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New Digital Era. Challenge of Government Proposals for the Inclusion of Indigenous Communities in the Northern Macrozone of Chile

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Abstract: The objective of this diagnostic research was to identify the perceptions of indigenous communities regarding the digital divide and government proposals for their inclusion in formative processes. For this purpose, the Indigenous Leadership School was developed at the University of Atacama in 18 months. The hierarchical segmentation, classification and regression (CART) method was applied to identify and select the determining variables of ICT management, and once the variables were selected, the associations between them were determined with the multivariate method of multiple correspondence analysis (MCA). Binary logistic regression analysis was used to evaluate the probability of presenting poor ICT management according to the variable selected as the most determinant of this characteristic, which corresponded to age, dichotomized into those under 46 and those over 45 years of age. Finally, univariate analysis of descriptive statistics of quantitative and categorical variables, centralization, dispersion, histogram and bar graph statistics were estimated. One of the strong conclusions indicates that those older than 45 years of age are about three times more likely to show poor ICT skills than those younger than 46 years of age.

Keywords: information technology; indigenous people; inclusion; education; access

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The National Human Rights Plan (PNDH), approved in May 2019 by the Interministerial Committee on Human Rights, designs 600 actions that respond to the recommendations made to the State of Chile by the Universal Human Rights System and by the National Institute of Human Rights (INDH), thereby receiving the commitment of the Services, Ministries and autonomous agencies of the State. In this understanding, the Ministry of Social Development and Family, from the Undersecretary of Social Services, established the objective for the generation of actions as part of the National Indigenous Policy that will be implemented from the indigenous public institutionality. For this purpose, it is estimated to have activities and actions aimed at indigenous people and/or communities. In coherence with the above, and in the context of the pandemic, racial segregation, cultural invisibilization and the emergence of discontent represented by social uprisings and indigenous movements, there is a need for spaces with the use of technological resources for distance learning. Based on the above, the objective of this diagnostic research was to identify the perceptions of indigenous communities regarding the digital divide and governmental proposals for their inclusion in training processes. For this purpose, the school of indigenous leadership was developed at the University of Atacama—IICSE Chile in the year 2021. As a proposal and as part of the political agenda, 400 subjects will be trained in effective leadership from an intercultural perspective of public policies focused on indigenous regulations and digital literacy for people belonging to the Aymara, Likanantay, Quechua, Diaguita, Colla and Changos communities.

The Ministry of Social Development and Family of the Chilean Government requested the University of Atacama, through the Research Institute of Social Sciences and Education,

to implement the Indigenous Leadership School, which is designed with a telematic class format due to the contingency of the pandemic. The operation of the classes through virtual media revealed several shortcomings in the technological, digital and connectivity areas. On the one hand, the low knowledge in the use and management of digital tools on the part of the beneficiaries of the program was revealed, and on the other hand, problems related to poor internet connection and signal for connecting to class sessions were observed. This gap in technological knowledge and difficulties with internet connection were presented as obstacles for the school, which was oriented toward leadership and indigenous regulations, to concentrate on.

Based on the above, it was pertinent to measure how many people are affected and the impact of this difficulty. For this goal, an instrument was designed in the format of a brief analytical survey considering the profiles of the beneficiaries of the Indigenous Leadership School, which collected general information from the respondents (name, age, gender, contact information) and their own perception of their level of management in the use of technological devices (computer, cell phone, Tablet) and how they would rate the internet signal in the area where they live. These latter data are very relevant for the analysis of the problem of connectivity and digital illiteracy. In the development of the text, we will identify, as a diagnosis, what the perception is of how much internet connectivity issues and digital illiteracy affect indigenous communities in the northern macrozone for the development of telematic education programs. This question is essential to identify the perceptions of indigenous communities regarding the digital divide and government proposals for their inclusion in formative processes.

1. Conceptual Framework

According to ECLAC, 66.7% of Latin Americans have access to the Internet. However, in the case of indigenous communities, less than half have access to cellular devices, and they live mainly in peripheral areas, unlike the rest of non-indigenous citizens.

From what has been researched, in Latin America, the Internet is positioned as a necessity, where urban centers have better connectivity, but in more remote places, with little infrastructural development, it is difficult to have the same access. This circumstance increases the digital divide between those who live in the center and those who live on the edges of a city.

