Community Internet networks and the collaborative production of technological and political knowledge

Las redes comunitarias de Internet y la producción colaborativa de conocimiento tecnológico y político

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Based on research on the deployment of a community Internet network in 2019 and 2020 in a rural community of Cordoba, Argentina, the collaboration strategies between organizations to produce technological and political knowledge are analyzed. The compatibility between the approaches of technological sovereignty and food sovereignty; the education-action methodology in the territory, face-to-face, collective and experiential; cooperation during the maintenance and extension of the network; articulation with other community networks and incidence on politics stand out.

KEYWORDS: Community Internet network, right to Internet access, cooperation, popular education, incidence in politics.

Con base en una investigación sobre el despliegue de una red comunitaria de Internet en 2019 y 2020 en una comunidad rural de Córdoba, Argentina, se analizan las estrategias de colaboración entre organizaciones para producir conocimiento tecnológico y político. Se destacan la compatibilización entre los enfoques de soberanía tecnológica y soberanía alimentaria; la metodología de educación-acción en territorio, presencial, colectiva y experiencial; la cooperación durante el mantenimiento y extensión de la red; la articulación con otras redes comunitarias y la incidencia en políticas.

PALABRAS CLAVE: Red comunitaria de Internet, derecho de acceso a Internet, cooperación, educación popular, incidencia política.

Com base em pesquisas sobre a implantação de uma rede comunitária de Internet em 2019 e 2020 em uma comunidade rural em Córdoba, Argentina, são analisadas as estratégias de colaboração entre organizações para produzir conhecimento tecnológico e político. Destaca-se a compatibilidade entre as abordagens da soberania tecnológica e da soberania alimentar; a metodologia da educação-ação no território, presencial, coletiva e vivencial; cooperação durante a manutenção e extensão da rede; articulação com outras redes comunitárias e defesa de políticas.

PALAVRAS-CHAVE: Rede comunitária da Internet, direito de acesso à Internet, cooperação, educação popular, incidência política.

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INTRODUCTION

The COVID-19 pandemic has brought to light the urgent need for universal access to Internet connectivity in order to ensure basic human rights (Baladrón et al., 2021; Bizberge & Segura, 2020). In this context, community Internet networks (hereafter CIN) have become a significant option. The deployment of such networks implies local organization and cooperation between digital and territorial activists in order to produce not only technological but also political knowledge.

This article is based on the results of research made on a CIN in a rural comunity in Las Calles, Traslasierra, Cordoba, Argentina. It was initiated in November 2019 and serves purposes of communication, information, education, work, recreation, and productivity improvement (Prato et al., 2000). This network has several distinctive features: 1) it was entirely deployed with LibreRouter, a free connectivity technology developed collaboratively and internationally by and for CINs; 2) most of the extension was implemented during the spread of coronavirus in Argentina. It was started in March 2020 and it was still being carried out as this article was completed; 3) the initial deployment was done during a *Semillero*, an education-action territorial methodology, in person, collective and experiential, also developed by collectives of CINs, and 4) it was "successful" in terms of the objectives stated by the participating organizations, that is, collaborating in knowledge production in order to deploy a community Internet network.

Most of the studies on community Internet networks have dealt with aspects such as surveys of experiences in one or several countries (Baca et al., 2018); their strategies of incidence on politics (Baladrón, 2021); the community that develops them, either as the object of intervention (Butler et al., 2013), or as subjects of such construction (Chamorro & Pietrosemoli, 2008; Taborda Ángel, 2017). Other studies analyze the relationship between CINs, community organizations and the communities' living conditions (Galperín & Girard, 2011), and the ways in which technologies are appropriated (Baladrón, 2020).

A theoretical-methodological approach was chosen for this analysis, it comprises and explains the subjects' practices regarding their position of power in a given system of relationships and under

certain circumstances. Connectivity will be considered a human right (United Nations, [UN], 2012); civil society organizations as complex and heterogeneous agents that hold relationships of relative autonomy with state and market; and the collaborative production of knowledge and technology between these collectives as a co-creation intended to meet their needs.

