

Indigenous Youth and Technology Appropriation in the Era of Artificial Intelligence:

Study on the Bolivian Highlands and Lowlands

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TABLE OF CONTENTS

Abstract:	4
1. Research Problem	6
2. Theoretical Framework	8
Rational Model of Technology Appropriation (MRAT)	9
The Digital Gap and the Rational Model of Technology Appropriation	11
3. Research Question and Objectives	14
Objectives:.....	14
4 Methodology	15
4.1 Collection of Information	16
4.2 Ethical Aspects	18
4.3 Geographical Location of Information Collection	19
5. Analysis and Findings	20
5.1 Access	20
5.1.1 Access to the Internet and Devices in Coroico, Quillacollo, Villamontes and Escoma.....	20
5.1.2 Access to the Internet and Devices by Chiquitano Youth	22
5.1.3 Indigenous Youth in the Era of Artificial Intelligence	24
5.2 Learning	25
5.2.1 Use of Digital Technologies.....	25
5.2.2 Interaction with Digital Technologies	26

5.2.3 Experiences with and Attitudes towards Learning	
Digital Skills	28
5.3 Integration	30
Coroico and its Relationship with Art	30
Escoma: Between Identity and Usefulness	31
Villamontes and Gran Chaco	32
Concepción: Technology and Environmental Activism	33
Quillacollo: Technology to Preserve Quechua	34
5.4 Transformation	35
Transformations in Internet and Technology	
Access and Use	35
Impact of Technological Transformation on	
Youth and their Communities.....	36
▶ 6 Conclusion	37
▶ Bibliography	39

Abstract:

Lately, information and communication technologies (ICTs) and internet access have been rapidly evolving, transforming society in a way similar to the transformation caused by the Industrial Revolution.

However, this technological progress has not been evenly distributed, creating digital gaps affecting several regions and social groups. In particular, Bolivian indigenous youth have stood out for their active engagement and participation in the digital sphere, seeking to adopt technology and establish their digital identity in line with their experience with technology.

In this sense, this report delves into the process of technology appropriation by Bolivian indigenous youth. It uses the Rational Model of Technology Appropriation to explore the stages of access, learning, integration and transformation of technology in their life. It also identifies the digital gaps they face, including access, skills and outcomes gaps.

This study includes a qualitative approach that deals with the experiences of Bolivian indigenous youth in highlands and lowlands, and it intends to show how their interaction with technology impacts their identity, ambitions and opportunities. Our findings aim to help the development of public policy to promote social, economic, environmental and identitarian development in Bolivian indigenous communities.

1. Research Problem

ICTs and the internet have become a central part of society. They play a vital role and drive cultural, social and educational transformation. In the last few years, the dissemination of ICTs and internet access has been comparable to the Industrial Revolution, as they have become a part of all aspects of life (Echeverría, 2008). Thus, we need to understand how technology is impacting society. In 2011, during the World Summit on the Information Society, the United Nations and the International Telecommunication Union focused on the benefits of internet connection for the community in general. However, they also pointed out that the expansion of technology has created several digital gaps, including the access, age and cognitive gaps (Covi Druetta, 2010).

These gaps create huge inequalities in the adoption of technology, which explains the existing differences among countries, regions and even different social groups in a population. According to Montenegro (2020), several studies have focused on researching access barriers in relation to productivity-improving technology faced by women and men. However, they have paid little attention to the difficulties that arise in the process of incorporating technologies into our everyday life once those barriers are overcome. In addition, in South American countries like Bolivia, indigenous rural towns usually come last in the provision of internet access, the use of ICTs and the development of electronic government. They are the ones who suffer the most (Martínez Cruz et al., n.d.).

Particularly in Bolivia, urban, peri-urban and rural areas have big differences in internet access and usage. While this inequality is a threat to the fundamental right to connectivity, it has created significant challenges for indigenous populations when they seek to acquire the training, skills and knowledge needed to develop their own digital identities.

In this context, indigenous youth are showing a noteworthy interest in participating in digital connectivity. This interest goes beyond the mere adoption of technology, as they aim to find their identity and their voice in cyberspace as well as equality of opportunities (Cortés, 2012). Indigenous youth find technology is a tool that allows them to explore and strengthen their cultural origins, while they attempt to become a part of the globalized digital society.

Additionally, the emergence of Artificial Intelligence (AI) has provided them with new capabilities, which has led to the modification of many of their regular practices in several environments, such as their work on the field, at school and in their social life. In this regard, AI has become an integral part of technology appropriation by young people (Echeverría, 2008). Lastly, according to experts from the Inter-American Development Bank (IDB, 2022), when technologies are accessible to indigenous youth and combined with their traditional knowledge, they become a powerful tool for the promotion of social, economic, environmental and identitarian development of indigenous communities in the region.

Therefore, this report aims to explore the experiences and contributions of Bolivian indigenous youth in the process of technology appropriation. Thus, we will be able to identify and disseminate the local realities that can act as a model for the development of public policy for the benefit of communities in the whole country.

2. Theoretical Framework

Technology appropriation has been a recurring topic in recent research, especially in the field of computer science, such as research on human-computer interaction (HCI) (Al Zubaidi-Polli, 2017). In general terms, technology appropriation refers to how users give meaning to technology and incorporate it in their everyday life, often adapting it to their needs when existing features are not enough (Muller et al., 2016). At this stage, we know technology has been appropriated and has become the users' own, and not simply what creators and designers provided them with (Al Zubaidi-Polli, 2017).