In Reference [1], when we talk about the digital divide, it is important to take into account not only the access to infrastructure but also the acquisition of skills for ICT use. Consequently, and given that this situation is complex, it is necessary to consider several factors when addressing the digital divide, such as infrastructure, geographic and socioeconomic conditions, population dispersion, digital illiteracy and economic resources, among others. Similarly, the digital divide, understood as an element of social exclusion and discrimination, is a concept that addresses other issues in addition to the access to ICTs and is relevant to consider their use. The digital divide [1,2] can be evidenced by gender, economy, generation and also by the characteristics of the user, which, for our study, corresponds to indigenous peoples [3].

The digital divide [4] is related to and depends on the processes in which the population finds itself. It is directly associated with those processes, whose progress depends on the society that enact the process. On the other hand, there is concern about the digital divide and the access to digital environments by the population farthest from the center; studies on the subject express that one of the problems is concentrated in the [5] physical access to technologies, noting: (a) that there has been an increase in this kind of access by the population in the last five years; (b) that cellular telephony has the main impact on Internet access, favoring a type of digital (market) inclusion; and (c) that the impact of public policies of digital inclusion on this type of access is relative and obeys a delayed temporality with respect to technological development and digital culture.

The digital literacy process, according to Calle and Lozano [6], involves achieving certain competencies that facilitate the construction of a subject that is able to interact

through ICTs. One of the OECD reports on the impact of the digital era on people's well-being points out that technology can have both a positive and a negative impact on people's lives [7]; there are studies that, in their concern for analyzing the impact of technologies on different groups of subjects [8], neglect minority groups. In any case, others [9] agree that the changes introduced by the new emerging technologies force society to adapt to them for their use in daily and professional life. It is in this sense that digital inclusion is defined [10] holistically, not only as skills, but also as territorial and individual capabilities in relation to the use and content of technologies.

It would seem that the use of technologies is a daily occurrence; however, upon investigating the problems that arise in asynchronous classes, In Reference [11], it is evident that teachers' technological competencies have decreased and, therefore, what is transmitted is far from the multimedia and technological language used by students.

In Reference [12], another issue that is demonstrated is that there is a difference between men and women in the use of technologies and in the type of use of digital competencies, where it is evident that women mostly perform actions that do not require great technological skills, such as using a chat room or using e-mail. On the other hand, it has been demonstrated that the use of technologies and the application of technological competences serve to increase social welfare [13–15] since they improve, for example, the processes of diffusion of a business, solve communication, and artificial intelligence is integrated to propose innovations in different areas, among others [16–18].

For native people, it becomes quite difficult to adapt immediately to a digital environment that requires another logic of thinking [19] because there is the impetus of digitalization that serves to start interesting the subject, digitalization and systemic thinking in the development of the built environment, which a more complex issue in its performance.

We know and it is a reality that indigenous communities are being marginalized [20] worldwide by social and socioeconomic status or by the geographic location where they are located. Historically, the trend indicates that they are one of the poorest and most deprived segments at any latitude. The literature suggests that information and communication technologies (ICTs) can improve their quality of life. On the other hand, the reviewed literature indicates that ICTs [21] have not yet succeeded in reducing inequality, which can sometimes be unintentionally perpetuated through access to them and in relation to socioeconomic inequalities.

Another issue that stands out is that barriers in mental health care and issues of violence for indigenous peoples have become visible due to evidence through technological means [22], and online resources that are jointly designed, secure and accessible and that provide anonymity are required. Therefore, training indigenous peoples in information technologies to address their issues is essential.

In Reference [23], the bibliographic review shows an important element that we should consider in relation to the topic of interest to us, namely, information technologies and native peoples, and that is the appropriation of indigenous and local ancestral knowledge that is accelerating in times of blatant neoliberalism.