Given this perspective, the following questions arise: What collaboration strategies between organizations of digital activists and territorial organizations are necessary to produce knowledge collectively in order to promote community Internet networks? Who does it and under what circumstances?

In view of these central questions, this article identifies the successive cooperation practices implemented during the process, the collective agreements reached, the organizations' characteristics and resources allowing them to reach those agreements, as well as the conditions that made them both necessary and possible. This is so because of the emphasis that was placed on identifying what made collaborative knowledge production possible. However, it must be noted that articulations between organizations aimed at deploying community Internet networks are not free from conflict, tension, disputes, and uneven power relationships, as has been analyzed and shown in prior papers (Prato et al., 2020).

It will be argued that among the strategies for collaborative knowledge production intended to promote community Internet networks the ones that stand out are those that foster autonomous technological development as well as those of popular pedagogy for the appropriation of technology and those of articulation and political incidence oriented to strengthening the CINs. Those collectives possess uneven and complementary trajectories, resources, and organizational competences and techniques that are a necessary requirement for the development of cooperation. Besides, collaborative strategies are a possible response under the prevailing legal, economic, and technical conditions.

In the first section of this article the theoretical-methodological perspective is presented. Then, there will be an analysis of the strategies of collaborative knowledge production in the stages of preparation,

Semillero and deployment, as well as those implied in adjustments, maintenance, extension, and use of the network. Thirdly, the participating organizations are constructed as collective social subjects. Fourthly, the conditions that made these practices possible will be studied. Finally, conclusions are stated.

Theoretical-methodological approach

Access to Internet is a human right and a necessary condition for the demand, exercise, and extension of other social, political, and cultural rights, as recognized by agencies of the international human rights system. The United Nations (UN, 2012) fosters the promotion, protection and enjoyment of human rights, including the right to freedom of speech on the Internet and on other technologies, as well as the way in which the Internet can be an important tool for the development and "exercise of human rights" (p. 2). However, this recent definition was the result of a dispute. The UN had launched the debate on the right to Internet access when it convened, twenty years after the MacBride report, the World Summit on the Information Society (WSIS) that took place in Geneva in 2003 and in Tunisia in 2005. The WSIS conclusions adopted a neo-diffusionist approach that proposed the transfer of knowledge, information, infrastructure, and technology from richer countries to poorer ones and from high and middle sectors to lower ones. It was then that the internationally organized civil society adopted the causes of the right to communication and democratization of communications promoted by the Movement of Non-Aligned Countries in 1970. To this end, it launched the Communication Rights in the Information Society (CRIS) Campaign and held forums in both instances of the World Summit. It demanded that the information society should be centered on the human being and their fundamental rights and needs; that technologies should be means for human development and not ends in themselves; and that the digital gap be understood as an expression and a result of the other social gaps (Calabrese, 2004; Mastrini & De Charras, 2005).

The right to Internet access is one of the digital rights, which include the right to access, use, create, and publish through digital

means as well as the rights to access and use electronic devices and telecommunications networks (Organization of American States [OAS], 2011, 2019). They imply the protection and realization of existing rights in the context of digital and connectivity technologies. Applied to new technologies, these rights face new challenges that demand they be redefined, specified, and extended.

Activism for digital rights promotes a more egalitarian access and management of technology and data, it fosters new forms of information and knowledge production, and it challenges dominant conceptions on information digitalization and connectivity (Milan & van der Velden, 2016). In Latin America, such activism started in the decade of the 2000s, twenty years later than in central countries. Given the network's global character and the problems it faces, Latin American organizations are either regional chapters of international organizations or part of international networks. They adopt the existing interpretive framework of communication, cultural, and civil rights produced in Europe and the United States and update it for the digital environment.

