

Navigating the Nexus: Blockchain technology, social Innovation, and complementary digital currencies

El nexo: tecnología Blockchain, innovación social y monedas digitales complementarias

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Cómo citar este artículo/Citation: Raffaelli, Paola; Nowak, Vicky (2025) Navigating the Nexus: Blockchain technology, social innovation, and complementary digital currencies. *Arbor*, 201(813): 2922. <https://doi.org/10.3989/arbor.2025.813.2922>

Recibido: 10 julio 2024. Aceptado: 10 abril 2025. Publicado: 17 octubre 2025

ABSTRACT: This paper explores the tensions between democratic and technocratic forms of social innovation in the context of complementary digital currencies. Through an in-depth ethnographic case study of Moneda PAR, a blockchain-based complementary currency in Argentina, we examine how diverse agents — including grassroots activists, political actors, academics and software developers — collaborated to design a financial social innovation aimed at economic inclusion. Building on the tension between democratic and technocratic social innovation paradigms, our analysis reveals that while blockchain technology addressed key limitations of earlier initiatives such as *Clubes de Trueque* (barter clubs), it also introduced new dependencies on technical experts. We show how conflicting motivations and unequal power over technological tools disrupted governance processes and undermined the long-term sustainability of the initiative. In so doing, this paper contributes to scholarship on digitalisation and social innovation by highlighting how technologies, while offering inclusionary potential, can also reproduce power asymmetries.

Keywords: complementary digital currencies; blockchain technology; social innovation paradigms; digital governance

RESUMEN: Este artículo explora las tensiones entre formas democráticas y tecnocráticas de innovación social en el contexto de las monedas digitales complementarias. A través de un estudio de caso etnográfico en profundidad sobre Moneda PAR, una moneda complementaria basada en blockchain en Argentina, examinamos cómo diversos agentes —activistas de base, actores políticos, académicos y desarrolladores de software— colaboraron en el diseño de una innovación social financiera orientada a la inclusión económica. Basándonos en la tensión entre los paradigmas de innovación social democrática y tecnocrática, nuestro análisis revela que, si bien la tecnología blockchain permitió superar limitaciones clave de iniciativas anteriores como los Clubes de Trueque, también introdujo nuevas dependencias respecto de expertos técnicos. Mostramos cómo las motivaciones en conflicto y el poder desigual sobre las herramientas tecnológicas alteraron los procesos de gobernanza y minaron la sostenibilidad a largo plazo de la iniciativa. Con ello, el artículo contribuye a los estudios sobre digitalización e innovación social, al destacar cómo las tecnologías, aunque ofrecen potenciales inclusivos, también pueden reproducir asimetrías de poder.

Palabras clave: monedas digitales complementarias; tecnología blockchain; paradigmas de innovación social; gobernanza digital

INTRODUCTION

Innovation is increasingly recognised as a fundamental driver of economic growth and competitive advantages (Malerba, 2002), and a key tool for addressing grand societal challenges (United Nations, 2021). Social Innovation (SI) encompasses activities based on three principles: it meets a social need or addresses a social problem; it creates new forms of social relations; and it empowers agency within existing institutional structures, potentially transforming them (Moulaert and MacCallum, 2019; Laville and Eynaud, 2019). Going beyond technological innovation, the term social focuses on creatively reconfiguring social relations (MacCallum *et al.*, 2009) to improve quality of life, wellbeing, and community empowerment (Pol and Ville, 2009; Dawson and Daniel, 2010; Cajai-ba-Santana, 2014). Thus, SIs are agentic, relational, and situated actions that not only aim to meet the material needs of the vulnerable but also explore new ways of doing things, question power and value systems, and ultimately pursue social transformation (Smith *et al.*, 2014; Cajaiba-Santana, 2014; Seyfang and Longhurst, 2016). However, it is uncertain yet if all SI respond to this understanding.

Community currencies (CC) are one form of SI that seek develop economic inclusivity (Seyfang, 2004). Designed, developed, and organised by communities, CCs help expand local markets, create networks between users, retain economic activity locally and sometimes build bridges with local governments (Zapata Campos *et al.*, 2023). There are more than 5,000 complementary currencies worldwide (Blanc, 2018) and reflecting the way that payments in traditional markets have increasingly become digital, many CCs have transitioned to digital platforms. Digital CC can be broadly divided into two main categories (Diniz *et al.*, 2019). The first includes general digital platforms that use technologies such as magnetic cards, mobile apps, or point-of-sale systems, and can be further classified into local, proprietary, or commons-based models. These systems are typically designed for use within specific geographic areas, support local governance, and are often well suited to users with limited technical knowledge (Faria *et al.*, 2020), such as the Mumbuca E-dinheiro currency in Brazil (Faria *et al.*, 2020; 2022). The second category refers to cyber platforms built on blockchain technology offer greater transparency and security through decentralised architectures, and enable use across wider geographical networks (Diniz *et al.*, 2019; Diniz *et al.*, 2024). However, dynamic blockchain platforms involve more complex, evolving architectures, which «include a larger number of technology elements... and create a more complex interaction among all elements» (Diniz *et al.*, 2019, p. 76), implying greater reliance on technical experts than traditional card or mobile payment systems. Whilst digitalisation is seen as a way of reducing costs, preventing fraud and enabling better management of currency circulation, the impact of this technology on CC governance and impact remains underexplored (Diniz, *et al.*, 2019). Furthermore, digitalisation built on complex technical infrastructure, and which excludes communities from actively participating in design and governance, can undermine the principles of autonomy and economic democracy that community currencies aim to support. The challenges relate not only to managing the technology, but also to ensuring that governance remains shared rather than centralised—especially as the currency grows (Faria *et al.*, 2022). These concerns have led to calls for more research on how the digitalisation of CC influences the economic democracy they aim to achieve (Faria, 2020; Diniz *et al.*, 2024).