In Reference [24], an issue that is also addressed with technologies are the barriers, complexities and opportunities that native peoples face when participating in language revitalization efforts and how these elements contribute to the adoption, adaptation, or abandonment of digital technology. That is, sometimes, the subjects themselves are demotivated, preferring to forget their language, roots and incorporate into a system that sometimes ends up passing through their subjectivity [25–27]. There are some assumptions that are inferred from the literature review: native peoples are located below the average, in an evaluative sense, of subjects who are not in the use of technologies. Not all young people are digital natives, and awareness of linguistic and cultural diversity must be respected and preserved with effective teaching methods that contribute to solve problems. In this way, technology can be used as a gateway to help collaborate with people by developing material that increases the knowledge of their cultural traditions [28,29]. Technology used well by the teacher, the mentor, the student or the citizen can help accelerate communication

and advance community proposals. It is also relevant to emphasize that the support of information and communication technologies (ICT) should be through a design that adapts to the cognitive capacities of the user.

In coherence with the above, we must mention that native communities have the possibility of developing strategies of insertion through technologies and can also improve their quality of life, as long as they develop skills and competences for life considering these technological advances, and this means in relation to the use of ICT [30–33].

In order to address the digital divide regarding the use of technologies and their impact on indigenous communities, we must understand that there are new forms of literacy, in line with informational environments [34,35]. The most common in this typology is Computer Literate, which means to be competent in the use of computers. However, this definition hides the fact of the existence of different points of view in relation to what competence implies, understanding that skills are developed and enabled in the practice of competence, i.e., digital literacy requires different skills to be apprehended by the cognitive subject.

This is how educational and governmental policies strive to create programs and increase the possibility of access to them, so that the target group can increase the competencies needed at the moment.

In Reference [36], however, current policies must rectify other social determinants to address the technological backwardness which is directly related to the socioeconomic deterioration that has existed in many countries since the industrial era, particularly in indigenous regions [37]. Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication [38]. According to the European Commission, digital competencies are based on basic ICT skills: the use of computers to retrieve, evaluate, store, produce, present and exchange information and to communicate and participate in collaborative networks through the Internet. Therefore, digital competencies are related to the use of information and communication technologies to solve everyday problems [39–42].

In coherence with the above, educational institutions, often conditioned by information and communication technologies (ICT), assume that [43] learning is conceived as a co-creation of knowledge, since its development is evidenced with greater significance in communities empowered by technology. However, this articulation and development do not occur in every community with access to ICTs.

The technological imperative in education is related to the advancement and digitalization of society articulated with the need to generate new competencies, these foster meaningful experiences and activities focused on deep learning because they are based on interactive activities and their didactic use is considered as one of the necessary requirements for the adequate development of current education [44].

Research shows that [45], preferably, the subjects who attend a training course choose to ask their peers when they do not know how to solve a problem or prefer to look for tutorials, and if they do so, they prefer to ask the teacher for help. When they do so, they prefer to attend telematic and not face-to-face consultations, thus showing the relevance of knowing how to use technologies and their implication in daily life. Similarly, it is evident that [46–49] an emotional dimension of the subject, who feels part of a given context, can be enhanced with the use of new languages that allow them to approach specific projects without distinction, digital competence being one of the nine key competences for the subject to participate in and feel like they are a part of society. In particular, the European Commission [50] mentions that digital competence implies the safe, critical and responsible use of digital technologies for learning, work and participation in society.

In Reference [51], the current model of education promotes and is determined by a curricular vision and educational praxis focused on the product rather than on knowledge and on the implications of this knowledge to society. ICTs have generated quality in learning, developing an important pedagogical change in educational scenarios [52]. Moreover, digital competence is not an isolated skill to develop, but different skills, such as skills of disciplinary areas [53], are at the service of the subject, who develops them and contributes

to their immediate environment. The information and knowledge society is a phenomenon that has impacted the organization of different groups, allowing the organization of information in networks and opening the possibility of accessing, communicating and being in constant connection [54]. This in turn has allowed the pedagogical use of ICT and facilitates the shared creation of knowledge through learning communities [55].

Most of the time, exposure or habits of using the Internet are put in value. New skills are required to optimize and take advantage of the benefits provided by ICTs [56]. The skills that stand out for detecting digital competence according to the studies reviewed are [57,58] searching, information processing, communication and virtual tools.