Similarly, the problems they approach related to communication, culture, and privacy are comparable to those of analogical environments, although the special features of digital contexts are taken into account. Furthermore, inequalities in access become more significant in the region. As is the case in central countries, regional strategies include both incidence on public policies to promote the recognition and extension of rights as well as self-managed strategies to exercise rights, even when they may not have been legally recognized yet (Segura, 2019).

> Technological sovereignty is about technologies developed by and for the civil society, and its initiatives are meant to create alternatives to commercial and/or military technologies. Its actions adhere to imperatives of social responsibility, transparency, and interactivity. Consequently, they are likely to enjoy a greater degree of trust (Haché, 2014, p. 16).

Civil society organizations that foster CINs are heterogeneous and complex; they have various organizational structures, activities, financing, and principles; they establish relationships of relative

autonomy with state and market. Such relationships imply neither mere cooptation nor full independence; they depend on the specific conditions in which they occur as well as on the unequal power relations established in each case (Sorj, 2010).

The community is also defined as a heterogeneous group of people who interact and share territory, history, ways of speaking, habits, values, interests, problems, needs, potentialities, identity, symbols, and projects (Castrillón Roldán, 2013). Community intervention lies in encouraging the strengthening of local relationships by solving shared problems (Sánchez Salinas, 2018).

In this respect, collaborative knowledge production implies communities of practice that co-construct knowledge and technologies focused on users in order to meet their needs (Schioavo et al., 2016), develop new uses for those technologies as compared to previous ones, and decide which ones should prevail (Finquelievich, 2007).

Digital activists who foster community Internet networks resort to popular education in order to promote collective construction of knowledge and technologies. Thus, they update the link between education and popular communication developed in Latin America since the 1940s as well as the struggles of socially disadvantaged sectors of society. Critical pedagogy focuses on the protagonists' perspectives, promotes mutual recognition, horizontality, and dialog between knowledges as practices that are both liberating and oriented to transforming reality (Binder & García Gago, 2020; Huerta Velázquez & Baca Feldman, 2018).

We believe that social subjects' practices can be both explained and understood (Costa, 2010) in connection with the social place where they are produced. That defines their chances of action as well as its orientation. From this perspective, such practices either strengthen or transform the rules of the social game they are part of, depending on whether the agents consider them enablers or limiters for the preservation or improvement of their position of relative power (Mozejko & Costa, 2002).

This defines the theoretical-methodological operations that were developed, namely: 1) analysis of the organizations' strategies; 2) construction of collective subjects; 3) conditions under which they

are produced; and 4) understanding and explaining practices in relation with those subjects and conditions.

To this end, the following techniques were implemented: 1) survey of precedents; 2) participant observation (2.1) in person, in the First Latin American Summit of Internet Networks,[4] the First Argentine Summit of Community Networks,[5] and Semillero;[6] and (2.2) remotely in the WhatsApp groups CN (Community Networks) Traslasierra and CARC (Argentine Summit of Community Networks); 3) face-to-face and telephone interviews; and 4) systematization and analysis.

POPULAR EDUCATION, TECHNOLOGY AND POLITICS

This section analyzes the strategies of collaborative production of knowledge and technology aimed at deploying a community Internet network in Las Calles. Such strategies were developed by AlterMundi, one of the two nongovernmental organizations (NGOs) that promote CINs in Argentina; Comunidad, Trabajo y Organización, [Community, Work, and Organization] (CTO), a Las Calles territorial community organization of social economy and family agriculture; and various other local, national, and international organizations. These strategies fall into three types: those that deal with technological development; those aimed at popular education in technology; and the ones devoted to articulation and political incidence. In this section, all the practices developed are identified in order to prove that collaboration in the production of knowledge is present in each of the successive stages of the necessary process to deploy and extend this CIN. The pedagogical practices and those related to political incidence are analyzed briefly.

In the preparatory stage, before beginning the deployment of the network, it was necessary to develop three kinds of knowledge: technological, pedagogical, and political. Such knowledge was dealt with in four levels: international, regional, provincial, and local.

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4   Buenos Aires, September 7th to September 9th, 2018 and La Serranita, Cordoba, September 10th to September 16th, 2016.