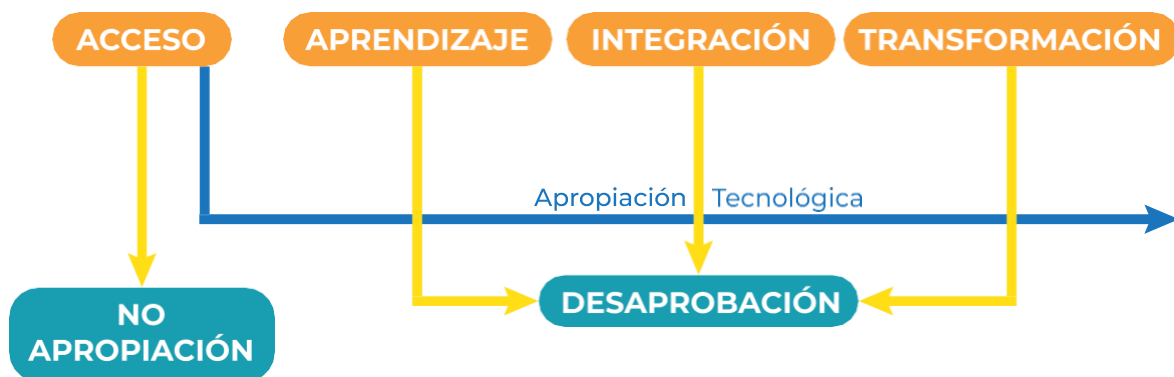
However, truly understanding technology appropriation is not an easy task, as it takes on multiple definitions in the field of research, with concepts that vary significantly. Many of these concepts focus on the experience of the user and technical definitions, concentrating on individual or communal experiences in relation to the design of technology (Turner, 2022). Nonetheless, other outlooks on technology appropriation take a sociological approach. For example, in an analysis from a structural perspective, Orlikowski (1992) argues that technology should be considered an inherent component of social structures. The author identifies three crucial elements in a model of analysis: human agents, technology and institutional properties (Quezada & Comisso, 2016, p. 105). Other authors like Ochoa (2006) also include concepts such as knowledge, use and transformation, which are introduced in the context of technology appropriation from a cultural and constructivist perspective (Montes González & Ochoa Angrino, 2006). This study adopts the perspective of the Rational Model of Technology Appropriation, developed by Quezada & Comisso (2016), as its theoretical and methodological framework. This model is characterized by incorporating social dimensions into the technology appropriation analysis, exploring how technology shapes the way it works and its socio-cultural effects.

Rational Model of Technology Appropriation (MRAT)

Essentially, the Rational Model of Technology Appropriation defines technology appropriation as an ever evolving process, where technologies are gradually integrated into individual practices and knowledge (Herrera, 2020). This approach highlights the active influence of technology on how the relationship is shaped, underscoring that appropriation is a result of a reciprocal interaction between technology and humans (Ibid). From a social perspective, this notion refers to a collective process that involves socio-technical influences and creates different results for each particular case (Quezada & Comisso, 2016).

Therefore, this model presents a definition of technology appropriation that divides it into four different essential stages, which end with the acquisition of knowledge, skills and new technological strategies, namely: access, learning, integration and transformation, as described by Quezada & Comisso (2016). By analyzing these stages, this report intends to show that technology appropriation entails a process in which both the user and technology are simultaneously transformed. This is because the process does not only include changes in the user's knowledge and skills, but it also modifies the properties of technology itself and its environment, as pointed out by Overdijk *et al.* (2006).

Figure 1: Rational Model of Technology Appropriation
(Quezada & Comisso, 2016)



Source: Adaptation (Quezada & Comisso, 2016, p. 108)

Figure 1 shows the stages of technology appropriation presented by the Rational Model of Technology Appropriation, which are described as follows:

Access: According to Quezada & Comisso, the fundamental factor in the journey of technology appropriation is the possibility to access a specific technology, which is an essential requirement for its incorporation. This phenomenon is shown in Figure 1. We can see that lack of access results in the interruption of the process and, ultimately, hinders the assimilation of technology. The concept of “access” can be vague. However, in contemporary times, given that most technologies require internet connectivity to work, it is important to consider that internet access plays a central role in the process of technology appropriation (Passaglia, 2022).

Learning: The following stage is the learning stage, where technology becomes a tool. This marks the beginning of the appropriation process. In this stage, people or groups acquire skills and explore the uses of technology, which is often comparable to the process of technological literacy (Romani, 2008). This stage is designed to, in a way, overcome the barriers that might prevent people from using technology (Quezada & Comisso, 2016). In addition, individuals develop a deeper understanding of the capabilities and applications of technology, which in turn allows them to use it more effectively in their everyday life. Acquiring technological skills in this stage is essential, as people can then maximize the benefits of technology while contributing to the reduction of inequalities in its adoption (Ibid).

Integration: The third stage involves integrating and incorporating technology, characterized by a closer relationship between the user and technology. During this stage, a person or a community coexists with technology, understanding how it works, its logic and its potential impact on their surroundings, without necessarily producing new knowledge. In this stage, technology becomes a tool with which people interact.

According to Quezada & Comisso (2016), as incorporation grows, people's knowledge about technology improves, and they understand its advantages and disadvantages.

“Technology ends up being integrated into the lives of people, having a greater impact on both individuals and society, and securing a place in their socio-cultural structural framework.” (Quezada & Comisso, 2016, p. 109)

Transformation: In the fourth and final stage, users adapt and modify technology according to their knowledge and needs. This has a significant impact at the social level and allows community innovation (Quezada & Comisso, 2016). Transformations include changes at the social level that influence the way in which society uses technology. During this stage, people acquire additional knowledge about technology and produce new knowledge about it. It is called the “transformation” stage because there are changes in the logic of technology itself and in the way it impacts people's lives (Ibid). Moreover, the authors explain that these technological transformations can modify the whole process, from access to learning, from integration to transformation.

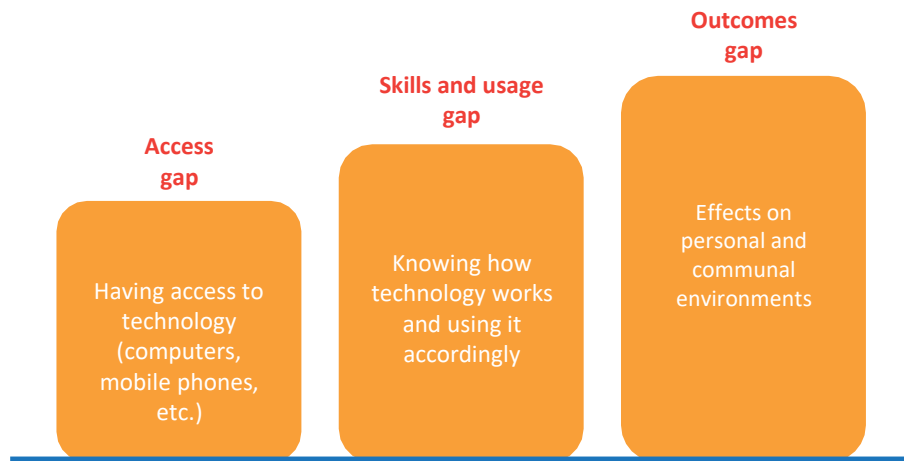
Within the Rational Model of Technology Appropriation, shown in Figure 1, there is an additional component to technology appropriation, known as “disappropriation” (Quezada & Comisso, 2016). This mechanism implies some people's decision to stop the appropriation process. Such a decision can sometimes be their only choice. This means they stop learning about, using and/or interacting with a specific technological system. This can be due to several factors, some of which might be directly related to the digital gap in some communities.