2. Methodology and Instruments

The research methodology was framed in a non-experimental, cross-sectional, descriptive, exploratory and correlational design. The identification and selection of the determinant variables of ICT management were carried out using the decision tree procedure through the hierarchical segmentation method of classification and regression trees (CART) [59] Once the variables were selected, the associations between them were determined by applying the multivariate method of multiple correspondence analysis (MCA) [60]. To evaluate the probability of presenting poor ICT management according to the variable selected as the most determinant of this characteristic, which corresponded to age, dichotomized into those under 46 and those over 45 years of age, regression analysis was used to evaluate the probability of presenting poor ICT management. According to the variable selected as the most determinant of this characteristic, which corresponded to age, dichotomized into those under 46 and those over 45 years of age, binary logistic regression analysis was used [61,62]. Finally, the univariate analysis of descriptive statistics of quantitative and categorical variables was performed by estimating centralization and dispersion statistics and histogram and bar graphs, respectively. See Figure 1

Data Collection Instrument (the questionnaire was applied via web, the research subjects answered the following questions)

1. How would you rate the internet signal according to where you live?
   - Very poor signal (I cannot videoconference, and I cannot download documents)
   - Poor signal (I cannot video conference, and video playback is interrupted or does not load)
   - Normal signal (I can make videoconferences and play videos)
   - Good signal (I can videoconference and play videos with high quality)
2. Which of the following statements do you identify with?
   - I do not consider myself very technological. Sometimes I need help from a family member to use some
   - functions of my phone or the internet.
   - I do not use the computer very well, but I can use the basic applications on my phone and surf the

internet.
   - I use the internet daily from my phone and computer, to make bank transfers, videoconferences,
   - browse different pages and work with office software.
3. Were you able to access the platform?
   - Yes, I had no problem.
   - No, I have not been able to access.

Figure 1. Data collection instrument.

3. Results Analysis

The information was collected by means of a questionnaire applied through the Internet. The sample was answered by 151 respondents and was composed of 80% women with an average age of 45.7, varying between 20 and 71 years of age, and 20% men with an average age of 45.8, varying between 30 and 65 years of age.

In the presentation of the Indigenous Peoples, the Diaguita and Aymara communities had the highest frequencies, with 44.3% and 21.2%, respectively; a percentage close to 10% in the case of the Chango and Likanantay communities; and representations of less than 5% for the Colla, Mapuche and Quechua communities. Participants who did not belong to any of the Indigenous Peoples accounted for 2.6% of the sample. The presentation of the native peoples was made up of eight categories represented in the bar graph and frequency table, Figure 2.

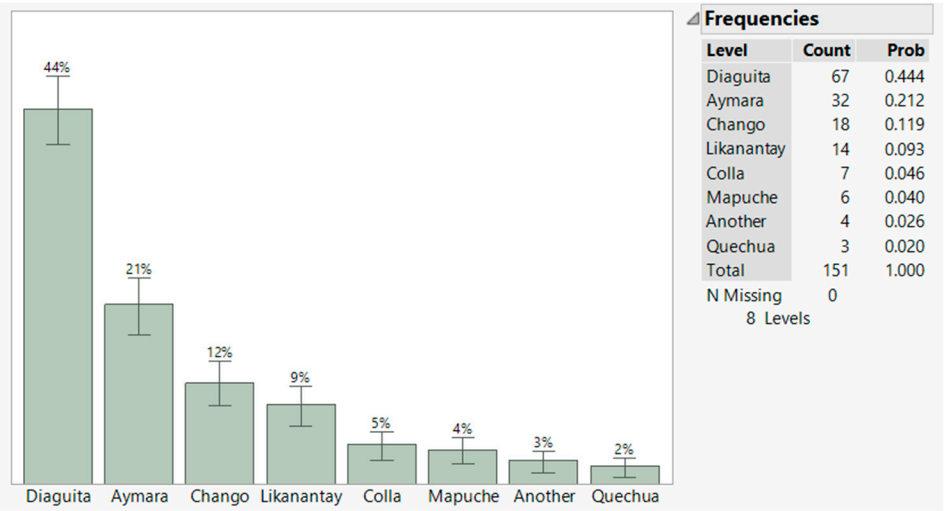

Figure 2. Graph and table of frequencies of the Indigenous Peoples present in the sample.

Individual exploratory analysis of the variables analyzed.