5   La Praviana, Cordoba, November 30th to December 1st, 2019.

6   Las Calles, November 23th and 24th, 2019.

The first strategy in this stage was the collaborative development of the LibreRouter, a free, wireless, multi-radio, high performance router (connectivity technology), especially designed for the technical, cost related, and legal viability needs of community networks in the countries of the Global South, and in particular, of Latin America. It was designed collaboratively by CIN organizations all over the world (AlterMundi, 2018; Alvear et. al, 2021; Dagnino, 2019).

Then, AlterMundi and its Mexican counterpart Redes AC collaborated in the development of a methodology for popular education in technology. They called it "Semillero" and it was tested for the first time in Cherán K'eri, Michoacan, Mexico in 2019 (AlterMundi, 2019). It was later implemented in the neighbors' community of Las Calles. This intensive method of education-action replaced the prior ways in which these NGOs intervened to promote CINs.

Semillero is an intensive pedagogical process intended to identify needs and resources in the community by means of a community self-diagnose, and to share knowledge on community Internet networks so as to install permanent capacities in the local organizations and train them to develop and extend the network. Besides, members of AlterMundi participated in the training program on popular education offered by the Argentine organization Pañuelos en Rebeldía, a specialist on the subject. Pañuelos en Rebeldía was invited to join Semillero.

In the third place, AlterMundi invited this research team to write a report that would produce knowledge on this type of experiences, assess the intervention methodology and its strategies, make analytical contributions, and validate academically the knowledge produced collectively.

Finally, CTO worked politically with the Las Calles community to make the need for connectivity a collective one, to construct it as a common demand, and conceptualize it as a right. Starting from these definitions, it recognized the CIN's potential to positively influence organizational projects; it evaluated the available resources, and defined self-management and cooperation with other organization as an option to meet this demand.

The second stage was that of the network's formation and initial deployment at Semillero. During this stage, the strategies developed

by AlterMundi, Redes AC, Pañuelos en Rebeldía and CTO were based on the premises of popular education. Other studies also emphasize the socialization and popular education processes in technology that allow strengthening and extension of these experiences oriented to the achievement of technological autonomy in marginalized communities (Huerta Velázquez & Baca Feldman, 2018).

Semillero was organized into distinct moments. The first objective was to foster self-knowledge and collective recognition of the relations between geographical, demographic, economic, cultural, and political aspects in the community, and of the rights targeted, obstacles faced, available, resources, and strategies.

The second objective was to build the complementary nature of the interpretive frameworks, that is, the referential approaches that allow analyzing and interpreting AlterMundi's and CTO's different realities and problems, their objectives and strategies concerning technological and food autonomy, as well as the importance assigned to self-management by both organizations. The analogy between food autonomy and technological autonomy is based on the realization that both food and the Internet network are objects in dispute between two models: one tending to concentration; the other, to democratization. Similarly, subjects are understood in both cases as citizens empowered with the ability to build their own Internet as well as self-determination in matters regarding food (Echániz, 2017; Haché, 2014).The fact that these perspectives are compatible and complement each other was also pointed out by Binder y Martu (2020) in connection with the link between the commitment to technological sovereignty and the feminist fight against male violence online, and by López Gabrielidis and Navarro (2020), regarding the relationship between digital and reproductive sovereignty.

The third objective was oriented to showing the meaning, pertinence, and possibility of a community Internet network as a tool to solve the problems that had been identified. The fourth objective was aimed at technical training. To this end, didactic materials developed by AlterMundi on the basis of previous experiences were used. Therefore, they are also the result of a collective knowledge construction. At this point, it was crucial to translate the jargon and technical culture marked

by a foreign language (English) into one that was accessible and understandable (Daza, 2019). Finally, the fifth objective was to deploy the community Internet network.