The Digital Gap and the Rational Model of Technology Appropriation

It is essential to address issues related with technology appropriation and the digital gap in countries of the Global South, like Bolivia. While our research framework is based on the stages mentioned above in the Rational Model of Technology Appropriation, we need to acknowledge the interaction between the appropriation process and the digital gap. It is fundamental to understand how each stage of the model relates to the digital gap.

While approaches vary according to the different research fields, there is general consensus about the need to analyze the digital gap at its various levels. In this study, we address three levels of the digital gap, as shown in Figure 2. The first level refers to access to computers and the internet. While there have been initial significant differences among citizens on this, it is still unequal among different socio-economic groups. (Mendez, 2022). The second level of the digital gap is about skills and usage. The decisive factors of such skills and their application are usually similar to those of the access gap, including aspects like socio-economic status, age, gender, location and ethnicity (Ibid). Lastly, the third level in the digital gap focuses on the outcomes of the access to and use of technology. In this case, some authors suggest that the third level is related to appropriation (Gómez Navarro *et al.*, 2018). However, for the purposes of this research, we take this level to mean “the level of outcomes”, as we consider appropriation is a rational process rather than an isolated stage or level.

Figure 2: Levels of the digital gap



Source: Prepared by the author

Thus, having described the levels of the digital gap, we establish a correlation between such levels and the stages of the Rational Model of Technology Appropriation (Figure 3). We notice a remarkable correspondence between the digital gap levels and the stages in the Model. If we think of technology appropriation as a multi-stage process, following Quezada & Comisso (2016), this correlation shows that the process needs to take into account the multiple digital gaps. This is especially important, as addressing appropriation without considering inequalities would be biased, particularly when using this model in contexts that have historically suffered from inequality in and barriers to the adoption of technology. Consequently, as seen in Figure 3, it will be imperative that we consider this correlation when applying the Rational Model of Technology Appropriation in this research.

Figure 3: Levels of the digital gap and stages of technology appropriation



Source: Prepared by the author

3. Research Question and Objectives

To explore the process of technology appropriation among Bolivian indigenous youth and understand its relation to their experiences, this research poses the following question:

How do indigenous youth in the Bolivian highlands and lowlands experience and appropriate digital technologies, including AI?

To answer this question, this research establishes the following specific objectives:

Objectives:

- To conduct research on how indigenous youth access the internet and technologies, including AI, in their communal environment.
- To explore the experiences and attitudes of indigenous youth toward learning digital skills and abilities, and how this affects their interaction with technology.
- To assess the impact of technology integration on the personal development of indigenous youth and their active participation in the community.
- To identify the types of transformation that have taken place in relation to the use of technology and access to the internet in indigenous towns in the highlands and lowlands of Bolivia, and explore how said transformations affect youth's life and communities.

4. Methodology

This study takes a descriptive approach and adopts a deductive method. With the purpose of gaining a deeper and richer understanding of the subject matter, this research uses a small —and not necessarily representative— sample, made up by subjects who volunteered to participate, using a convenience sampling method.

The uniqueness of this research lies in the use of focus groups and/or in-depth interviews conducted in five small towns in Bolivia, all of which are inhabited by rural or indigenous people. Participants have been selected using specific criteria, including an age group ranging from 15– to 20–year-olds, an equal gender distribution and individuals who identify as indigenous. This strategic sampling method has made it possible to carefully and significantly explore the experiences of young people inhabiting the highlands and lowlands of Bolivia.

The following analysis categories have been defined for the information collection process:

Table 1: Analysis categories

Research question: How do indigenous youth in the Bolivian highlands and lowlands experience and appropriate digital technologies, including AI?			
Specific objectives	MRAP category	Digital gap category	Unit of analysis
To conduct research on how indigenous youth access the internet and technologies, including AI, in their communal environment.	Access	Access	<ul style="list-style-type: none"> • Internet access in their communities • Access to infrastructure • Access to devices • Knowledge about AI

Specific objectives	MRAP category	Digital gap category	Unit of analysis
To explore the experiences and attitudes of indigenous youth toward digital skills and abilities, and how this affects their interaction with technology.	Learning	Skills and usage	<ul style="list-style-type: none"> Experiences had by young people when learning digital skills. Use of digital technologies Attitudes toward the acquisition of digital skills. Interaction between indigenous youth and digital technologies
To assess the impact of technology integration on the personal development of indigenous youth and their active participation in the community.	Integration	Skills and usage Outcomes	<ul style="list-style-type: none"> Technology integration in the community
To identify the types of transformation that have taken place in relation to the use of technology and access to the internet in indigenous towns in the highlands and lowlands of Bolivia, and explore how said transformations affect young people's life and communities.	Transformation	Outcomes	<ul style="list-style-type: none"> Transformations in internet access in indigenous towns. Transformations in the use of technology by indigenous communities. Impact of technological transformations on young people's life and communities.

Source: Prepared by the author

4.1 Collection of Information

Information was collected by creating three focus groups and conducting five semi-structured interviews, as follows:

Table 2: Focus groups

Focus group	Town	Identification	Distribution (age and sex)
FOCUS GROUP 1	Quillacollo	Quechua	<ul style="list-style-type: none"> • 2 16-year-old men • 1 17-year-old man • 3 16-year-old women
FOCUS GROUP 2	Escoma	Aymara	<ul style="list-style-type: none"> • 2 15-year-old men • 2 17-year-old women • 1 16-year-old woman • 1 18-year-old woman
FOCUS GROUP 3	Villamontes	Chaqueño ¹	<ul style="list-style-type: none"> • 3 16-year-old men • 3 16-year-old women

