicano-compra-acciones-altan>

⁴⁷ ExpansionMx, “Telcel, AT&T and Telmex seek to restore services following Otis [Telcel, AT&T y Telmex buscan restablecer servicios tras paso de Otis], *Expansion*, October 25, 2023, <https://expansion.mx/empresas/2023/10/25/acapulco-incomunicado-por-otis> and <https://www.altanredes.com/huracan-otis-altan/>

⁴⁸ Fenwick, Sam, “Analyzing Altán Redes’ mobile experience”, *Open Signal*, January 17, 2023 <https://www.opensignal.com/2023/01/17/analyzing-altan-redes-mobile-experience>

For ARTICLE 19 and other CSOs, she explained, it is necessary to broaden the perspective and understand the specific needs of communities and population groups, including how they use the internet, what content they seek and what connectivity means to them. Although Altán Redes has facilitated connectivity in many territories, there is still a sector in Mexico that is completely disconnected. Moreover, among those connected, not all have internet access that allows them to enjoy diverse and meaningful content.

She also makes a clear distinction between the actions made by Altán Redes and the connectivity policies driven by the state, noting that, in real terms, the results of this policy have been quite limited. “The results have fallen far short of the promises, at least of this administration, regarding connectivity”, she expressed.

The relationship with Virtual Mobile Operators (MVNOs)

Altán Redes collaborates with MVNOs, who lease network capacity from Altán Redes to provide mobile services to their customers. MVNOs play an integral role in extending telecommunications services to a broader customer base, enabling them to offer affordable and diverse service options. According to Altán Redes, it also aligns with the principles of competition, as more players in the market can result in better services and pricing for consumers⁴⁹.

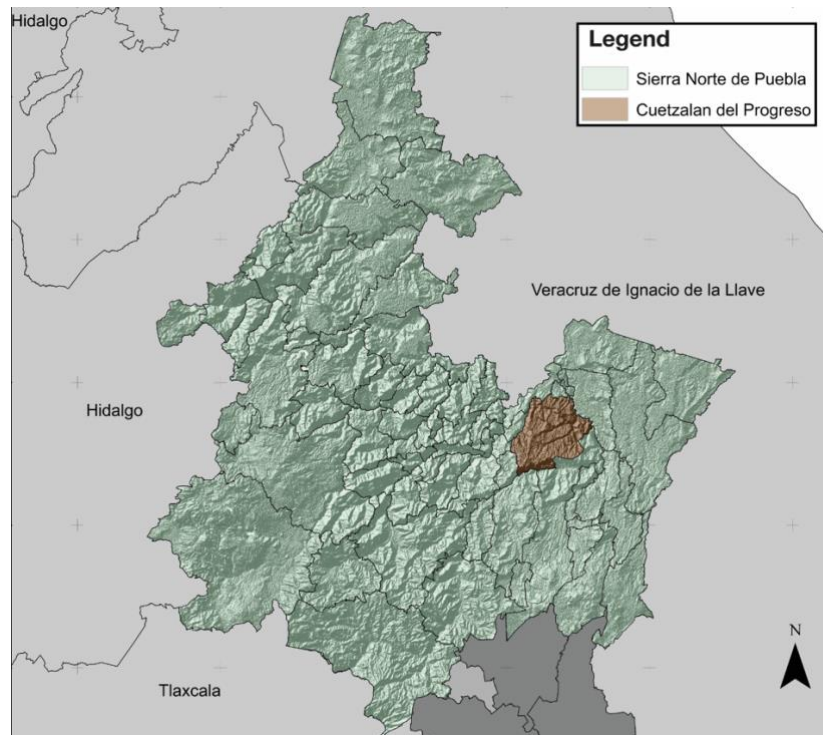
Despite the numerous challenges AR has faced and the different criticisms it has received since it began operating on the 700 MHz band, it is important to note, as clearly expressed by Martha Tudón, its pivotal role in addressing the digital divide in Mexico from an infrastructure perspective. By focusing on rural areas and collaborating with Mobile Virtual Network Operators (MVNOs), AR expands access to Information and Communication Technologies (ICTs) while community-based organisations uphold fundamental human rights. This facilitates that more people and communities, including those historically marginalised, can appropriate and incorporate technological processes into their community life.