The strength of the methodology applied in Semillero lies in that the practical experience of handling technology enables subjects to know and recognize this objective possibility so that it becomes a subjectively perceived one. This process is a necessary condition for the individual and collective appropriation of technology. At a subjective level, it is impressive to see how, after 36 hours of work, connectivity is granted to a community that had no access to it. "There's Internet here?", wondered in disbelief and surprise the owner of one of the houses where a node was installed, after a hot and long day of work (I. Tejeda, personal communication, November 23rd, 2019). Baladrón (2020) also points out the results of the activities of the Latin American community networks: access to connectivity and technology appropriation by the community.

The third stage was that of the network's maintenance and extension. The main collaborative strategies of knowledge production involved AlterMundi, CTO, NonoLibre (the other community Internet network already existing in the Traslasierra Valley), as well as MonteNet and QuintanaLibre, which are members of the Argentine Summit of Community Networks (CARC) in the province of Cordoba. They cooperated in providing technical assistance, solving problems, and in producing and seeking material resources and financing for the network's maintenance and extension. These organizations fostered the extension of the ElValleReinicia network, deployed in the town of Las Calles as well as its interconnection with the existing NonoLibre network in the neighboring town of Nono. Links were also established with the towns of Las Rabonas and Río de los Sauces, both in the Traslasierra Valley.

These strategies were based on the practical solution of arising problems allowed the progressive appropriation by CTO of the necessary tools and methodology for the network's maintenance and extension, thus enhancing its competences in this respect. As a result, there was a greater involvement in the network's maintenance on the

part of the community and a willingness to take over the solution of possible problems. The experience of taking daily care of the network was a key factor in having CTO members share with others the power of making their own Internet.

> In a few weeks we are going to Río de los Sauces, a community in the hills that has no access to any kind of signal or Internet. Part of my family lives there. I suggested this place because I know what it's like having to climb mountains in order to get signal. Now, with the pandemic, young people like my brothers can't get their schoolwork done on time, precisely because they have no Internet access (I. Tejeda, personal communication, September 9th, 2020).

Besides, AlterMundi and CTO articulated with other provincial, national and international organizations and universities in order to influence public policies. To this end, they organized and participated in public events; shared remote groups with collaborative digital tools, and cooperated with groups that wanted to deploy CINs. In this respect, the First Latin American Summit of Community Internet Networks and the First Argentine Summit of Community Internet Networks were instrumental in the national and regional articulation of organizations interested in collaborative knowledge production between digital and territorial activists regarding the deployment of such networks. The CARC sought funding from international organizations in order to deploy new CINs, strengthen the Community Networks' existing ones, and promote links between Argentine networks.

Summing up, the organizations of digital and territorial activists that deploy community Internet networks develop multiple strategies of collaborative knowledge production aimed at developing and producing technology that meets these organizations' needs; implementing popular education in technology; promoting the deployment and interconnection of networks in rural territories; and influencing the articulation and strengthening of Argentine and Latin American community networks as well as the formulation of both national and regional public policies.

ORGANIZATIONS

This section deals with the trajectory, competences, and resources of the organizations that produced technological and political knowledge for the deployment of the community Internet network in Las Calles. Such organizations were AlterMundi, CTO Traslasierra, Redes AC, Pañuelos en Rebeldía, international NGOs of digital activists, the other community Internet networks in Cordoba, and the research team Sociedad Civil Derechos y Políticas de Comunicación y Cultura (Civil Society, Rights and Policies of Communication and Culture) of the National University of Cordoba. It is aimed at proving that these collectives possess and control competences and resources that complement one another regarding collaborative strategies of technological and political knowledge for the deployment and strengthening of community Internet networks.