This study responds to these calls by examining how digitalisation of CC, particularly the use of blockchain, affects power relations within CCs. We explore tensions between community empowerment and technological development in CC adopting blockchain software through the lens of SI theory, drawing on Montgomery's (2016) social innovation paradigms that distinguish between democratic and technocratic forms. In doing so, we address the need for research in interactive spaces in social innovations (van Wijk *et al.*, 2019), particularly in digital platforms for co-creation (Grönroos, 2012). Our research focuses on the case of Moneda Par, a digital CC based on blockchain technology, established in 2017 as a financial social innovation. The case is set in Argentina, a country known for its extensive monetary experimentation over the past 70 years, particularly following the 2001 crisis (Gomez & Dini, 2016), when the *Clubes de Trueque* network of community currencies helped millions of Argentinians survive economic collapse. Drawing on 18 months of participant observation, in-depth interviews and secondary sources we use an analytical historical approach (Rowlinson, Hassard and Decker, 2014; Wadhwani, 2016) to understand how Moneda PAR built on the legacy of *Clubes de Trueque* and how blockchain reshaped its governance and functioning. In taking an historical approach, we respond to calls for context-specific studies of CC development (Diniz *et al.*, 2024).

In the following paper, we begin by outlining our theoretical framework, drawing on Montgomery's (2016) distinction between democratic and technocratic social innovation, alongside literature on empowerment, digitalisation and interactive spaces. We then introduce our Moneda PAR case and methodological approach, outlining the steps taken in data collection and analysis. We then provide contextual detail on Argentina and Clubes de Trueque, to provide the historical influences on the development of Moneda PAR. In our findings we outline the successes of Moneda PAR, particularly its significant improvements over Clubes de Trueque as a digital currency before developing two vignettes that illustrate the limitations introduced by blockchain technology. These form the basis of our discussion which develops three key contributions to the literature on SI and digital CC. We conclude by reflecting on the broader implications of our analysis for the design and governance of complex technological SI driven by diverse groups of stakeholders.

BLOCKCHAIN BASED COMMUNITY CURRENCY – DEMOCRATIC EMPOWERMENT OR TECHNOCRATIC SI?

Democratic social innovation addresses social and economic inequalities by challenging mainstream views and harnessing community action to transform systems (Montgomery, 2016; Fressoli *et al.*, 2014), meeting the needs of the vulnerable while questioning power structures and value systems, ultimately aiming for social transformation (Martin and Upham, 2015; Daskalaki *et al.*, 2019). Often rooted in activist projects, democratic social innovation challenges capitalist structures through communal ownership and relies on voluntary labour, grants, or mutual exchange (Seyfang and Longhurst, 2016). It addresses social problems and inequalities through «new ways of doing, organising, framing and knowing» (Montgomery, 2016; Pel *et al.*, 2020, p.3) by connecting innovation and community action, deeply anchoring it in the local context (Nowak and Raffelli, 2022). CC in the global South can be seen as democratic social innovation, emerging as a collective response to economic exclusion and supporting informal economic exchanges where formal markets have failed (Gomez, 2010; Zapata Campos *et al.*, 2023). These currencies provide a collective alternative to formal markets, based on mutual help and citizen participation, challenging existing practices. They are characterised by self-management and the establishment of democratic decision-making frameworks, empowering members of society to take control of their livelihoods.

In contrast to democratic forms, the technocratic school aligns with a neoliberal paradigm (Montgomery, 2016) incorporating Schumpeterian conceptions of heroic entrepreneurs whereby talented individuals address social issues more efficiently than government structures (Nicholls and Teasdale, 2017). This highlights the role of science and technology, focusing on the innovation of knowledge, processes, and outcomes to generate community social inclusion (Martin & Upham, 2016; Smith *et al.*, 2014). Schumpeterian innovation argues for replacing the *old* and *bureaucratic* with *new* and *creative* innovations, increasing impact by framing neoliberalism within the ideas of efficiency, necessity, and empowerment (Montgomery, 2016, p. 1987). In line with this, recent research from entrepreneurship has focused on the potential of CC as an alternative monetary system in supporting and sustaining entrepreneurs (Kuk *et al.*, 2024). While the goal of SI is to empower individuals and communities by providing knowledge and control to challenge dominant rules, the focus on technological innovation can risk neglecting societal concerns. The technocratic perspective resonates with the adoption of blockchain technology in CC, where technological innovation leads to more efficient and novel ways of operation. However, this view is inherently elitist, relying on experts to deliver transformation, with both technical and democratic 'experts' driving change (Montgomery, 2016). These competing positions help us understand the tensions within a participatory CC that relies on technical innovation developed by experts.

These tensions between technocratic and democratic elements of CC based on blockchain technology are evident when considering whether the innovation empowers communities to take control of their local economic systems. Empowerment involves an individual's belief in their own self-efficacy—the conviction that they can influence events towards desired outcomes (Elmes and Smith, 2001, p. 34). Social innovations empower disadvantaged groups by integrating democratic frameworks that enable autonomy and self-regulation according to participants' core interests and values (Avelino & Wittmayer, 2019). Communities have demonstrated the ability to create, develop, and maintain financial social innovations that enable transactions based on trust in a collectively managed monetary system (Servet, 2013), allowing networks to actively and creatively reclaim and reorganise money (Barinaga and Zapata Campos, 2023). Contrary to the privatisation of money, CC represent a citizen claim on money. The process of *commoning* money—designing and negotiating their own currencies—empowers

communities (Barinaga *et al.*, 2021). However, when this process depends on technological or technical experts, the community risks losing control over the governance of their monetary systems (Faria *et al.*, 2020).

Empowerment has a dual aspect, where uplifting one group can potentially disempower others. Avelino & Wittmayer (2019) illustrate this with the example of time-banks, showing that while promoting individual self-development and reducing dependency on money benefits some, it can lead to increased administrative burdens, regulation, and mission drift, ultimately hindering innovation and alienating members over time. Empowerment often creates dependencies, where those in power granting authority to others can reinforce their own dominant positions (Avelino, 2021). For instance, paid project workers entering a community may inadvertently cause community members to perceive themselves as unskilled and defer to professionals, thus diminishing community empowerment (Finlayson and Roy, 2019). Software development typically requires predefined algorithms and standardized rules, anticipating community negotiations and agreements on the governance of the monetary system (Rozas *et al.*, 2021). While digitalisation can enhance the reliability and transparency of complementary currencies, it also imposes rigid governance frameworks. This can be problematic if community governance agreements diverge from the pre-established blockchain code.