⁴⁹ *Op. Cit.* Altán Redes, “Why the...”

V. WIKI KATAT, A COMMUNITY-BASED INITIATIVE FOR DIGITAL INCLUSION

Wiki Katat is part of a long-standing project called the Unión de Cooperativas Tosepan Titataniske⁵⁰ (Tosepan). The name of the cooperative means "United We Shall Overcome" (Unidos Venceremos) in the Nahuatl language. Since the 70s, their work has been closely tied to revitalising native languages and culture, promoting local economic development, assuring fair trade for local peasantries, reappropriating territory from extractivist projects, and accessing the right to telecommunications.

Wiki Katat and *Tosepan* are based in Cuetzalan del Progreso, a municipality located in the northeastern region of the state of Puebla, in what is known as the Sierra Norte geography is partly characterised by a mountainous topography, with high altitudes that generate a temperate climate and cloud forests.⁵¹



Source: "Yeknemilis: Social Learning and Intercultural Transdisciplinary Collaboration for Sustainable Life"⁵²

⁵⁰ Local Futures, "Unión de Cooperativas Tosepan", Jan 14, 2019, <https://localfutures.medium.com/uni%C3%B3n-de-cooperativas-tosepan-58f9d96086ec>

⁵¹ H. Ayuntamiento De Cuetzalan Del Progreso, "Cuetzalan Del Progreso", Available at: https://www.cuetzalan.gob.mx/userfiles/cuetzalan_21/files/INFORMACI%C3%93N%20DE%20CUETZALAN.pdf

⁵² Bueno, I.; Moreno-Calles, A.I.; Merçon, J. Yeknemilis: Social Learning and Intercultural Transdisciplinary Collaboration for Sustainable Life. Sustainability 2023, 15, 9626. <https://doi.org/10.3390/su15129626>

According to the 2020 population census, the municipality of Cuetzalan has a population of 49,864 inhabitants. Almost 70% of people over 3 speak an indigenous language, mainly Nahuatl⁵³. Regarding internet access, only 10 per cent of households have internet access⁵⁴. At the state level, in Puebla, 31.7 per cent of the population has a computer, while 70.1 per cent use the internet and 71.9 per cent use mobile phones.⁵⁵

The municipality of Cuetzalan is ethnically home to Nahua (self-described as Maseuales), Totonaca (also known as Tutunakus) and Mestizo communities⁵⁶—peoples who have historically claimed their right to autonomy and the defence of land and territory⁵⁷.

The right to communication, from autonomy to the reappropriation of the territory

Tosepan has had a rich history of championing the rights of indigenous communities in Mexico to communicate. The cooperative developed diverse communication projects in their history, ranging from the newspaper⁵⁸ and radio stations like Radio Tosepan Limakxtum (in Nahuatl/Maseual: meaning “United” - “Our universe”) to connectivity projects like Wiki Katat. Although, as Bonifacio Iturbide Palomo points out, "it's not just access to the internet, it's access to telecommunications".

⁵³ INEGI, “Porcentaje de población de 3 años y más hablante de lengua indígena (Porcentaje), Cuetzalan del Progreso, 2020 [Percentage of population aged 3 and over speaking an indigenous language (Percentage), Cuetzalan del Progreso, 2020]”, INEGI, <https://www.inegi.org.mx/app/indicadores/?t=132&ag=21043#D132#D6207019034>

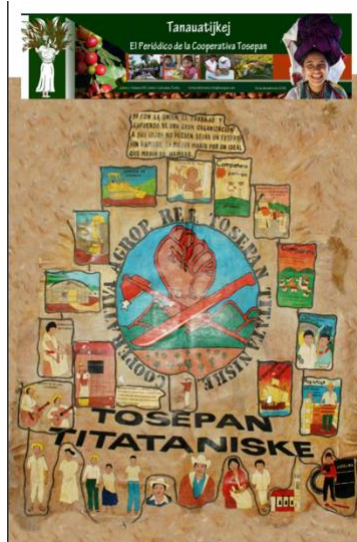
⁵⁴ INEGI, “Porcentaje de viviendas particulares habitadas que disponen de Internet (Porcentaje), Cuetzalan del Progreso, 2020 [Percentage of inhabited private dwellings with Internet access (%), Cuetzalan del Progreso, 2020]”, Available at: <https://www.inegi.org.mx/app/indicadores/?t=53&ag=21043#D53#D6207019042>