Source: Prepared by the author

Table 3: Interviews

Interviews	Town	Sex and identification
Interview 1	Coroico	• 16-year-old Aymara man
Interview 2	Coroico	• 16-year-old Afro man
Interview 3	Coroico	• 19-year-old Aymara woman
Interview 4	Coroico	• 15-year-old Quechua woman
Interview 5	Puquio	• 19-year-old Chiquitana woman
Interview 6	Puquio	• 17-year-old Chiquitano man
Interview 7	Concepción	• 16-year-old Chiquitana woman
Interview 8	Concepción	• 20-year-old Chiquitano man
Interview 9	Concepción	• 18-year-old Chiquitano man

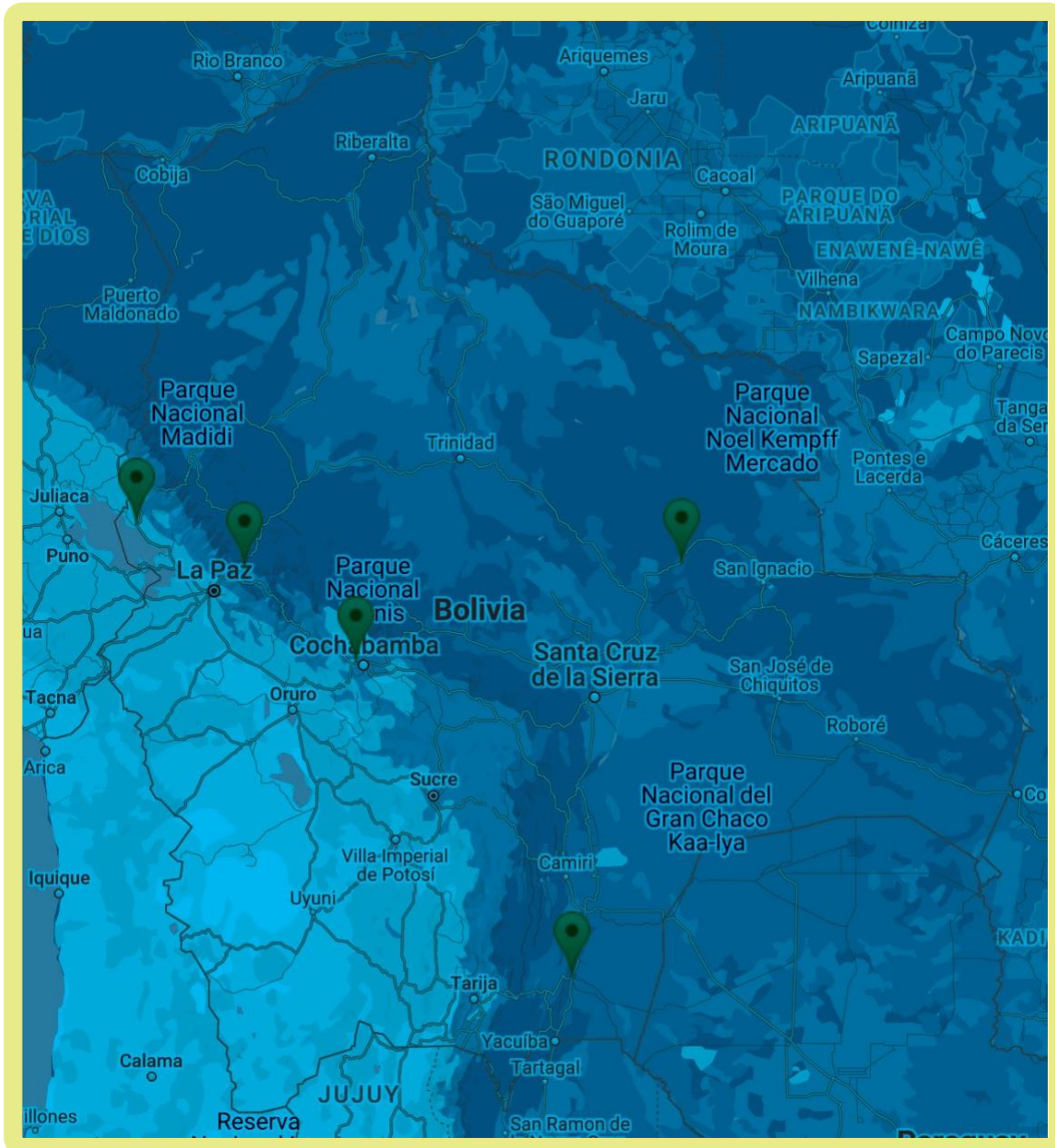
Source: Prepared by the author

¹ In this focus group, young people do not identify as one specific indigenous people. When answering our introductory questions, they considered themselves as being part of some of the 20 indigenous peoples inhabiting Gran Chaco. This is why they have been identified simply as Chaqueño people.

4.2 Ethical Aspects

- Formal authorization from their parents or guardians was obtained so that minors under 18 could participate in the interviews and focus groups. Those over 18 were given a consent form which they signed in order to participate.
- Verbal consent was also obtained from all participants, regardless of their age, before they could participate in the interviews and audio recordings. This consent was obtained even after parents or guardians had formally authorized their participation.
- Before each interview and focus group, participants were reminded that their collaboration was completely voluntary and they could withdraw their consent at any time.
- To ensure participants' privacy, recordings were anonymized, as established in our consent form. In addition, it was made explicit that recordings would only be used by the researcher and no personal data would be shared with third parties.
- In the final report, quotes from their participation will include only their age, gender and how they identify, thus preserving their anonymity and confidentiality.

4.3 Geographical Location of Information Collection



Source: Prepared by the author

5. Analysis and Findings

5.1 Access

5.1.1 Access to the Internet and Devices in Coroico, Quillacollo, Villamontes and Escoma

Youth from all four towns connect to the internet mainly through mobile data in their cell phones. Most of them do not have access to a fixed connection, although they do claim that such connection is present in their communities, but its feasibility varies depending on costs. They highlight fiber as a connection method.

“I buy megabytes to connect to the internet through my phone.”

(16-year-old Aymara man)

“All we use is data, because it’s easy to buy.” (16-year-old

Chaqueño man)

“I buy unlimited megabytes, which last for several days.” (16-year-old Quechua woman)

With regard to connectivity costs, most of them seem to handle their expenses carefully when purchasing mobile connectivity. Many of them think having fixed connectivity at home is an unnecessary expense, as they or their same-aged siblings are the ones who use mobile devices at home, unlike their parents, who focus on covering basic expenses.