AlterMundi is a non-governmental organization devoted to the development of free software tools, documentation, and open hardware for the deployment of low cost, high performance free community networks by people with no specific training in areas with connectivity issues. It was formed in 2011 in the rural town of José de la Quintana, Cordoba, Argentina. In 2012 it founded the community network called QuintanaLibre. Since then, it has carried out the deployment of various CINs. It promoted the creation of the first net of community networks in the country and contributed in deployments in other parts of Argentina. It has also participated in experiences in Nicaragua, Brazil, Colombia, and Mexico. There are two non-profit organizations that promote CINs in towns with less than 5 000 inhabitants in Argentina, but only AlterMundi has legal identity and a national license. This enables it to request financing from the national regulatory agency for telecommunications and it also receives international financing. It promoted the creation of the Dynamic Coalition on Community Connectivity sponsored by the United Nations Internet Governance Forum and Internet's Society's (ISOC) Community Networks Special Interest Group (Baladrón, 2018). Since 2019, it has been a member of CARC, which seeks to influence public policies for the sector (AlterMundi, 2020).

CTO (Community, Work and Organization) Traslasierra is a territorial social organization that has been working in towns in the Valley of Traslasierra since 2012 (Hernández & Martí, 2019). In 2019 it was in the process of obtaining legal identity as a cooperative. Its objective is to strengthen the organized and self-managed work of rural communities and to foster food sovereignty. It produces food agro-ecologically, markets it in local fairs, and makes community purchases. It obtained funds from the national government to purchase machinery, infrastructure, and vehicles besides monthly income for popular economy (F. Puzio, personal communication, November 22nd, 2019). At a provincial level, it is a member of the Rural Workers' Union (UTR), which, in turn, is part of the Confederation of Popular Economy Workers (F. Puzio, personal communication, August 16th, 2020). It is also in contact with the National Forum of Farm and Agrarian Organizations, the Farmers' Union of Traslasierra Valley which is part of Cordoba's Farmers' Movement, and with the United Organizations of Popular Neighborhoods of Cordoba, among others.

Village Telco (South Africa), Güifi.net (Spain), AlterMundi (Argentina), Ninux.org (Italy), FunkFeuer.at (Austria), and FreiFunk.net (Germany) are the digital activists' organizations that cooperated in the development of the LibreRouter. Financing was provided by the Regional Fund for Digital Innovation (FRIDA), which depends on LACNIC, the Internet Addresses Registry for Latin America and the Caribbean.

The research team that produced this paper at the request of AlterMundi studies the role of civil society in the disputes for rights to communication and culture. Its members are also part of social collectives in the sector and have wide experience in cooperating with various kinds of social organizations

Two associated organizations contributed to enhance the strategies of popular education in technology that were developed by AlterMundi and CTO during Semillero. Pañuelos en Rebeldía is a team devoted to popular education that seeks to contribute to the political training of social movements, assisting in the systematization of the pedagogical dimension of their practice. Redes por la Diversidad,

Equidad y Sustentabilidad A.C. (Networks for Diversity, Equality, and Sustainability A.C.) is a civil association based in Mexico City. It was formed in 2004 and its objective is to promote the formation of networks that support and facilitate the processes of developing telecommunication technologies for organizations, groups, and communities. Redes was the first NGO in Latin America to implement a Semillero with the objective of deploying a community network in Mexico.

Finally, the community Internet networks QuintanaLibre, La SerranitaLibre, NonoLibre, and MonteNet participated in Semillero and, in particular, cooperated in the net's maintenance and extension. Nonolibre was the closest geographically; MonteNet, like CTO, was in the start-up phase of a community net built from scratch; QuintanaLibre is the net promoted by AlterMundi's founders; and LaSerranitaLibre stands out for its participation in the activities promoted by this NGO and CARC as well as for its management capacities.

Summing up, AlterMundi, CTO, as well as the other organizations are actors with three kinds of key competences in the process of education-action carried out, namely complementary organizational, technical, and pedagogical competences; they also work at complementary local, provincial, national, regional, and international levels; and they are recognized in their areas of competence. Therefore, the positions they occupy are unequal in power but complementary regarding collaboration in the production of knowledge aimed at deploying and strengthening community Internet networks in rural areas.