⁵⁵ INEGI, “Encuesta Nacional sobre Disponibilidad y Uso de Tecnologías de la Información en los Hogares (ENDUTIH) 2022 [National Survey on the Availability and Use of Information Technologies in Households (ENDUTIH) 2022]”, INEGI, 2022, Available at: <https://www.inegi.org.mx/programas/dutih/2022/>

⁵⁶ Ellison, Nicolas. (2020). Altepét / Chuchutsipi: Cosmopolítica territorial totonaca-nahua y patrimonio biocultural en la Sierra Nororiental de Puebla [Altepét / Chuchutsipi: Nahua-Totonaca Territorial Cosmopolitics and Biocultural Heritage in the Sierra Nororiental of Puebla, Mexico]. *Revista Trace*. 88. 10.22134/trace.78.2020.742. Available at: https://www.researchgate.net/publication/347309608_Altepét_Chuchutsipi_Cosmopolítica_territorial_totonaca-nahua_y_patrimonio_biocultural_en_la_Sierra_Nororiental_de_Puebla_Altepét_Chuchutsipi_Nahua-Totonaca_Territorial_Cosmopolitics_and_Biocultural_He

⁵⁷ Ellison, Nicolas & Suremain, Charles-Edouard & Romero, Laura & rios, gabriela & unitona, & titataniske, union. (2020). "La declaración de Cuetzalan en el marco del coloquio internacional AGRO-BIODIVERSIDAD, PATRIMONIOS LOCALES Y OGM [The Cuetzalan declaration in the framework of the international colloquium AGRO-BIODIVERSITY, LOCAL HERITAGE AND GMOs]". , Available at: https://www.researchgate.net/publication/341525379_La_declaracion_de_Cuetzalan_en_el_marco_del_coloquio_internacional_AGRO-BIODIVERSIDAD_PATRIMONIOS_LOCALES_Y_OGM/citation/download

⁵⁸ In 2010, the Tosepan cooperative published Tanauatijkej, a local newspaper to share information about the cooperative. The name comes from the Nahuatl, Tanawatihkeh, meaning the person in the community who communicates or informs. Radio Tosepan, Tanauatijkej Cuetzalan, Jun 24, 2010, Available at: https://issuu.com/tanauatijkej/docs/periodico_tosepan



Source: Radio Tosepan, Tanauatijkej Cuetzalan



Source: Wiki Katat



Source: taewaloni.net

Wiki Katat reflects the history of indigenous Nahua and Totonac communities that historically revendicate their autonomy. In an interview, Niki tells me Wiki is a way for indigenous communities to reclaim their territory. "Being a social and community-based virtual mobile operator is a form of empowerment [because] we can transmit what we are and how we relate to the territory through it.

For Martha Tudón, Wiki Katat has a starting point as a cooperative community process "where it makes sense for the relevance of the needs of the community itself, where if you have a problem, you will attend in your language".

The history of the Tosepan and Wiki Katat has been a story of building technological autonomy. Although the right of indigenous peoples and communities to access information and communication technologies was written "on paper", "we as indigenous communities didn't have access, we didn't have the right", says Nicacia Lino de Jesús partner of Wiki Katat and member of the Board of Directors of Radio Tosepan Limakxtum.

Wiki Katat is a project that looks inwards. To its history and cosmovision⁵⁹, to its forms of organisation from assemblies to strengthening its youth.