“My parents don’t give me money for megabytes, so I have to use my allowance money. Sometimes my grandma gives me money.” (17-year-old Aymara woman)

“My parents don’t want to pay for Wi-Fi. They say it’s an unnecessary expense and that it’s only used for games.” (16-year-old

Quechua man)

“Wi-Fi is very expensive. Our neighbor told us Entel is the cheapest, but my mom says that if she pays for Wi-Fi, she won’t be able to pay for my phone, and I prefer my phone.” (16-year-old Chaqueña woman)

However, this perspective changes when it comes to the availability of TV or cable services, as they say plans offered by certain entities are convenient for their parents, who are the decision-makers about connectivity at home.

“We didn’t have Wi-Fi, but my dad loves to watch soccer games, so TIGO offered a plan that includes TV and also internet connectivity. So, we begged him and we got it (...). If it hadn’t been for soccer, we never would have had Wi-Fi, even considering my mom uses it more than us.” (16-year-old Quechua woman)

Additionally, some other experiences were mentioned in relation to fixed connectivity. Participants mentioned the need to be near an access point, often located at main squares, in order to connect. They were also required to have a desktop or laptop computer to set up the connection, which in many cases was not feasible in their homes, so they had to give up fixed connectivity.

“(…) In 2008, we wanted to get fixed connectivity, but the technician said we needed a computer, and we didn’t have one, so we couldn’t get it.” (18-year-old Aymara woman)

Notably, after the COVID-19 pandemic, technicians were able to set up fixed connections using a router and mobile devices, thus avoiding the need for a laptop or desktop computer. Importantly, during the focus group meetings in Escoma, participants were unaware of the possibility to have a fixed connection exclusively through a mobile device.

“During the pandemic, it was easier. A woman told my dad that we could have an internet connection without having a computer (...). When they connected us, they used my brother’s mobile phone and we don’t have a computer yet, but we do have Wi-Fi, including my TV.” (18-year-old Aymara woman)

Considering connectivity quality, the devices they have access to, and the comments above, we note that availability is limited mainly to mobile devices. All interviewees reported that there was at least one mobile phone at their homes, even though they are aware that mobile phones may not be the most appropriate for certain tasks required at school or for entertainment. Needs regarding use will be explored in later sections.

“I have a mobile phone, and so do my mom and dad. My little brother doesn’t have one; he had to use my dad’s during COVID to access WhatsApp and complete his kindergarten homework, but now he only uses it to watch videos (...). I have a Huawei phone, but it’s not new. It does have a good camera, though.” (16-year-old Chaqueño man)

“I now have my older brother’s old phone, and he has a new one for university. Mine is old but my parents say I need to use this one until it stops working.” (16-year-old Quechua woman)

5.1.2 Access to the Internet and Devices by Chiquitano Youth

During our field work, we noted inequality in access to the internet and devices among young people in the Puquio community, located in the town of Concepción, compared to those interviewed in the Capital of Concepción. While young people in the Capital experienced a reality similar to the one described in the previous section, Puquio youth shared a different experience during their interviews. Unlike the others, young people from Puquio had very limited access to the internet. Regarding mobile connectivity, the members of this community claim that there is only one ISP offering mobile internet connection, which in many cases is deficient due to poor mobile phone coverage.

“Entel is our only option, and it sometimes cuts off. The town square gets better reception, but if you get far from it, you lose

signal.”(17-year-old Chiquitano man)

“There are some Entel antennas, so it is our only option. There were rumors about TIGO coming to the area, but it never did.” (19-year-old Chiquitana woman)

“We only have mobile phone connectivity, but I think the technical school has Wi-Fi, which must be Entel for sure. Everyone else only has mobile phone connectivity.” (19-year-old Chiquitana woman)

This situation makes it hard to compare or assess their expense level, given this is “their only option” available. Consequently, they argue that the idea of fixed internet connection is not perceived as a truly feasible alternative for them or their families, as they do not consider it a priority. In line with other communities, the lack of devices like desktop or laptop computers is seen as an additional barrier to accessing a fixed connection.

As regards the quality of connectivity, the interviews revealed they do not have access to modern or appropriate devices either. In many cases, family members share the available devices.

“I have an old computer, but it is really old, so we use a mobile phone. My friend from Concepción has a computer and they can print content and everything. We can’t do that here; I have to go to Concepción to do those things.” (19-year-old Chiquitana woman)

These interviews confirmed that not all rural areas and indigenous communities have the same opportunities when it comes to technology.

In the context of technology appropriation, as seen in the theoretical framework section, access is the first and essential stage to begin the process. Therefore, this significant access gap in the community shows that their relationship with technology differs from the one observed in other contexts. This issue will be explored in later stages of the technology appropriation process. However, while the access gap is considerable, youth have found ways to connect and access technology by copying what they have seen in other towns, like in the Capital of Concepción.

5.1.3 Indigenous Youth in the Era of Artificial Intelligence

When questions about AI were asked, most participants associated the concept with ChatGPT. Interestingly, none of the participants had advanced knowledge about artificial intelligence *per se*. Consequently, interviews delved into their knowledge about and access to ChatGPT.

“Artificial Intelligence? Oh, ChatGPT, you mean? I’ve heard about it but I’m not sure about what it is.” (16-year-old Aymara man)
“I know about ChatGPT, but I’m afraid to use it, our teacher says it’s cheating.” (16-year-old Quechua woman)

Most participants from Coroico and Villamontes mentioned that they currently use ChatGPT for school work, which will be explored in detail in the section about “learning”. Participants from other towns said they had heard about AI in the media or through acquaintances or family members, but they said they did not know how to use it.

“Our technology teacher taught us about artificial intelligence and showed us how it works.” (17-year-old Aymara woman)
“I saw one on the internet about artificial intelligence, they showed several images.” (16-year-old Afro man)
“I learned about artificial intelligence thanks to Rivers² and how it can imitate your voice, but I don’t know how it works.” (16-year-old Chaqueño man)

During this time, participants showed genuine interest in the fact that current technology is significantly different from what it used to be. They mentioned once more the impact of the pandemic as a milestone that drove the implementation of new technologies. Participants put emphasis on the fact that their communities are increasingly open to and interested in having internet access. They consider this is the first step to motivate their peers to learn more about technology, even in the professional sphere.