CONDITIONS OF POSSIBILITY

This section deals with the various conditions –namely economic, legal and those related to public policies, infrastructure, and equipment– that made possible the collaborative processes of knowledge and technology production in order to promote the community Internet network in Las Calles. It is argued that, in order to provide connectivity in a rural community, collaboration between organizations of different kinds and levels of activity is necessary, since in spite of their legal

recognition there is no state financing for community Internet networks in the country.

Community Internet networks were recognized in 2014 by law 27078 Argentina Digital as providers of telecommunications services in Argentina. The law also establishes the promotion of such networks by means of specific programs. This was achieved as a result of incidence by organizations like AlterMundi. This law differentiates Argentina from most Latin American countries, where there is some kind of regulation about the provision of telecommunications services in distant zones, but no reference is made to community networks (Díaz Hernández, 2018).

In 2018, resolution 1895 granted AlterMundi the license to provide services of information technology and communications in towns with less than 5 000 inhabitants. However, until 2019 no funds from the Universal Services Fund that promoted the CINs had been granted. As a result, economic issues were also solved cooperatively. The initial deployment was financed with funds sought by AlterMundi and provided by APC (Association for the Progress of Communications) and ISOC. Such funds were used to finance transportation, LibreRouters, teaching material, and part of the tools. (M. Giudice, personal communication, August 12th, 2020). CTO provided lodgings, refreshments, and tools, while NonoLibre also contributed lodgings and refreshments.

The maintenance of ElValleReinicia was covered until 2020 with resources obtained by CTO. At present, CTO and the other networks in Traslasierra are seeking the provision of broadband service from state, community, and private institutions (ElValleReinicia, personal communication, November 25th and 26th, 2019). CTO procured the materials for extending the network by means of purchases or donations, LibreRouters provided by AlterMundi at cost price (ElValleReinicia, personal communications, February 28th and March 3rd, 2020), and funds provided by FRIDA.

As regards the existing connectivity infrastructure, access to connectivity in Argentina is very uneven, far from universal or equitable. One third of households have no Internet access. Cellular phones are one of the main ways to access Internet, and almost 90% of

users have prepaid plans (ENACOM, 2020). Although there are 2 000 operators, only three of them concentrate provision of the service.

In Traslasierra, only owners of tourism facilities and those with higher acquisition power have land lines (F. Puzio, personal communication, September 3rd, 2020). In some places there is no signal for mobile telephony and where there is, it is lost during storms as well as in the summer, due to greater use of the net by tourists, and most families only own mobile telephony devices.

Internet provision in Traslasierra is monopolized by Arnet (Telecom). There are a few retail providers, but families in Las Calles cannot afford the service. Only three households were provided with wireless connection by a local supplier, but it worked "very badly" (F. Puzio, personal communication, September 3rd, 2020).Those who had access to the Commune's WiFi password were able to use its service, but it was precarious, therefore, most resorted to buying mobile data when they needed a connection.

In Las Calles, there is a 200 volt power supply provided by the Nono Cooperative of Public Works and Services, Ltd. Families do not own solar panels and there are frequent power outages during the summer because of increased consumption (F. Puzio, personal communication, September 3rd, 2020). This proves the need to ensure connectivity access in a rural area where the service offered by commercial providers is both expensive and low quality. Also, the free service provided by the state is precarious and short range.

Summing up, collaboration between different kinds of organizations at local, provincial, regional, and international levels with the objective of providing accessible and quality connectivity in a rural community took place in a country whose legislation recognizes community Internet networks as legal providers of telecommunications services and establishes a promotion mechanism, which had not been made effective yet. In the absence of state financing, the only way to produce knowledge in order to deploy the community Internet network was to act collectively, with international cooperation and the solidarity of the participating organizations.

CONCLUSIONS

As has been proved in the above sections, the self-managed deployment of a community Internet network calls for the convergence of multiple collaborative strategies between various organizations of different levels, action spaces, and expertise. The first preparatory stage included the collaborative development of the LibreRouter by organizations from different continents on the one hand, and of the Semillero methodology by AlterMundi from Argentina and Redes AC from Mexico, on the other. There was also cooperation between organizations of digital and territorial activists and this research team. Additionally, a collective demand was constructed as well as the willingness to respond to it by means of self-management.