⁵⁹ Unión de Cooperativas Tosepan Titataniske, Consejo Altepet Tajpianij, Yeknemilis A.C., Masehual Siuamej Mosenyolchicauani, Órgano Técnico del Ordenamiento Territorial Integral de Cuetzalan y Boege, Eckart (coord.) (2021). "Códice Masewal: Plan de vida, soñando los próximos cuarenta años [Codex Masewal: Plan of life, dreaming the next forty years. forty years]". Cuetzalan, Puebla: Unión de Cooperativas Tosepan Titataniske, p. 43, Available at: <https://www.academica.org/eckart.boege/4.pdf>

“We have our Masewal cultural production and communication systems: in schools, radio, television, internet, cinema, social networks that promote cultural communication and the use of our native languages.”⁶⁰

The members of *Wiki Katat* interviewed for this work considered that there is an opportunity for the young people of the northern highlands of Puebla to continue working and training themselves based on the thoughts and community values of their indigenous communities. Those, says Lino de Jesús, that “our grandfathers and grandmothers gave us”. For her, *Wiki Katat* entails a dream: “to generate work for the indigenous youth of the region. So that they stay in the territory, continue to organise themselves and defend their language and worldview”.

It is a way, she says, of taking responsibility for the technologies they use "and that also has to do with technological empowerment within the territory with grandfathers and grandmothers who can start to create their content". Mayra López also agrees on this. “One of the most important challenges is not only access to the internet, to technology, but also to quality, reliable, simple information that responds to people's needs”.

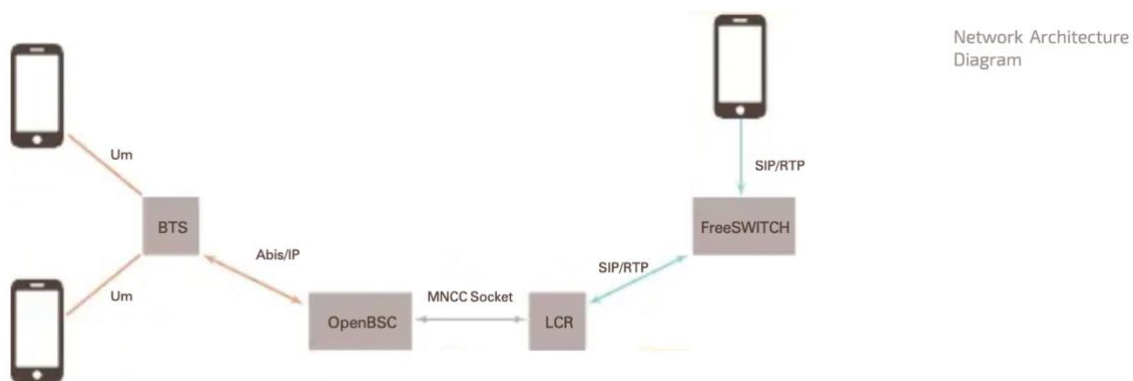
Technological appropriation means that digitality is intertwined with community dynamics. On the one hand, a practical learning action is to use ICTs to create digital platforms hosted on their servers that allow people to share content locally or by deploying an MVNO. And little by little, by building an autonomy entitled to subvert the massive power of large digital platforms that are out of alignment with their worldview.

It breaks with telecommunications monopolies, said Martha Tudón. Both from an economic and social perspective. *Wiki Katat* challenges the idea that certain communities are not served due to a lack of perceived economic value on the part of mobile operators. And socially, the initiative plays a crucial role in bridging the gap between service providers and disconnected communities. The belief that only profitable companies or the welfare state can meet connectivity needs. She also highlights the importance of *Wiki Katat* by recognising and addressing people's diverse needs and worldviews, which large monopolies fail to do.

⁶⁰ Op. Cit. “Código Masewal...”, p. 12

Nicacia and Angelina received training in telecommunications as part of the federal government's "Jóvenes Construyendo el Futuro" (Youth Building the Future)⁶¹ programme with Tosepan and TIC AC. In Angelina's case, this led her to be trained through practice in installing the first 2G network in some communities in the lower part of the municipality. For her, the training process was related to "how we want to bring communication or communication tools to our communities".⁶²

This training process for young people is part of the ten-year trajectory of the civil organisations TIC AC, Rhizomatica and Redes, which in 2013 began operating the first Community Mobile Telephony (CCT) network in Talea de Castro, Oaxaca⁶³.



Source: "Community Mobile Telephony Manual: Connecting the next billion".