² Streamer, social media influencer

5.2 Learning

5.2.1 Use of Digital Technologies

The following stage in the technology appropriation process involves learning. In this context, participants were asked about their use of technology once they have access to it. All of them mentioned that they mainly use the devices they have access to for communication, followed by educational purposes and, lastly, recreation.

“I use it to chat, for school work and also to play games.” (18-year-old Chiquitano man)

“I like watching or making TikToks. I like texting; I don’t like people calling me.” (16-year-old Quechua woman)

“I use it to do my homework, to chat, to play games. I also use TikTok and I like going on Instagram, too.” (16-year-old Aymara man)

Importantly, their use of technology is closely related to the type of device they have access to, which once again underscores the existence of a usage gap. Participants claim that, on many occasions, the scope of their use is limited to the functions of the device they have access to.

“My mobile phone screen is shattered, but it still works.

My parents say it’s enough for my homework and I don’t need it for anything else. I’d like to be able to make good-quality TikToks.” (15-year-old Quechua woman)

As regards their motivations, their uses slightly differ in frequency. Their motivation is considerable when it comes to communication with their peers and entertainment, while educational purposes come last or as an additional motivation.

Nonetheless, youth from all five towns agree that during the pandemic their motivation to use their devices for school purposes increased. However, they argue that, over time, their teachers stopped using technology at school and fell back into traditional methods.

“Before the pandemic, our teachers would never use their mobile phones, but during COVID they had to use WhatsApp. They had to send us our homework and we had to hand in our answers (...). With my brother, it’s different. We have the same teacher, but he doesn’t send my brother his homework via cell phone. He uses the old way, and he gets mad when students send him texts.” (20-year-old Chiquitano man)

“Now that the pandemic is over, we fell back into the old ways, because teachers want us to write down everything by hand and they tell us off when we copy our homework from the internet, but I have now become used to it, so I do it even though my teacher gets mad.” (17-year-old Quechua man)

Participants highlight that, due to the increase in the use of technology between 2019 and 2021, they were compelled to modify their daily habits in favor of using technology. While they relate the educational use of technology to the tasks of their formal education, like schools and institutions, they tend to overlook that they do some activities that also have an educational nature. This will be described in section 5.2.3, which explores youth’s interaction with technology.

Moreover, we can distinguish between different uses of technology in these towns. Firstly, participants in the town of Concepción mentioned using technology for environmental activism, while participants in Escoma and Quillacollo use it as a tool to conduct technical tasks and as a source of income, apart from making their indigenous identity visible. Young people in Coroico have a profound relationship with their culture through art and they associate it with the digital environment. Participants from Villamontes use technology as a means of communication and to express regional identity (Gran Chaco), as well as a means to acquire technical skills.

5.2.2 Interaction with Digital Technologies

Interaction between participants and digital technologies is deep-rooted in their everyday life. All of them explained how their devices have become essential elements in their life.

Most commonly used applications include social media, especially Instagram and TikTok. Some mentioned Facebook, but their use of it is minimal. In the towns of Villamontes and Quillacollo, some participants watch streaming content on Twitch.

"I like using apps like Instagram, TikTok... I have a Facebook account, but I don't use it." (16-year-old Quechua man)

"TikTok is the one I like the most. My parents like it too, so sometimes we watch TikToks together." (16-year-old Aymara woman)

"I love streaming. My favorite streamers on Twitch are Mariana, Rivers, Quackity." (16-year-old Chaqueño man)

Apart from social media, some applications like Roblox and Free Fire were also mentioned. These serve a twofold purpose, as they are used for entertainment and as a means to connect with people their age.

However, some negative aspects came up when addressing the interaction between participants and technology. Some inherent risks of using digital technologies were mentioned, especially by participants from towns near the border, like Villamontes and Escoma, who have received —as well as their family members— job offers to move to other regions.

Additionally, they mentioned cyberbullying, as many of them are immersed in school environments and experience an increase in negative situations through social media and messaging systems.

"Well, not everything about the internet is positive. They created an Instagram for Villamontes gossip, where they post lies about students and I'm sometimes scared about my name coming up, because none of it's true." (16-year Chaqueña woman)

"One of my classmates started crying because everyone was saying that she was dating 2 boys and it wasn't true. I bet one of them wanted to be with her." (16-year Chaqueña woman)

"Oh, we're always getting scam messages. My mom got one offering her a job on the Peruvian border. She immediately blocked the number, and then my friend's mom got the same message." (15-year-old Aymara man)

In addition, especially in Escoma, Concepción and Puquio, technology was perceived as a threat to the preservation of their indigenous identity. This will be addressed in detail in section 5.3. However, it is important to note that participants' interaction with technology is linked to their identity.

5.2.3 Experiences with and Attitudes towards Learning Digital Skills

As stated in the theoretical framework section, in the stage of learning, people — participants— develop a deeper understanding of the capabilities and applications of technology, and learn how to use it in a more effective way in their daily life. In this sense, we explored participants' experiences with and attitudes toward the acquisition of digital skills.

They expressed that, for the most part, learning about new technologies and applications is a relatively easy task. However, the issue is scarcity of available spaces in their communities where they can acquire such skills. This relates to the existing gap in usage and skills, as small or historically underserved communities usually lack qualified human resources in these areas.

"It's easy. Plus, everything's on YouTube. Our teacher suggests going on the internet when we want to learn about something else." (17-year-old Quechua man)

"I would like to learn more about some apps, but there's no institution for that here, and our teachers don't know either. If someone taught me, it'd be easier. All I'd have to do is practice." (15-year-old Aymara man)

"I'd like to hack... Nah, just kidding. I saw on the internet that a guy like us was already developing his own apps, but I don't know where I can learn about that. It'd be good if someone could teach us or if there was something like an educational institution, but it'd have to be cheap." (20-year-old Chiquitano man)

Another important aspect is that in populations with an active participation from civil society organizations, the skills and usage gap tends to be narrower, as these organizations create spaces for digital literacy. For example, in Coroico, young people mentioned that digital literacy has experienced a significant increase thanks to the efforts of the Aguayo Association and the Internet Bolivia Foundation, who have been active in the last few years.

"I arrived here this year, and I think it's good that we talk about these topics. Where I used to live, we talked about them but no action was taken. I like that there are many app workshops that no one would teach for free anywhere else." (16-year-old Afro man)

With regard to their attitudes, most participants mentioned that they generally find it easy to interact with the technologies they come across with. However, this is conditioned by the perceived usefulness of such technologies. Some of them expressed a strong commitment to learn about these new technologies, as they consider this would contribute to a more solid connectivity in their communities and to reducing the stigma around the internet and technology.