While social innovation is a collective process, individual empowerment is essential for participation. Empowerment for social change occurs through a mutually reinforcing loop of individual and collective empowerment (Oosterlynk *et al.*, 2019). This can be differentiated from individualised empowerment, that is concerned with meeting personal needs and improving individual income or status. Empowerment can emerge from within the community, but outsiders can also catalyse change and empower disadvantaged communities (Barinaga and Zapata Campos, 2023). Excluded individuals often live in impoverished contexts, making daily life challenging and limiting their ability to envision alternatives (Battilana and D'Aunno, 2009). Outsiders can bridge resource gaps by converging in 'interactive spaces' with the community (van Wijk *et al.*, 2019), leveraging on their technical or technological expertise which can be crucial for social innovation. For example, Fresoli *et al.* (2014) demonstrate that social innovations resulting from community and technology developer interactions can foster local development and empowerment when the community controls «both the innovation process and the distribution of outcomes» (p.284). However, critical theory argues that external empowerment efforts can reproduce existing power dependencies. Power is not a pre-existing capacity; it must be self-developed through its exercise (Avelino, 2021). Therefore, the role of outsiders in community empowerment within the social innovation process remains contested.

Motivations for engaging in social innovation are generally framed as prosocial, driven by their care, ethics, altruism and compassion (Andre and Pache, 2016; Seelos and Mair, 2005). In the context of CC, Zapata Campos *et al.*, (2023) point to three grassroots motivations: to alleviate poverty; to challenge conventional imaginaries of innovation; and to embed initiatives in community through relations of trust. These motivations chime with the goal of social innovations of scaling social innovation deep, that is seeking to increase or enhance services provided to one group, rather than simply reaching more people (Andre and Pache, 2016; Smith & Stevens, 2010). However, these motivations are increasingly questioned, with recent research pointing to self-interest in prompting social innovative actions, recognising mixed motivations that combine social- and self-orientated reasons (Mascena, Barbosa, & Dumont, 2024). This recognises that a desire to address societal problems can exist in tandem with traditional entrepreneurial motivations, such as maximise their social impact and value by delivering services to a larger number of people (Desa and Koch, 2014; Islam, 2020). This maximisation drive relating to scaling-up social innovation can embed organisations in market-oriented discourses that depart from social goals (Bruder, 2025). Maximisation is associated with technocratic forms of innovation, contradicting motivations for social change anchored in democratic social innovation.

This tension is especially pronounced in CC that incorporate advanced technologies such as blockchain. When software developers introduce market-oriented perspectives on money, conflicting with the foundational principles of commoning money (Barinaga, 2020), or potentially when they are motivated by conventional entrepreneurial drivers, such as making the most of personal skills, or personal ambition to create high profile technological innovation.

RESOLVING THE TENSIONS THROUGH COLLABORATION IN INTERACTIVE SPACES



Addressing power differentials to achieve social change often takes place through the collaboration of various groups of agents with different expertise, who must meet, negotiate, and co-create solutions. These interactions take place in *interactive spaces* (van Wijk *et al.*, 2019), where agents develop social relationships, allowing them to understand each other's perspectives and interests. Haug (2013) emphasises the importance of such spaces, noting they «facilitate meetings and other kinds of face-to-face encounters that provide the [required] kinds of associational ties» (p. 707). Interactive spaces also bring together diverse types of agents. For example, they can unite networks of activists and organisations that generate innovative bottom-up solutions rooted in the community's local interests and values (Seyfang and Smith, 2007, p. 585), or build up on external experts who contribute essential knowledge for developing innovations (Marti *et al.*, 2013). These varied agents may have different motivations or differ in their expected outcomes although sharing a common starting. Consequently, while these groups can coexist and collaborate towards a shared solution, their visions of social innovation may be based on competing paradigms, such as technocratic versus democratic social innovation (Montgomery, 2016).

Interactive spaces are evident in the development of digital CCs, as community members, grassroots organisations, funders and software developers may come together to develop a new currency system. These relationships tend to support democratic forms of innovation, prioritising local knowledge and participatory governance frameworks (Faria *et al.*, 2020). However, in blockchain platforms the specialised knowledge of software developers is central to development and can take priority (Diniz *et al.*, 2019;2024). This can encourage the development of a technocratic paradigm where key decisions are placed within the remit of software and thus removed from the group decision-making (Montgomery, 2016). This introduces a risk that power relations within these interactive spaces become misaligned, where innovation takes place at the expense of local empowerment.

Bringing together these debates on social innovation, empowerment, and digital governance, we adopt Montgomery's (2016) typology of democratic and technocratic social innovation as our core analytical lens. The ongoing coexistence of the democratic and technocratic SI paradigms highlights that «social innovation is never neutral but always political and socially constructed» (Nicholls and Murdock, 2012, p. 4). Understanding how these paradigms operate in practice requires disentangling the rationales and motivations of the different actors involved as they shape both the process and outcomes of SI. The technocratic SI paradigm aligns with neoliberal logics, relying on experts' knowledge to address social issues and promote social inclusion through market rationale prioritising efficiency and scale (Montgomery, 2016). Here, empowerment is often framed in terms of access to tools and services, delivered by professionals to the beneficiaries. In contrast, democratic SI challenges dominant economic ideologies, leveraging community-led innovations and activist initiatives to drive deeper more transformative change (Montgomery, 2016). Empowerment in this paradigm is viewed as a self-developed capacity that enables autonomy and self-regulation based on principles and values, with outsiders playing a supportive role in stimulating community empowerment but not having the authority to grant it. This conceptual lens guides our analysis of Moneda PAR, helping us to explore how digital technology, particularly blockchain, mediate empowerment, participation and control in a community currency.

RESEARCH CONTEXT AND METHODOLOGY

The setting

This study forms part of ethnographic fieldwork on complementary currencies conducted in Argentina between 2020 and 2023. Moneda PAR, launched to the public in 2017, is a complementary currency leveraging Blockchain technology. Developed by a group passionate about monetary innovation, it operates as a mutual credit system resembling local exchange trading systems (LETS), allowing participants to access interest-free loans (for further details on mutual credit systems, see Barinaga, 2019). The name PAR derives from the Spanish word for peer, reflecting its peer-to-peer nature. Unlike traditional currencies backed by assets like gold or legal tender, «every PAR that is issued is backed by the transactions that take place within the community. Tokens [called PARES] are like a voucher for an existing product or service, or future ones» (White paper, 2018 p.5). The currency aims to «liberate the productive potential of various economic agents from the constraints of the conventional financial system» (Orzi *et al.*, 2021, p. 8). Its value is determined through collaboration among peer economic agents forming a network, contributing to the creation of collective value.