Wiki Katat, then, is a way of inhabiting technology, of rooting it in the communal essence of collective work shaped by Nahua and Totonaca identity. Digitality is not a showcase of content. It is the fine needle that threads through time the stories of people and communities. As Nicacia says, "to create content that can identify us, where I can listen to the grandfather and grandmother of some thought they have and that the most important thing [is] that this indigenous way of life is not only kept in a museum where it is remembered [of] how they lived". Technology, therefore, is intertwined with the *Masewal Nemilis*, the indigenous way of life.

⁶¹ Jóvenes Construyendo el Futuro [Youth Building the Future], Secretaría del Trabajo y Previsión Social, STPS, <https://jovenesconstruyendoelfuturo.stps.gob.mx/>

⁶² Interview for this research.

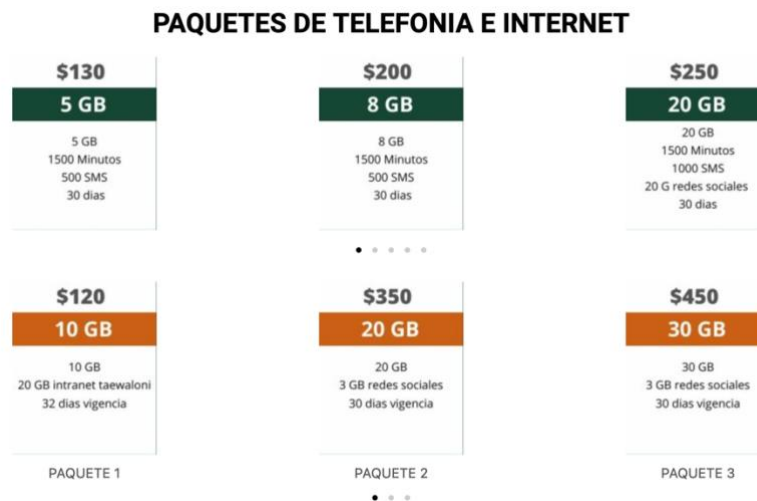
⁶³ Huerta Velázquez, Erick y Lawrence Bloom, Peter "Community Cellular Telephony Manual, Connecting the Next Billion", Redes por la Diversidad, Equidad y Sustentabilidad A.C., February 13, 2018, Available at: <https://espectrolibre.org/sites/default/files/downloads-formacao/MANUAL%20TIC%20ENG%20FINAL.pdf>

That is why they are building Taewaloni. A core element of Wiki Katat that holds "the stories, voices, images and sounds of the territory that we carry in our backpacks and that remind us of how we inhabit the territory and care for life"⁶⁴.

Tapalewihkeh: Wiki Katat's system of support networks

Wiki Katat shares the same elements as a Mobile Virtual Network Operator (MVO). It offers wireless communication services using the wireless network infrastructure of a Mobile Network Operator (MNO) that owns and leverages the physical networks. In this case, Altan's Network. However, it marks a substantial difference from the other MVNOs by having a social and community component described above and a strategy to expand its services and build a network to support its customers.

MVNOs can offer various services, such as voice calls, messaging and data services, just like traditional mobile operators. They often enter the market with unique pricing plans (see Figure 1), value-added services or specific niche markets⁶⁵. There are several types of MVNOs, and some studies foresee building network infrastructure to support 5g and B5G (Beyond Fifth Generation) networks⁶⁶.



Source: Wikikat.mx (prices are expressed in Mexican pesos)

⁶⁴ <https://taewaloni.net/acerca-de-taewaloni/>

⁶⁵ Barriga, Claudia *et.al*, "Operadores Móviles Virtuales: Funcionamiento, Experiencia Internacional y Recomendaciones sobre Modificaciones Normativas necesarias para su eventual funcionamiento en el Perú: Documento de Trabajo N° 15", OSIPTEL, 2013, p.18, Available at: https://repositorio.osiptel.gob.pe/bitstream/handle/20.500.12630/362/Informe_Final_OMVs_2013-VoBoL-web.pdf?sequence=1&isAllowed=y

⁶⁶ F. Granelli and R. Bassoli, "Autonomic Mobile Virtual Network Operators for Future Generation Networks," in IEEE Network, vol. 32, no. 5, pp. 76-84, September/October 2018, doi: 10.1109/MNET.2018.1700455. <https://ieeexplore.ieee.org/abstract/document/8473485/figures#figures>

In this scenario, Wiki Katat faces diverse challenges. Not just in terms of competition and the new generation of networks. At the same time, is dealing with expanding its service offerings with the difficulties of mobile phones incompatibility with 700 MHz frequency while implementing a unique system of local support nodes.