In relation to the ICT management variable, it was observed that most of the interviewees self-assessed themselves as having a good ICT management and the levels of acceptable and insufficient management were presented in a similar proportion, Figure 3.

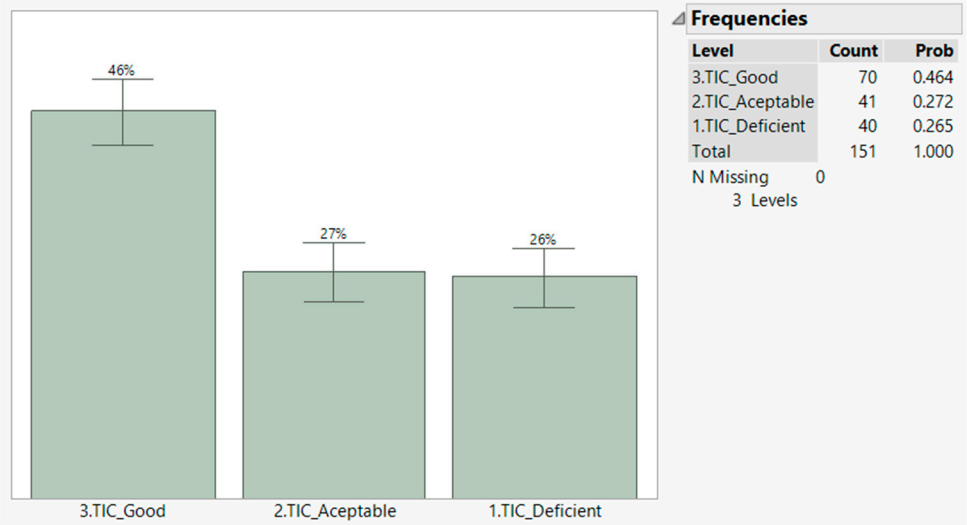

Figure 3. Table of the ICT management variable.

With respect to the signal level according to the location of the home, it was observed that most of the cases presented a normal signal followed by a poor signal. The lowest frequencies corresponded to good and very poor signals, Figure 4.

In relation to the access to the use of the educational platform "Edukaso", it was observed that almost 70% of the interviewees responded that they had been able to access the platform, which corresponds to a very important proportion with respect to this performance variable, Figure 5.

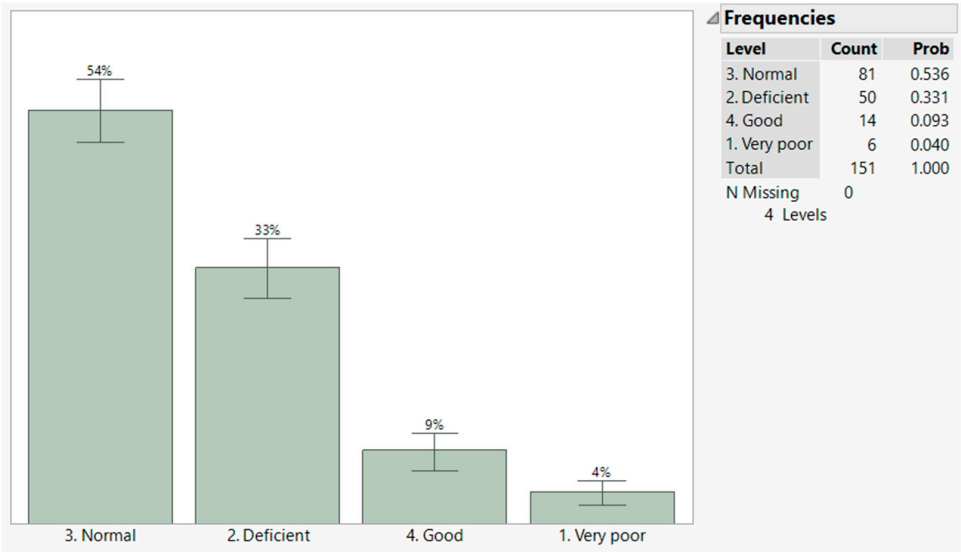

Figure 4. Graph and table of variables according to signal level.