Data collection

The first author engaged with Moneda PAR as a currency user in 2020, quickly transitioning to a role in the national coordination of the currency. In this capacity, she closely monitored the economic activities of each local community or ‘node’, approaching data collection from ethnography (see Table 1). Between 2020 and 2022, she actively participated in regular Nodes’ Federation meetings of Moneda PAR, where representatives from all nodes across the country convened to discuss various currency-related issues following the principle of ‘one member (node) one vote’. Additionally, several assemblies were held during this period to formalise bottom-up, democratic decisions. Given this access to the whole community, Author 1 was able to distribute invitations to participate in the research through WhatsApp messages which nodes’ representatives distributed to their nodes. This resulted in 20 in-depth virtual interviews (lasting between 60 to 100 minutes) with users from diverse CC nodes throughout Argentina, as well as with those involved in the national coordination of Moneda PAR. To minimise the potential exploitative nature of research (Bell and Bryman, 2007), research participants received payment in PARES equivalent to one hour of work at the time. The resulting sample was 16 women and 4 men from the 11 nodes with the large majority of transactions at the time. These interviews explored topics such as participants’ engagement with Moneda PAR and their prior experiences with financial social innovations and Clubes de Trueque in particular. They also delved into the challenges Moneda PAR was facing at the time, opportunities presented by digital currencies, perspectives on innovation and ownership, and perceptions of their own futures as well as the future of Moneda PAR. In addition to primary research, extensive secondary data was collected, including internal documents such as executive reports and annual reports. In line with users’ reports, the interview sample covers the nodes with majority of monthly active users. This multifaceted approach provided a nuanced understanding of the social innovation process, examining the interaction of various agents in the currency, particularly in relation to community and blockchain technology ideas.

Table 1: Primary data collection

Ethnographic fieldwork (fieldnotes) 20 months in depth ethnography in nodes meetings and fairs, federation meetings, and management meetings. Additional visits and contacts over a 3-year period (2021-2024), observations captured informal conversations and participant interrelations.
Semi-structured interviews MAV – user & node coordinator HC - user & node coordinator HP – National leader RB – user PB – user DTS – user & node coordinator MLSM – user & node coordinator PVG – user LLP – user FL – user IVG – user PB – user MJ – user & node coordinator VAV – user RC – user & node coordinator RP – user AB – user & node coordinator IVG – user SV – National leader FC – National leader

Source: Own elaboration

Author 1 was fully immersed in ethnographic data collection, which enabled the development of close relationships with members of Moneda PAR. The separation of tasks strengthened the validity of the study and enhanced analytical clarity. Author 1's deep understanding of the Argentine context and economic history provided an insider perspective that informed the selection of relevant issues, events, and relationships during both data collection and analysis (Karra & Phillips, 2008). Meanwhile, Author 2, maintaining critical distance from the field, helped mitigate potential biases in interpretation (Alvesson, 2003). Her expertise in social innovation further validated Author 1's findings. This collaboration ensured a reflexive and well-balanced analysis, while the final analysis results from a consensual view between both authors.

Analysis was conducted iteratively, allowing us to move back and forth between theoretical frameworks and empirical data to generate inductive insights into the process of financial social innovation (Strauss and Corbin, 1998). We used open coding to identify key concepts in the data, employing an inductive approach to organise and present our themes (Attride-Stirling, 2001). In the initial analysis, we reorganized fieldwork data according to the participants' ideas about CC, highlighting the interconnectedness of events and the dynamic construction of meanings. Although Moneda PAR was not originally planned as a peer-to-peer tool (explained below), our data revealed that Clubes de Trueque significantly influenced its development, with connections to the original scheme emerging through observations and interviews. This enduring influence prompted us to contextualize Moneda PAR's development within the legacy of Clubes de Trueque.

The information provided by interviewees aimed to capture historic events that could trace the inception of current organisational practices and given the influence of past events relating to Clubes de Trueque, an analytical historical approach to analysis was adopted (Rowlinson, Hassard and Decker, 2014; Wadhvani, 2016). This involved supplementing the observations and interview data with a range of historical sources relating to both Clubes de Trueque and Moneda PAR, building an historical narrative to understand the factors influencing the organisation today. Analytical history emphasises the importance of comparison in understanding historical events across time, and across similar organisational forms, to uncover recurring challenges and the long-term consequences of past events, enabling and understanding of how the past continues to shape and influence the present. In this vein, theory on Clubes de Trueque was instrumental in guiding the process for making codes and organising codes (Lock *et al.*, 2022), resulting in rigor as «first and foremost an outcome of inferential reasoning processes linking data to theoretical conclusions» (Harley *et al.*, 2020, p.257).

Continuing with an iterative process, and in the pursue of putting patterns together (Lock *et al.*, 2022) we identified the perceived benefits of Moneda PAR compared to its Clubes de Trueque in a second round of data analysis, particularly due to its digital form. Participants reflected on how it embodies democratic social innovation, empowers users, and aligns with deep motivations of the involved activists –this frequently prompted comparisons to Clubes de Trueque, and is developed in our analytical history of Moneda PAR. The long-term and in-depth observations of the scheme's development uncovered the constraints in its implementation. Thus, in a further round of analysis we focused on the challenges related to the implementation of blockchain technology that we expand upon below in two vignettes focused on the challenges emerging in the scheme.