As of November 2023, *Wiki Katat* has 1,855 users, below the number of users they had estimated for 2023. Angelina points out that they had hoped to reach a minimum of 2,000 users by 2023; however, they are not expecting it to be achieved. To be sustainable, *Wiki Katat* must reach 4,000 users.

Implementing an MVNO is not easy. As Penelope Partida of TIC AC pointed out, there is a distrust of new players, such as MVNOs offering telecommunications services. "There are certain prejudices and propaganda people are exposed of which is the best network. These are very fixed ideas, even if you see better prices and networks. They hesitate because it's not the big one". The challenge, then, is that paradigm shift.

The other challenge *Wiki Katat* faces, Penelope raised, is the compatibility of telephones with the 700 MHz frequency. This means that even the new phones brought by migrants from the United States can't use their network. The only way, Penelope explained, is by buying a new phone in Mexico to be compatible with the frequencies legally accepted when a phone is imported. Many people who wanted to switch would have to buy a new phone. Infrastructure arrives, but the equipment has to support all bands.

Angelina also agrees that mobile phone compatibility is a challenge. She adds that the problem is not only with new mobile phones brought from outside, but mobile phones, or what they called "cacacuatitos" (little peanut in Spanish), that support only 2G. It happens also that some older people are not interested in learning how to use the new equipment. They have the simplest equipment, so they use autonomous community networks.

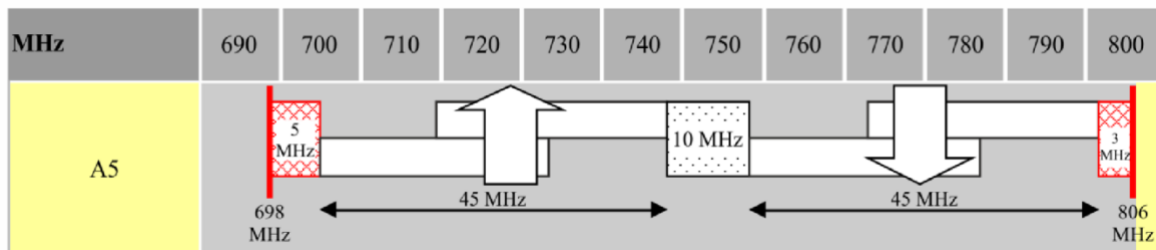
As Penelope explained, Altán Redes was built on a 700 MHz⁶⁷ band because it "allows to reach more remote areas and offer better coverage"⁶⁸. Since 2014, the former Ministry of Transport

⁶⁷ Federal Communications Commission, "700 MHz Public Safety Spectrum", FCC, Available at: <https://www.fcc.gov/700-mhz-public-safety-narrowband-spectrum>

⁶⁸ "Due to propagation and signal permeability conditions, frequency bands below 1 GHz offer the best technical conditions for providing mobile services [and] for the provision of mobile broadband services, it is preferable to have large spectrum segments that allow mobile broadband technologies to offer the best characteristics in terms of data transmission rates, network latency, user experience and spectral efficiency [...] the bands below 1 GHz that meet the above considerations and would be available in Mexico

and Communication (Secretaría de Comunicaciones y Transporte, SCT) recognised the value of the 700 MHz network in "boosting the telecommunications sector"⁶⁹.

Segmentation scheme A5 according to Recommendation ITU-R M.1036



Source: IFT and ITU-R M.1036

Another challenge identified by Angelina is the integration into Altán Redes. "Many issues [were] technical", and she had first to understand how it worked to explain to community members when they asked her questions. For example, she also had to explain to them easily that the signal works at 700 megahertz and not all phones are compatible.