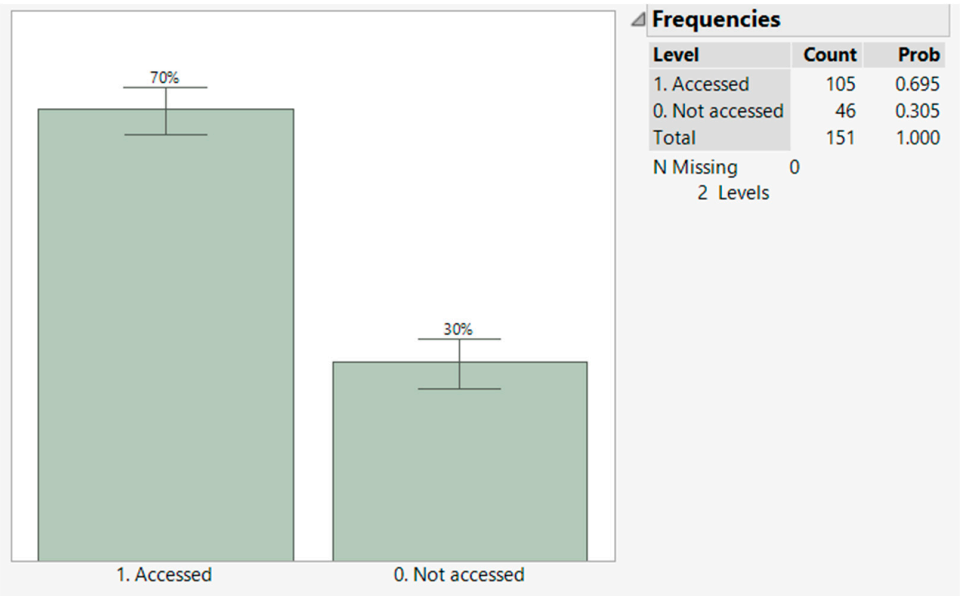

Figure 5. Chart and table of variables according to access.

Identification of the determinant variables of ICT management by means of a decision tree using the hierarchical segmentation method through classification analysis and regression trees (CART). The analysis determined that the variables age, signal level and native peoples corresponded to the most important variables in determining ICT management, Figure 6.

The importance of the contribution of the variables showed that belonging to a native town was in the second place of importance after age, and the level of the signal was in the last place of importance. See Table 1.

Table 1. Table of importance variables by columns.

Term	Number of Splits	G^2	Portion
Age	1	24.826	0.580
indigenous peoples	1	11.648	0.272
Signal level	1	6.286	0.147