THE ARGENTINIAN ECONOMIC CONTEXT AND CLUBES DE TRUEQUE CC

Argentina's openness to CC stems from a monetary system that historically saw several currencies co-existing. The American dollar has been used in practice since the 1950s (Gomez, 2019) along with the exchange of goods and other valuable assets such as soybeans in lieu of money (Luzzi and Wilkis, 2018). This currency pluralism emerged in response to rampant inflation that has beleaguered Argentina's economy over many years – for instance annual inflation averaged 300% between 1975 and 1990 (Kiguel, 1991). To secure and maintain value, the Argentinian people have turned towards alternatives to the peso. While a comprehensive overview of the history of Argentina's currency can be found elsewhere (for instance, Gomez, 2019), here we aim to provide the reader with the context behind the emergence of the largest CC global network to date – Clubes de Trueque (CT, barter clubs) - and how that prepared the ground for Moneda PAR's CC based on blockchain technology.

Argentina faced its worst socio-economic crisis in December 2001, with the poverty rate reaching 47.8% and unemployment at 21.5% (INDEC, 2002). As the crisis deepened throughout the 1990s, a group of ecologists established a marketplace on 1st May 1995, amidst worsening economic conditions. This initiative was designed to facilitate bartering among themselves, serving both to meet their needs and as a reaction against the harsh neoliberal policies of the time, enabling survival during difficult economic periods through an alternative to the formal market system, until people were able to meet their needs in the conventional market. The idea was to produce and consume home-made goods exchanged in the marketplace, valuing working capacity with other goods rather than money. As the group was rather small in the beginning, it was direct barter –a member making clothes exchanged a pair of trousers for two chickens reared by another member. However, while the economic situation worsened, the scheme quickly appealed to a now unemployed and disenfranchised middle class who saw CT as way to make complementary income, secure basic needs or protect their lifestyle. By 1997 there were almost 70 CT barter clubs in different neighbourhoods (Morisio, 1998), that offered an alternative source of providing income for many as the economic situation deteriorated (Gomez, 2022).

CT clubs quickly grew in scale and number, and by the crisis of 2001 it is estimated that there were more than 5,000 clubs that between 4.5 and 6 million people regularly participated in (Ovalles, 2002; Fiszbein *et al.*, 2003), accounting for a third of the economically active population. The type of goods exchanged also expanded, and it was possible to trade almost anything - from locally grown and homemade food, haircuts, and cleaning services to books, clothing, and brand-new products that were the bankrupt stock of businesses that had gone into liquidation due to the economic recession.

The clubs were grouped into four regional networks that operated in a de-centralised manner as an umbrella for each club. Networks introduced notes to facilitate exchanges which enabled members to trade across several clubs (shown in Image 1). Although, initially members kept to one network, the reliance on CT clubs to alleviate increasing poverty led many households to participate in several clubs (Gomez, 2022), sometimes across from different networks. Clubs began to accept notes from other clubs and networks, making it necessary to hold trans-network meetings to clear debts among them. While these meetings initially were perceived as a way to resolve the operative issues of a national scheme and generated the opportunity to discuss the purpose of CC more broadly, soon the different views about CC management clashed in these meetings.

Picture 1: Notes from Clubes de Trueque networks.



Source: Authors' own archive.

The rapid growth and expansion of CTs was unplanned and became chaotic, to the extent that by 2002 several problems emerged. Firstly, similar to issues found in other complementary currencies (Barinaga, 2019), clubs reproduced inequalities seen in the formal economy, whereby clubs in affluent neighbourhoods offered a larger variety of goods and services. Second, as the poorest joined CTs to meet their daily living needs, there was excess demand for basic goods, creating speculation and inflation. Nodes' notes were simply printed papers that each club acquired from the network. Rising prices also necessitated an increase in the number of notes in circulation, and networks printed more to keep up. While some nodes followed good practices, others saw in this a possibility for individual benefit. In 2002, a large-scale forgery of CT notes across all networks compromised the scheme. Although the issue partially derived from internal management failures, it is also believed that traditional political parties were involved in undermining CT's credibility along with criminal gangs seeking to secure the survival of populism and political clientelism (for a detail analysis on the forgery scandal, see North, 2005; 2008). Soon after this issue became a massive media scandal that severely undermined the trust and credibility of the whole scheme (Clarín, 17 October 2002). As a result of this in parallel to the vigorous recovery of employment and income (Gomez, 2022), the number of clubs fell sharply from 5000 in 2002 to 1000 clubs 15 months later (Gómez, 2012).

Several scholars have examined the collapse of Trueque (Gómez, 2010; North, 2005; 2008; Pereyra, 2006), while Gomez (2012) suggests the reasons are related to the lack of resilience in governance across four dimensions: legitimacy, rule enforcement, resource synergies, and transaction and organisational costs. Firstly, regarding legitimacy, although with different models, most leaders had minimal infrastructure, control mechanisms, or means to monitor clubs, with contact primarily focused on acquiring Trueque notes. Secondly, rules were set by network coordinators but lacked effective enforcement mechanisms, relying on peer responsibility. Operating rules were agreed within clubs – consensus was easier in clubs rooted in existing communities, like schools, or among ideologically aligned participants–, although many members and coordinators did not feel accountable for rule compliance, which undermined the scheme's legitimacy. Thirdly, transaction costs were relatively low as clubs within the same network shared notes. However, this compromised the scheme's resilience and survival. Lastly, the loose structure of networks hindered coordination for partnerships with other organisations providing high-demand products such as food, affecting resource synergies. Given the intrinsic limitations of CT, Moneda PAR aimed to overcome them from the outset.

MONEDA PAR, THE FIRST BLOCKCHAIN MUTUAL CREDIT COMPLEMENTARY CURRENCY

Our analysis brings practical insights into the benefits and limitations associated with financial social innovations, specifically focusing on digital complementary currencies leveraging blockchain technology. Initially, it discusses how Moneda PAR is the result of the collaboration between different groups of experts, and the chosen technology provided benefits to overcome the mistakes of the past made by CT. As the analysis unfolds, it becomes evident that these groups harboured varied motivations, mindsets, and engagement patterns, each with distinct expectations regarding Moneda PAR. When expectations were unmet, unforeseen limitations raised, particularly concerning the challenges on developing a blockchain digital wallet to meet the specific needs of Moneda PAR's local nodes and users. We argue that these limitations are intertwined with differing visions of social innovation, as articulated through the competing paradigms highlighted by Montgomery (2016).