Penelope also explains that to operate a network at the regional level, the whole integration process with Altán Redes is complex, from setting up the infrastructure to administering the servers and VPNs. "This required people who are experts in the field and extending that knowledge to all the involved people," she explained.

The other challenge Wiki Katat members identified, as mentioned above, is expanding their network and providing customer service support. To deal with it, they have been looking for people to join them as *Tapalewihkeh* (which comes from the word *Tapalehui* in Nahuatl and means "act of helping each other"⁷⁰). Three actors comprise this network: 1) people from the

for the provision of mobile broadband services are only the 698-806 MHz band. IFT, "Acuerdo Mediante El Cual El Pleno De La Comisión Federal Detelecomunicaciones Recomienda Que Los Estados Unidos Mexicanos Adopte La Opción De Segmentación A5 Para La Banda De Frecuencias 698-806 Mhz (Banda 700), Incluida En La Recomendación Uit-R M.1036, Enel Ámbito De Sus Atribuciones Respecto A Los Usos Futuros De La Banda [Agreement By Which The Plenary Session Of The Federal Telecommunications Commission Recommends That The United Mexican States Adopts The A5 Segmentation Option For The Frequency Band 698-806 Mhz (700 Band), Included In The Itu-R M.1036 Recommendation, Within The Scope Of Its Authority With Respect To Future Uses Of The Band.]", IFT, p. 7, September 2012, Available at: <https://www.ift.org.mx/sites/default/files/contenidogeneral/espectro-radioelectrico/acuerdo-banda-700mhz.pdf>

⁶⁹ Documento elaborado en conjunto por el Instituto Federal de Telecomunicaciones y la Secretaría de Comunicaciones y Transportes, 28 de agosto de 2014 Página 1 de 9 Propuesta de derechos para la banda de 700 MHz y Nota sobre el programa de trabajo para garantizar el uso óptimo de la banda 2.5 GHz [Document prepared jointly by the Federal Telecommunications Institute and the Ministry of Communications and Transport, 28 August 2014 Page 1 of 9 Proposed rights for the 700 MHz band and Note on the work programme to ensure the optimal use of the 2.5 GHz band]", SCT-IFT, August 28, 2014 https://www.sct.gob.mx/fileadmin/Comunicaciones/Red_Compartida/Esp/Info_General/propuesta-derechos-banda-700_MHz-uso-optimo-banda2.5GHz.pdf

⁷⁰ González Martínez, Milka Sarai, "La construcción de la identidad indígena a través del tapalewi [The construction of indigenous identity through the tapalewi]", Universidad Veracruzana, p.278

community who join the project to integrate more users, 2) small traders from the community, and 3) community radio stations. Each *Tapalewihkeh* can support people in paying for their mobile phone service or activating it.

In this way, Wiki Katat creates a network to expand its service offering while implementing a system of local support actors with a significant added value, Penelope explained. “To do it differently, to do it closer, there are people who can speak the local language, many communities on their shoulders and have their languages”.

Current customers can also rely upon presence support in the premises of Radio Tosepan Limakxtum⁷¹ or *Tosepantomin*⁷², the Savings and Loan Cooperative in the centre of Cuetzalán, Puebla.

To continue expanding its service and integrating more users, they have an alliance with TIC AC, which also has its a MVNO, to get coverage in other territories.

Wiki Katat also organises committees in established groups to strengthen the decentralised community support system to train and provide services to communities, including technical troubleshooting. As such, it provides training and ongoing support. Angelina points out that if they have done everything possible at the local level to set up the equipment and it is not resolved, people come to her or another colleague in the premises of Radio Tosepan who provides more specialised support.

In order to follow up on cases related to users' technical problems, *Wiki Katat* is implementing a ticketing system to follow up on the issues with any of the telephone lines.

Finally, it has points of sale in communities, in the centre of Cuetzalan, and on the website. However, online payments are not yet available, so they are working to expand and facilitate recharges for those outside the territory through direct contact or communication with them.