"I'd really love it if all people in Escoma could learn about technology instead of just us. This way, connectivity could be improved in some communities. Connectivity is only good near the church here. Some communities, like my grandma's, have no connectivity and they're not interested in it, but maybe that would change if they learned about its benefits." (18-year-old Aymara woman)

Additionally, a significant portion of participants expressed curiosity and were willing to explore new applications and devices. They are open to exploring and discovering new ways to use technology. This is especially important, as during the information collection process and in spite of the several aspects addressed related to technology, discussions used to focus on devices connected to the internet, simply because they represent an entryway to new technologies, or at least the first approach to technology experienced by indigenous youth.

5.3 Integration

We have already addressed the experiences indigenous youth have had with access and learning, with a focus on their personal experience with technology, especially internet use through their devices. In this section and section 5.4, the units of analysis focus on the communal experience. For the most part, we will address the relationship among technology, the way young people identify, and their role as individuals with access to technology within their communities. In this sense, we have further explored communal perception. We talked to participants about not only their personal experience, but also how other youth in their communities have experienced the integration of technology and the transformation caused by it.

According to Quezada & Comisso, the integration stage in the technology appropriation process establishes a link with the socio-cultural dimension at both the personal and communal levels. In this context, we asked participants how their communities integrate new technologies. We also explored how this integration relates to their indigenous identity.

Coroico and its Relationship with Art

Participants are part of an art collective called “Coroico Art”. They establish a close connection between technology and art, mainly due to the work by the Aguayo Association on digital violence, which uses a methodology based on art.

They highlight that, in the last year, the relationship of their town with technology has experienced a significant change. In fact, there are constant efforts to learn about digitalization as a positive tool and a right. This has enabled technology to take a fundamental place in their town.

“We have a theater about social media. We have performed here and in some other communities.” (Aymara man)

“Our social media theater is great, not only because we talk about technology and its risks, but also because we address other topics.” (19-year-old Aymara woman)

However, they criticized the prohibition to use mobile phones, tablets or computers at local schools. They think this restriction makes no sense when looking at the relationship of the community with technology. They argued that integration would be more effective if teachers stopped stigmatizing the use of technology in educational environments.

“I don’t get teachers. They make us use the internet to look for information about everything, but they don’t let us use our phones at school because it’s forbidden.” (16-year-old Aymara man)

They also mentioned one of their achievements as a collective: One of their female mates won the National Robotics Competition in Bolivia and represented the country in Singapore. This was a milestone for the integration of technology in the community, as young people from rural and indigenous areas proved they can become tech leaders.

“We all have asked Lis how she did it. Seeing how she won and got to travel, lots of kids now want to become a part of our art group.” (15-year-old Quechua woman)

Thanks to this achievement, young people are now expressing their hopes for change in local schools. They also add that, at the local level, their families and authorities have experienced a significant transformation in their relationship with technology.

Escoma: Between Identity and Usefulness

In the case of young people from Escoma, the integration of technology is yet to be fully reflected on the community. Despite the fact that the use of technology saw an increase during the COVID-19 pandemic, young people think that, once everything was back to normal, the community took a step back. Escoma is a small town with surrounding communities who often send their youth into exile. Participants state that, if they need to acquire deeper knowledge and learn more about technology, they need to seriously consider the possibility of leaving Escoma.

“If you like technology and the internet, you can’t stay in Escoma. You’d have to migrate to the city or maybe go to Peru. You wouldn’t do well here.” (15-year-old Aymara man)

“It’s unlikely for someone to learn or become an expert here. My cousin went to La Paz to study computer science, because he liked to fix cell phones and such. He wouldn’t find work here. In La Paz, he even has a store.” (16-year-old Aymara woman)

Regarding their identity, participants shared that they find it difficult to relate their indigenous Aymara identity to technology. This is because the Aymara culture has traditionally put emphasis on manual and hard work, such as working on the fields. An Aymara person who mainly creates digital content, such as videos, for a living conflicts directly with the expectations of their family and community. Despite consuming content on social media, like TikToks, created by Aymara influencers who promote the food and traditions of their people, parents and members of the community still label these content creators as “lazy”. In this sense, the integration of technology by Aymara youth from Escoma is challenging. Nonetheless, some mentioned that technology could be used as a way to establish communications and sell products, which could represent a source of income.

“My mom says it’s a lie that TikTokers earn money. She thinks it’s a waste of time and instead of recording they should be helping at home.” (18-year-old Aymara woman)

Villamontes and Gran Chaco

As mentioned earlier, Villamontes is inhabited by descendants of over 20 different indigenous peoples. While young people are aware of their heritage, they find it difficult to identify with any one particular ethnic group. However, they do identify as people from “Gran Chaco”.

Participants stated that the relationship of Chaco with technology is similar to the one of young people from urban areas, in terms of communication, social media use and marketing of products. However, they highlight that their interaction with technology includes a process of technification, where they attempt to use technology in sectors like agriculture and telecommunications. When speaking about their indigenous identity and technology, participants mentioned that, unlike in other contexts, there is no inherent conflict. Some indigenous groups in Chaco use technology to map burn areas (called “*chaqueo*”) and to preserve their indigenous regions, in an effort to also preserve their identity. This way, technology is integrated in the indigenous communities of Chaco as a means of resistance and expression of identity.

“I belong to a group where they teach us how to map, so we go to the communities and map and record. I don’t know how to record yet, but I have a partner who does.” (16-year Chaqueña woman)

Concepción: Technology and Environmental Activism

As mentioned earlier, in Concepción and Puquio, internet access and, consequently, access to new technologies is not optimal, hindering real integration of technology into their indigenous identity. However, they do not completely reject technology, but rather ignore it. To a certain extent, Chiquitano youth are the ones who integrate it through their environmental activism.

Chiquitano people are committed to recovering their indigenous tongues and preserving the environment. In this sense, Chiquitano youth drive the use of technology as a means to continue their activism and are motivated by their communities to use technology in their mother tongue. Nonetheless, the access gap is still the main barrier preventing profound integration.