OVERCOMING MISTAKES FROM THE PAST WITH TECHNOLOGY

In 2016, four groups with diverse interests in money and alternative payment systems engaged in the development of a complementary currency pooled their expertise to establish Moneda PAR. Firstly, a group of political activists and well-connected politicians, who were critical of conventional money's constraints on disadvantaged communities, saw the potential liberation offered by a complementary currency (CC). This group had connections with a Catholic organisation *Observatorio de la Riqueza Padres Pedro Arrupe* aligned with Pope Francis II's ideas about peace and justice, and influenced by the Liberation Theology that advocated grassroots action in fighting for the poor and marginalised associated with the Movement of Priests for the Third World. Secondly, academic experts in monetary theory who saw CC as a means to boost local economies, in particular impoverished local neighbourhoods experiencing liquidity shortages - insufficient currency circulating in the local economy created

a barrier to transactions. Thirdly, software developers and tech-savvy engineers interested in Bitcoin's proposition and anarcho-capitalist ideas saw the potential of blockchain technology to redesign monetary systems. They joined forces with grassroots organisations in the Social and Solidarity Economy (SSE) as the CC was aimed at users aligned with these values. The CC was initially planned as a business-to-business tool, with cooperative sector and unionists the core SSE actors, but this changed when former CT members joined forces to support Moneda PAR's development.

Despite coming from diverse backgrounds, the group was brought together through the clear leadership of high-profile politician who provided the political support required to achieve national scope. They convened regularly throughout 2016 and 2017, shaping Moneda PAR into an interactive space in which these different groups engaged in «face-to-face encounters that provided the kinds of associational ties» (Haug, 2013, p. 707) from where negotiations of new types of arrangements can emerge (van Wijk *et al.*, 2019).

The groups combined their expertise in forming Moneda PAR, aiming to overcome the limitations that CT had experienced a decade earlier. Academic and political activists saw mutual credit — specifically aligned with the LETS (Local Exchange Trading System) model — as a viable monetary system capable of scaling nationwide. A paper-based currency was rejected due to the high risk of forgery, prompting the decision to create a unified national currency rather than separate ones for each node or network, to better address security and coordination challenges (Orzi, Valdecantos, and Porcherot, 2021). The group also sought to avoid the discretionary issuance and governance flaws that had undermined the CTs.

In contrast to traditional paper money, blockchain technology offered a secure and scalable infrastructure with built-in mechanisms for transparency, global coordination, and auditability. All involved groups came to view blockchain as «the ideal technology for the project, as it eliminated dependence on paper and centralized systems vulnerable to hacking» (Moneda PAR leader A). This option was favoured not only for its technical advantages but also because of the specialized expertise of the participating software developers. While blockchain was still largely associated with niche hacker communities at the time, and not generally viewed as the most practical option, the software developers were motivated by the pioneering nature of the project: it was the first mutual-credit complementary currency to leverage blockchain technology (field-work notes, 09/2021). As one Moneda PAR leader put it, their aim was «to apply blockchain for tangible benefits to real people, aiming for real-world impact.» Thus, the software developers volunteered their time and knowledge without financial support to develop a blockchain-based digital wallet and launching Moneda PAR in 2017.

Ultimately, blockchain was seen as offering the necessary infrastructure to build a practical, democratic, and scalable complementary currency capable of addressing the structural weaknesses of the CT, as detailed in Moneda PAR's foundational white paper:

«The Blockchain technology can boost complementary currencies in three major ways. First, it can provide them with a technological infrastructure that makes their use practical and easily scalable. Second, it offers communities a decentralized governing system for their currencies. (...) The possession of tokens gives their owners the right to take part, collaborate, propose, rate and vote on issues that are relevant for the underlying community. Third, it can create incentives to make communities, software developers and “complementary currency architects” join forces to develop new solutions that help communities achieve their goals. This way of organizing communities, also known as open-source organizations, is meant to democratize ownership and decision making.» (White paper, 2018, p. 4).

In parallel to the technical matters, Moneda PAR's community of users emerged as a grassroots organisation relying on principles of collective autonomy - a crucial element in alternative organizations (Parker *et al.*, 2014). Aligned with the democratic approach to social innovation (Montgomery, 2016), Moneda PAR's governance system consisted of autonomous yet interconnected nodes, each represented in the Nodes Federation. Local nodes, established by a core group of individuals in the same area, managed and coordinated their respective marketplaces. Whilst each node operated independently and was responsible for establishing internal practices, they were all part of the national Nodes Federation - an umbrella body that ensured coherence and facilitated the articulation of local initiatives within the broader scheme. The Nodes Federation convened every two weeks, initially in-person and later virtually as the scheme expanded and the Covid-19 pandemic enforced lockdowns.

Additionally, a national team with positions such as national coordinator, secretary, and roles for economy, communication, and training, was elected for a one-year term by the national assembly, where each active node had one vote. To regulate operations and establish clear rules for participants, Moneda PAR adopted a national statute from the outset, to ensure «clarity, transparency, and preventing individual members from acting independently» (Moneda PAR leader A) - as had happened to CT. During fieldwork, these positions were occupied by members who were involved in the early days of Moneda PAR, belonging to the political party activists, academics, and grassroots movements. It is noteworthy that none of the blockchain developers participated in the governance structure.

In 2017, Moneda PAR's leaders travelled across the country to meet with municipalities and worker cooperative networks and promote the currency as a business-to-business tool. Their goal was to increase credit availability for businesses amidst rising interest rates and inflation in the formal economy. They struggled to engage the cooperative movement, but the meetings drew many people who had experience with CT and recognised the significant advantages of blockchain technology in addressing previous challenges. In one such meeting, a woman conveyed this recognition to a Moneda PAR leader, acknowledging the potential of the new technology to overcome the issues faced by CT.

«She said to me: you don't need to explain me what a complementary currency is. [Moneda PAR is offering us] exactly what we would have needed twenty years ago to prevent Clubes de Trueque collapse» (Moneda PAR leader A)

Former CT members who had continued informal exchanges long after the network had dissolved began adopting Moneda PAR. In this way, what had originally been an unrecognised user base, quickly became the critical mass of Moneda PAR platform users.