⁷¹ Radio Tosepan Limakxtum <https://taewaloni.net/cooperativa/nombre-cooperativa-3/>

⁷² European Investment Bank, “Cooperativa de Ahorro y Préstamo Tosepantomin (Mexico), winner of the 2017 European Microfinance Award”, 1 December 2017, Available at: <https://www.eib.org/en/press/all/2017-343-cooperativa-de-ahorro-y-prestamo-tosepantomin-mexico-winner-of-the-2017-european-microfinance-award>

The model of work of Wiki Katat has also been across the continent. Bonifacio explained they “have worked more with the indigenous communities that make telecommunications, not only in Mexico but also in Guatemala, Honduras, Colombia, part of Argentina and even people from Chile and Ecuador”.

VI. CONCLUSION

In the landscape of Mexico's telecommunications sector, the articulation of civil society organisations like TIC AC, the Social and Community Mobile Virtual Network Operator *Wiki Katat* and the public-private entity Altán Redes (AR) have created a unique combination of forces to amplify mobile broadband coverage while allowing indigenous communities to appropriate technological processes and strengthen their cultural, economic, and political dynamics.

Operating as a wholesale shared mobile network operator, AR's unique collaboration with Mobile Virtual Network Operators (MVNOs) and *Wiki Katat* has been instrumental in providing affordable and accessible services, particularly in rural and underserved areas. However, the challenges faced by AR, such as financial sustainability and regulatory compliance, underscore the complexities of extending connectivity on a national scale.

The story of *Wiki Katat*, a community-based initiative in Cuetzalan del Progreso, adds a distinctive layer to the narrative of digital inclusion. Stemming from the Unión de Cooperativas Tosepan Titataniske, *Wiki Katat* embodies the grassroots efforts addressing the digital gap at the local level. *Wiki Katat* has become a beacon of technological appropriation in a region where only 10 per cent of households have internet access by focusing on indigenous identity, autonomy, and cultural preservation.

Crucially, the digital inclusion landscape in Mexico goes beyond the efforts of major players like Altán Redes. The digital divide has spurred non-state actors, including civil society organisations, indigenous communities, cooperatives, and small private companies, to initiate projects that fill the void left by the state and large telecommunications corporations. In some indigenous communities, intranets with Linux-based operating systems like "endless" have become lifelines, allowing content creation and access without an internet connection.

Telecomunicaciones Indígenas Comunitarias (TIC AC) and Rhizomatica and Redes civil society organisations stand at the forefront of these grassroots efforts. Through strategic litigation and community organising, TIC AC secured licenses for indigenous social use of the radio-electric spectrum, marking a turning point in indigenous communities' access to telecommunications. This acknowledgement by the state paved the way for collaborations between TIC AC and Altán

Redes, showcasing how local organisations can actively shape and participate in the telecommunications landscape.

The collaboration between Altán Redes and TIC AC reflects a paradigm shift in the business model, moving from an extractivist perspective to one that prioritises community benefits. The journey from negotiating spectrum rentals to crafting accessible offers for rural areas highlights the evolving nature of partnerships between major telecommunications entities and grassroots organisations. As Altán Redes became integral to the Mexican state's efforts to guarantee internet access to remote areas, the door opened for innovative collaborations beyond traditional business motives.

Indeed, the framework Wiki Katat, AR, and TIC AC devised is uniquely tailored to the Mexican context's intricacies. Its automatic replication is precluded by the nuanced regulatory disparities across countries, as elucidated by Penelope. Nevertheless, this study discerns certain elements that may be distilled as instructive insights and practices. These include the organisational synergy forged between the youth and the elder constituents of the community, the strategic alliances forged between Civil Society Organizations (CSOs) and indigenous communities to nurture local capacities, and, significantly, the pursuit of a shared narrative— the quest for the right to telecommunications— resonating across disparate communities globally.

In conclusion, the dynamic interplay between Altán Redes, Wiki Katat, and grassroots initiatives like TIC AC showcases the multifaceted approach needed to address the digital divide comprehensively. While Altán Redes focuses on national coverage and MVNO collaborations, local initiatives like Wiki Katat and TIC AC exemplify the power of community-driven solutions in ensuring digital inclusion at the local level. The evolving landscape signifies a technological revolution and a shift towards more inclusive, community-centric models that empower individuals and communities to actively participate in the digital age.

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