“We have a group called JUMA, which stands for United Youth for the Environment. In this group, we make clean-up campaigns and prevent fires, so we use social media to do so. Even our parents say that, if we have to be on our phones, we’d better communicate what’s happening in Chiquitania to the world.” (18-year-old Chiquitano man)

“We belong to the youth board of Chiquitania and we have disseminated information about recovering our tongues through social media. Users have motivated us to make content about this issue, since all the content available is in Spanish and from the city.” (20-year-old Chiquitano man)

Quillacollo: Technology to Preserve Quechua

Participants from Quillacollo show integration of technology in their Quechua identity, which focuses on the preservation and revitalization of the Quechua language.

Interviewees put emphasis on their motivation to speak Quechua among them and with their families and have been practicing this on social media. At school, they are encouraged to use translation apps to translate from Spanish into Quechua and vice versa, and even to use Quechua during English lessons. They mention there are several programs that allow them to use social media as a platform to express their Quechua identity.

They underscore that, before the pandemic, these opportunities were not available and speaking Quechua was seen as pointless. However, with the rapid increase in digitalization during the pandemic, Quechua has become a tool that provides opportunities in spaces that had seemed inaccessible in the past, such as social networks. They do, however, recognize that these opportunities are limited mainly to young people and that other members of their families might feel excluded.

“Speaking Quechua was pointless before. But now, you can take advantage of it on social media and become known. I’ve heard about some TikTokers who travel across Bolivia.”
(16-year-old Quechua man)

5.4 Transformation

Transformations in Internet and Technology Access and Use

In all cases, participants made emphasis on the transformation of internet access during the pandemic. They explained that, in their communities, before 2019, internet access was considered a luxury, and often unnecessary.

“I don’t know if I can speak about ‘transformation’, because somehow everything is still the same as before. I do think more people at school and in my family use a mobile phone now, maybe that has changed.” (18-year-old Aymara woman)

Participants think this has been a milestone and it is unlikely to go back to the way things were. However, they share that, even though there is internet access through infrastructure or private services, there has not been a transformation in the improvement of the service at the community level, but rather it has become stagnant. The only case that stands out is Coroico, which has recently passed a new local law on digitalization. For young people, this means that in the future there will be parks, schools and other places with internet access. By contrast, the rest of the towns —including indigenous and municipal authorities— have not made any progress beyond the efforts made during the pandemic. In fact, they state that the transformation they once perceived has stopped for the most part.

Chiquitano youth think the transformation in device access and use is even more stagnant due to the wide connectivity gap in the Puquio community.

“It was hard to believe that we could connect through cell phones, as one sees in the movies. But now I see people at school and the community who connect through their phones, although sometimes there is no signal, but we always try to connect. Back in their time, my parents couldn’t do this. I’d like for this to improve; I’d like to see a transformation here in Puquio.” (17-year-old Chiquitano man)

This shows a significant difference between Aymara and Quechua youth, when compared to young indigenous people from the lowlands. The access gap is much wider in remote communities where indigenous people inhabit the lowlands.

Impact of Technological Transformations on Youth and their Communities

As mentioned in the theoretical framework section, the fourth stage in the technology appropriation process is transformation. This stage is based on changes at the social level where technology significantly influences communities by creating new dynamics and even new ways of appropriation.

After interviewing participants from all five Bolivian towns under study, it is difficult to claim that their communities have gone through technological transformation. While section 5.3 provides some examples of how technology has been integrated into these communities, it is clear that gaps play a prominent role in hindering appropriation. Depending on the studied community, the access gap, usage gap or outcomes gap prevailed over appropriation.

This scenario seems surprising, as countries in the Global South have made several attempts at technology appropriation, not only in indigenous communities but also in urban settings. When asking participants whether they saw a transformation, all agreed that transformation has not taken place in their communities yet when it comes to technology.

Importantly, interviewees shared their vision for the future and felt motivated to embrace transformation in their communities. Apart from acknowledging the responsibilities of their communities as authorities capable of producing change, they also take on the responsibility of being agents of change in this transformation.

*“I would love for us as a community to be more in contact with technology. Not in the same way as the city is, but in our own way.”
(17-year-old Aymara woman)*

“We need to create change. For example, I’ll study about technology and then I can come back to Villamontes and help other Chaqueño people. My dad taught me I have to contribute to my people.” (16-year-old Chaqueño man)

6. Conclusion

This research has explored the technology appropriation process among indigenous youth in Bolivia, specifically in the highlands and lowlands communities. The main objective was to understand the relationship between said population and digital technologies. Addressing this, we have come to certain conclusions that, somehow, provide an answer to the issue at hand and the specific objectives described.

Firstly, our findings reveal intriguing patterns about the interaction of indigenous youth and technology. There is a clear predilection for mobile connectivity over fixed connectivity. They handle their expenses carefully and perceive connectivity as an essential yet limited tool. Participants put emphasis on the complexities of decision making about connectivity in their homes, given they lack control and depend on external factors like the municipality, intended use, and cost, among others. There are also inequalities in internet access among rural communities. Puquio is a clear example of this when compared to other more central areas. The gap in the availability of service providers and poor mobile signal in Puquio highlight the specific difficulties faced by remote communities, which exacerbate the access gap. Regarding the use of digital technologies and learning, our conclusions highlight the prevalence of social media and entertainment apps, indicating a significant integration in participants' daily life. In spite of the gaps, a growing interest in and acceptance of technology during the pandemic reveal that there is an opportunity to promote greater adoption and deeper learning.

With regard to the impact of technology integration on the personal development of indigenous youth and their active participation in the community, we note some regional differences. However, the intersection between activism and technology stands out, especially in Concepción. This shows young people's capacity to use technology as a tool for social change and the preservation of their cultural identities. In spite of this, limited availability of internet connectivity in some areas is still a significant barrier to greater integration.

In the cases of Coroico and Escoma, art and cultural identity appear as key factors influencing the relationship young people have with technology. Tensions in Escoma between the Aymara identity and traditional expectations reinforce the need to consider local culture when implementing technologies in these communities. Integration in communities has been mainly based on internet access, which has become more common, but no significant improvement has been made in usage and transformation at the community level. It is apparent that the gaps involving access, use and outcomes outweigh the appropriation process. However, despite these limitations, participants show they have a vision for the future and a motivation to be agents of transformation in their communities.

In summary, our conclusions highlight the need for adaptive and culturally sensitive approaches to technological integration in indigenous communities, which can at the same time acknowledge and address the inequalities and specific challenges of each context.

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