Moneda PAR not only offered a more reliable and trustworthy platform for exchanges, it also enabled transactions between members across geographic distances. While it was not a generalised practice, some users bought products from others in other cities and received them by mail. This was particularly useful for trading services, as Author 1 found when she started using the platform:

«I joined Moneda PAR in the middle of the pandemic, driven by my academic interest in knowing more about complementary currencies from a practical standpoint. I was living abroad Argentina, and I offered English classes to the community. And then exchanged my PARES for cakes or presents to send to my family living in Buenos Aires» (Author 1, fieldwork notes, 05/2021).

In contrast to Clube de Trueque users who had to rely on multiple paper notes depending on the network where they were exchanging in the past, Moneda PAR significantly eased transactions by offering a single digital currency that could be used anywhere and transferred between users without the need for meeting in-person. Despite easing exchanges and reducing transaction costs for users, the organisational costs proved significantly higher due to the need for ongoing maintenance of the blockchain.

During the fieldwork period, several national-level actions were launched to develop synergies with other social economy organisations, expand the market, and ensure the resilience of Moneda PAR. Academic research conducted on Moneda PAR (Porcherot, 2023) provided the national coordination team with information about the type of needs and offerings that participants exchanged through the scheme, highlighting food and beverages, and health and personal care as the main categories. Given that CT had faced challenges created by the overwhelming demand essential goods, Moneda PAR focused on attracting food producers to the scheme. The objective was to ensure the market could meet the material needs of the local communities to maximise their participation. This was raised in several federation meetings (fieldwork notes), prompting actions from both national coordination and local nodes. From 2019 to 2021, the national coordination of Moneda PAR held several meetings with local agricultural producers and consumer cooperatives to involve them in the project, however, these efforts were largely unsuccessful. Local nodes actively sought to bring local food producers to their markets on an individual basis, but there were difficulties. For instance, in 2021, a consumer cooperative participated in Boedo Node for a few months, but had to cease their activity as they cooperative found it too difficult to spend the PARES generated by transactions (Author 1, fieldwork notes, 09/2021).

In 2020 Moneda PAR developed an extensive training program, focussed mainly on training coordinators for new nodes. The training program formally encountered several sessions of synchronic discussions, and its main goal was to explore the economy of abundance rather than scarcity in which the productive capacity of individuals and community is in constant expansion encompassing the needs of the community. However, in practice these meetings worked as a socialising space for all nodes, in which established nodes' coordinators regularly met and discuss their expectations, difficulties, and success. Acknowledging nodes' self-autonomy, the participation in the training was not mandatory, although it was discussed in Federation nodes' meetings if nodes that do not participate in the training would be granted the same overdraft capacity than nodes that participate on it and are aligned with Moneda PAR's values (Fieldwork notes).

In summary, Moneda PAR's design, incorporating blockchain technology with a locally autonomous yet nationally coordinated governance structure sought to address the challenges faced by CT—legitimacy, rule enforcement, resource synergies, transactional and organisational costs. This made Moneda PAR a more sustainable and resilient complementary currency. The secure, transparent, and decentralised platform provided by blockchain technology ensured tamper-resistant, immutable, and scalable transaction records, facilitating project growth. The pooled technical expertise from group members was crucial to its success: political networking, academic insights into monetary systems, and the technical and blockchain knowledge of developers. The latter was particularly essential for maintaining and expanding the digital wallet. Despite the robust organisational governance and expert configuration, Moneda PAR never reached the expectations and unforeseen limitations arose, especially as software developers and consultants gradually disengaged from the project in 2021. The following examples illustrate how the heavy reliance on a digital tool with no proper support began to constrain the organisation.

THE EMERGENCE OF NEW LIMITATIONS

The founding groups dedicated significant time and effort to develop and implement Moneda PAR as a social innovation. The voluntary work of blockchain software developers in the creation of the digital wallet was instrumental, launching the first digital wallet in 2017; «a functional software that works relatively well, with many things to improve and some faults» (Moneda PAR leader A). They had social motivations concerned with serving local communities but were also interested in developing the technology into a pioneering financial social innovation, as no other blockchain mutual credit complementary currency was known to them. Given the economic context and the previous success of CT, they anticipated Moneda PAR's «potential utilization would add up to 10% of Argentina's GDP» (White paper, 2018, p. 6). However, these expectations did not come to fruition - as leader B remarked, «We were expecting to be thousands, millions, and that did not happen» (Moneda PAR leader B). Moneda PAR maintained a stable user base of around 150 monthly users between mid-2018 and mid-2020 and reached a plateau with over 300 monthly users in 2021 making less than 1500 transactions, falling short of the significant impact its leaders had anticipated. As Leader B noted:

«[The diffusion of the social innovation] takes time, in a practical meaning. Blockchain solely allows to record information and give reliability that those registers were not tempered. (...) In Moneda PAR we thought the tool was pivotal, and we would revolutionise the world, but in practice that never happened'» (Moneda PAR leader B).

As the success of the platform failed to meet expectations, blockchain developers began to partially withdraw from the project, dedicating minimal time to supporting the maintenance of the technology. Although it was claimed that developers were central to Moneda PAR, Author 1 never encountered them during 18 months of fieldwork. Despite emerging issues with the digital wallet in Nodes' Federation meetings, there was not representation from the developer group. They were also disengaged from nodes activities, not participating in trading during this time, which suggests their interest was mainly driven by entrepreneurial rationale than the development of a collective CC. Analysing the lack of further engagement and expansion of the currency is beyond this article's scope, but it may relate to internal conflicts that arise in 2021 and the technological issues that will be explained below. The digital wallet did not meet community needs, such as the request for a digital marketplace to display goods in early 2021 (fieldwork notes 05/2021). Additionally, problems with changing overdraft credit limits and the digital wallet's frequent unavailability are discussed below.

Vignette 1: Making consensus decisions and implementing them on the wallet

Moneda PAR's mutual credit system enables users to make transactions using zero-interest credit, which allows them to experience the CC through buying products, before earning currency by selling their goods and services. This means that new users can experience the CCs potential, facilitating economic exchange and by fostering social connections, building the trust required to participate in a CC. New participants often expressed surprise that they were able to buy goods without having PARES upfront.