In the second stage, the formation and initial deployment of the community Internet network, Semillero was implemented with cooperation from territorial, popular communication, popular education, and CINs organizations, among others.

Finally, in the third stage, that of the network's maintenance and extension, CTO, AlterMundi, and other community networks in the province collaborated in the production of technical knowledge and of skills for seeking financing and resources to solve practical problems, on the one hand, and, on the other, of political knowledge for the national and regional articulation of community Internet networks and for incidence on national and international public policies.

The facilitating role played by organizations with various competences and complementary resources working in articulation with each other was a key factor. In this way, organizations act as facilitators and guides of the processes of collective formation and development of knowledge and technology, taking into account the opportunities offered by the existing conditions as well as the trajectories of the subjects and communities involved. Similarly, the organized community had a crucial role as a collective learning community that supports, sustains, encourages, and makes possible collaborative learning and self-management. This is so because the deployment, extension, and maintenance of a net require groupality, a shared common space, a

collective trajectory, and the building of an "us". It is in collaborating that organizations turn their heterogeneity into power.

Key factors were, in this respect, recognizing a common problem, turning the shared need into a collective one, and the political construction of a collective demand as well as the creation of an agreement on the way of looking for the solution to such problem and the answer to that demand. Similarly, it was necessary to have a shared history and the vision of a common future and a collective project as well as to envision all the actors together in that territory. Each one of these strategies implies processes of self-knowledge and of recognition of the objective conditions and the participating subjects.

Another key factor in the collaborative process was the change in perspective regarding the attitudes towards digital technologies that made it possible to turn passive subjects who do not want to, do not know and/or cannot carry out a self-managed project for the solution of their needs into active subjects that develop, apply, and manage competences to promote a community Internet network. In order to achieve such appropriation, it is fundamental to relate technology to daily problems, to practice, and to experiment. Besides, an understandable discourse was needed, that would turn accessible the jargon and culture of technicians, marked by a foreign language shared by the international community of specialists. Furthermore, there was permanent collaboration in the building of compatibility between interpretive frameworks, political views, and conceptions of social issues in terms of democratization, extension of rights, building of autonomies and sovereignties, and collective projects that pose alternatives to concentrated capital. These are issues shared by the community character of territorial organization and the community character of digital activists' collaborative culture (Castells, 2001). Finally, this process required analyzing the social and territorial conditions, problematizing the network's functions in the systems of relationships between territories, and adapting the technology to those conditions.

Considering the needs for connectivity access in wide territorial sectors of Latin America and the scarce recognition and promotion policies of community Internet networks as legal suppliers of telecommunications services, it becomes clear that the strategies

both of articulation and cooperation with other local, national and international networks and of incidence on national and international telecommunications policies are relevant ways to obtain support and ensure the CINs' long term sustainability.

These territorially located and socializable processes of production of technological and political knowledge strengthen the competences of participating people and organizations. On the other hand, they contribute in stressing wider relations of power, since they offer supplies to influence similar processes and public policies for the sector. Therefore, these practices change the rules of the game in connectivity technologies as well as in social and political organizations.

The strategies of collaborative knowledge production are at the very heart of popular education and communication as a dialog of knowledges oriented to emancipating subjects who are historically violated. Technological sovereignty is thus promoted as a liberating instance, articulated with others such as food sovereignty. In this respect, community Internet networks distinguish themselves from neo-diffusionism in that they promote self-managed solutions to connectivity focused on communities, their needs, and potentialities.

For all of the above, and unlike preceding papers that emphasize the technical and pedagogical role of organizations promoting CINs, the present work states that it is the community itself that creates and maintains the Internet network. The network creates a community where there is none. In any case, it strengthens the existing one: the community fabric is part of the existing collaborative framework it appeals to. Without it, neither the initial development nor the long term sustainability of a community Internet network would be possible.

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