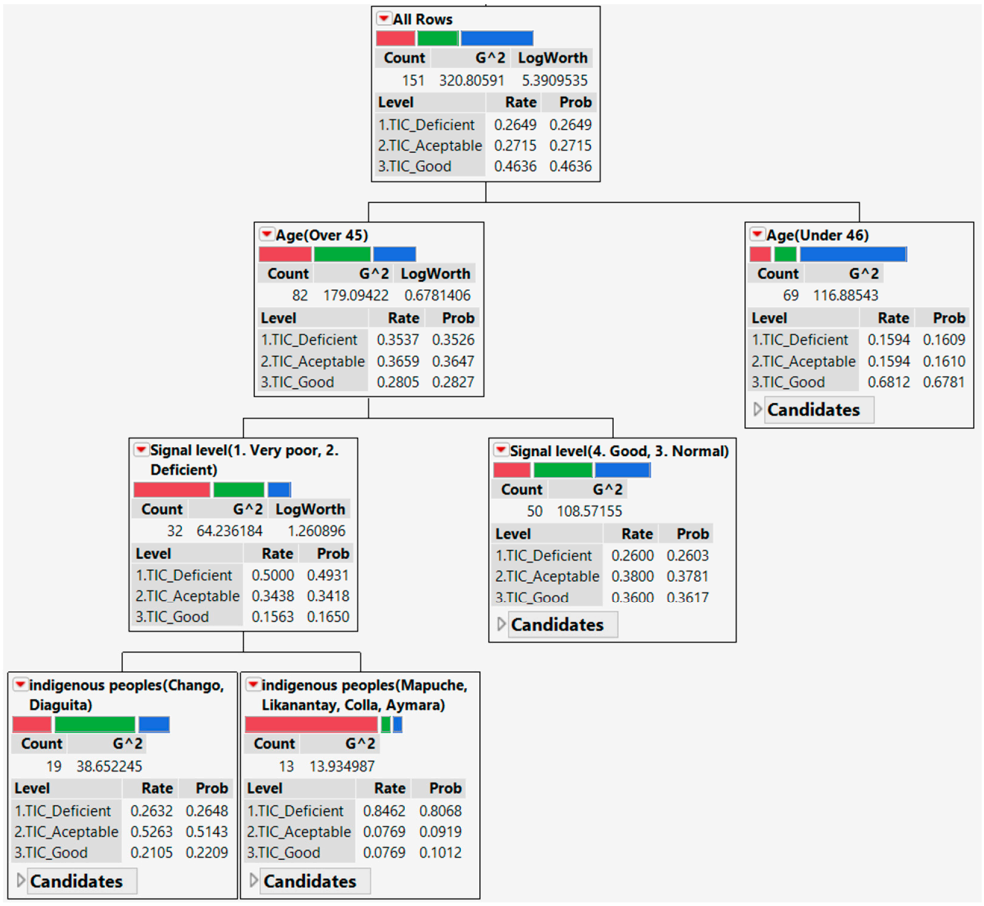

Figure 6. Diagram of the classification analysis and regression trees (CART).

Evaluation of the interdependence between the variables analyzed, by means of multivariate analysis of multiple correspondences, was described using a biplot diagram. The result showed an association between ICT management, age, signal level according-place of residence, belonging to minority native peoples and access to the educational platform. Figure 7.

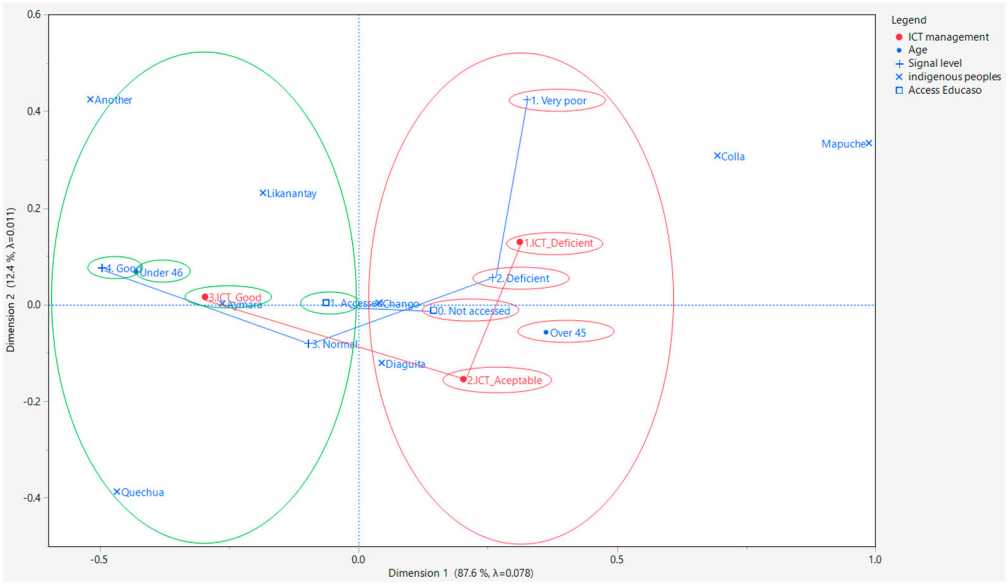

Figure 7. Evaluation of the interdependence description using the biplot diagram.

Evaluation of the presentation of poor ICT management (dependent variable) according to age (independent variable) in the group over 45 years of age compared to the group under 46 years of age was performed by means of a binary logistic regression model analysis, see Table 2.

Table 2. Contingency table of ICT management and age ranges.

		Management of ICT		Total
		Poor	Good	
Age:	Over 45	29	53	82
	Under 46	11	58	69
	Total	40	111	151

Logistic Model: Deficient ICT management in those over 45 years of age compared to those under 46 years of age, see Table 3.

Table 3. Model Coefficients—Management of ICT.

Predictor	Estimate	SE	Z	*p*	Odds Ratio	95% Confidence Interval	
						Lower	Upper
Intercept	−1.66	0.329	−5.06	<0.001	0.190	0.0995	0.361
Age:							
Over 45–Under 46	1.06	0.402	2.64	0.008	2.885	1.3125	6.342

Note. Estimates represent the log odds of "Manejo de TIC = Poor" vs. "Manejo de TIC = Good".

Conclusion of determinant variables with classification trees: The selection of the determinant variables identified (1) belonging to indigenous peoples, (2) age and (3) quality of the Internet signal according to the place where they live as the most determinant variables of ICT use.

Conclusion of the interdependence assessment: The variables related to the quality of the Internet signal according to the location of residence, belonging to a native people and age, show an interdependence of more than 80% with the level of ICT proficiency and access to the educational web platform.

Conclusion of the evaluation of the presentation of poor ICT management according to age in the group over 45 years of age: According to the results obtained through the logistic regression model, it was possible to conclude that those over 45 years of age present approximately three times more possibilities of evidencing poor ICT management than those under 46 years of age, and this difference is statistically significant ($p \leq 0.05$).

Despite public efforts to develop programs and actions (more than 600) according to the National Human Rights Plan in agreement with the recommendations made to the State of Chile by the Universal System of Human Rights and by the National Institute of Human Rights (INDH), it can be observed that there is a significant gap not only in terms of access to digital technologies of those living in the peripheral areas of cities but also in terms of trends to a certain dependence of the user on the technological object, but not on the use of it.

When analyzing dependent and independent variables, the state-of-the-art in terms of research on the use and penetration of information technologies in indigenous communities is quite poor, i.e., there are many aspects that other studies could focus on to have a more complete understanding of the problems presented and to potentially provide more detailed solutions to help and complement government efforts for the inclusion of indigenous peoples in the processes of economic progress with respect to their worldview.

4. Discussion

As has been identified through the studies reviewed [1,4], when we talk about the digital divide, it is necessary to consider several factors to refer to it. In relation to the

results obtained with the classification trees, a coherence with the geographic variable is observed. This is relevant because it increases the digital divide. Therefore, we can assume that a good government policy should be concerned with economic resources to bring the population closer to the places where there is a good connection. It is not a matter of increasing efforts for access to connectivity but rather to increase the quality of life and socioeconomic opportunities of the indigenous population and to provide training in the use of technologies with relevance to the problems of the territory and local and social groups.

Regarding the possibility of using technologies and access to new contents from the use of ICT platforms, we could realize [5] that most of the subjects who attended the school have access to cell phones, as shown in different studies; however, there is concern that the digital divide is evident in the effective management of the devices and in the relationship with physical access to the media that are promoted for the connection to the knowledge of cyberspace. That is, being in the presence of a technological device and using it in a basic way does not ensure that one is taking advantage of the benefits it would have in projects where the use of these would be necessary for effective development, which would serve to both raise social demands to propose improvements and to advance in society and facilitate daily life in its functions.

While it is true that there are studies that address the problem we are interested in, from the point of view of the possibility of adults over 45 years of age to access new virtual environments and communication with ICTs, we have perceived an absence of studies that relate the variables: age, indigenous communities, and ICT use. From the results obtained, it can be said that for adults over 46 years of age, the digital divide increases and greater difficulty is evidenced in the efficient use of ICTs. It is possible to conceive them as a support when primary and daily functions are hindered. Therefore, the research opens the horizon to advances in the deepening of these relationships and associations for inclusive proposals.

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Institutional Review Board Statement: The study was conducted in accordance with the guidelines of the Declaration of Helsinki. The ethics committee lacked institutionalization and functioning, therefore the revision of the survey document was carried out by an expert in the area of the Department of Engineering and Computer Science of the same university. Ethics Committee Universidad de Atacama Work Code/092021.

Informed Consent Statement: Informed consent was obtained from the participants through the web form due to the pandemic and at the time of obtaining the information to publish this document.

Data Availability Statement: https://drive.google.com/drive/folders/13vlFau5gTZwAQx1pTXA3F6XDPRtYMm0J?usp=sharing, accessed on 29 April 2022.

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