In 2021 Moneda PAR's digital wallet comprised three overdraft credit limits: 1,000; 5,000; and 30,000 PARES. These limits had not changed since the platform had been set up in 2017, which created problems given the severe inflation that Argentina experienced during the time period, averaging 45% per annum between 2018 and 2021 (INDEC). Consequently the buying power of these credit limits deteriorated significantly year on year - 1,000 PARES represented three hours work in 2017, by 2021 it was diminished to the equivalent of three bread rolls. This impacted on what new members could buy, as Flora, an experienced user, highlighted:

«1,000 PARES are not what they were four years ago; now they are worth only 300 PARES [because of inflation]. New nodes and members need more credit to start trading. The worst scenario for a complementary currency is having insufficient complementary currency. This needs an urgent solution.»

After much debate in Federation meetings representatives reached consensus to increase the three credit limits. Some members, called for the creation of a fourth intermediate limit as the three existing credit types did not meet their community's needs. However, Moneda PAR leader C suggested this was technologically impossible due to the existing blockchain's coding, and this was not adopted. Furthermore, despite agreeing increased credit limits, there were significant delays in implementing the changes to the digital wallet. (Summary of notes from Nodes Federation Meetings)

IMPLEMENTATION CHALLENGES FROM TECHNOLOGY CONSTRAINTS

Exchanges in a mutual credit complementary currency, such as Moneda PAR, occur as mirrored accounting transactions recorded on the blockchain. When a user buys one hour of work or three bread rolls, two symmetric transactions occur: a positive balance in the seller's account and a negative balance in the buyer's account. If the buyer has insufficient funds they use the overdraft facility, to be repaid later. The three levels of overdraft coded into Moneda PAR's blockchain as outlined above relate to the types of user with 1000; 5000; and 30,000 PARES allocated according to whether the user is self-employed, small producers or companies. (Moneda PAR White Paper 2018, p.5).

In Moneda PARs mutual credit system, when users access credit, it effectively expands the total amount of PARES currency circulating in the system. However, inflation combined with inflexible credit limits compromised the system's ability to adjust the supply of PARES to meet the needs of the community. It reduced the purchasing power of members and the scheme's capacity to generate impact, compromising its effectiveness. As highlighted in the vignette, by 2021, newcomers could only buy small items on credit, undermining their ability to see the full potential of the complementary currency for their household.

Despite the nodes representatives reaching a consensus to adjust the overdraft credit limits in the Federation meetings, implementation relied upon the software developers updating the blockchain code. Unlike the standard digital platforms adopted by other CCs, that offer pre-developed functionality and customisable features that enable changes to be made without the need for specialist programming knowledge (Diniz *et al.*, 2019), Moneda PAR's blockchain system required constant software development. Whilst flexibility is heralded as one of the benefits of blockchain, implementing changes necessitates significant programming expertise (Faria *et al.*, 2020). Given Moneda PARs reliance on voluntary work of software developers who were increasingly disengaged from the project, and in the absence of funds to finance developers' wages, technical adjustments were slow to materialise and eventually came to a halt. Consequently, despite being established as a grassroots organisation committed to principles of collective autonomy, with governance mechanisms for democratic decision-making in place, practical implementation of decisions lagged behind the needs of its members.

Vignette 2: Availability and support for the digital wallet

Notes from Several Nodes' WhatsApp Groups and Fair Dynamics.

Moneda PAR's weekly fairs are advertised through nodes' WhatsApp groups, with flyers stating: «Come to the next fair on Saturday afternoon, bring your products and knowledge to sell, and invite someone new to discover Moneda PAR» (Fieldwork notes 09/2021). To increase the number of users and diversify products, a best practice was established whereby each member would invite someone new to every exchange fair. During fairs, volunteers helped newcomers download the Moneda PAR digital wallet from Google Play and explained its use, enabling them to participate immediately using the overdraft facility (explained in Vignette 1).

Following a software update in the second half of 2021, the digital wallet became intermittently unavailable on Google Play and later required downloading via a direct link, which was a difficult process to follow. Compatibility issues arose with some smart phones creating an additional barrier for new users, that particularly affected middle-aged people, who comprise most of Moneda PAR users.

Based upon an analysis of demographics undertaken by Porcherot (2023), the majority (70%) of Moneda Par's users are women, with an average age of 48 years. Although highly educated, many of these users had limited digital proficiency, and the removal of the digital wallet from Google Play was a significant barrier to their participating in the scheme.

Over time an increase in failures of the Monder PAR app on Google Play forced people to manually record exchanges made in fairs and send PARES later when the wallet regained functionality (Author 1, Fieldwork notes, 03/2022). Workarounds were possible as users knew each other well within the tight-knit community where trust was already established. Similarly, when users made incorrect transactions, the digital wallet lacked any features that would enable corrections to be made. In standard digital CC platforms, erroneous transactions can be reversed or deleted by the central organisation. In contrast, a decentralised blockchain CC requires a new transaction to be made to compensate for the mistake, as transactions are immutable and cannot be undone. For example, on one occasion a user sent a significant amount of PARES to an inactive account and there was no way of recovering the funds, which prompted internal discussions about the limitations of scaling-up the project (Author 1, Fieldwork notes 09/2021).

Critical members argued that the unreliable digital wallet was a major constraint on Moneda PAR's growth and needed urgent resolution to attract thousands of users. In the second half of 2022, grassroots pressure to improve the wallet intensified as it was not meeting community needs. Towards the end of that year, a leader with well-established connections across several nodes organised a workshop to explore different digital wallets (Author 1, Fieldwork notes 11/2022). This event marked a turning point for Moneda PAR, highlighting a division within the groups.

The engagement of blockchain developers in Moneda PAR has been inconsistent. In 2021, the Federation assured users that developers were addressing the issues and improving the wallet. Their subsequent (partial) withdrawal appears to stem from unmet expectations regarding the impact of a blockchain-based complementary currency. Lead developers initially joined Moneda PAR driven by the potential for social and technological impact. Had the project secured funding, technological challenges may have been resolved by paying developers for ongoing maintenance and app development. However, unfortunately no external funding materialised, and the anticipated buzz never occurred. The disengagement of developers contrasts sharply with the sustained commitment of activist-politicians and activist-academics, who remained involved in Moneda PAR's daily activities. This difference is attributed to an activist mindset:

«When you've invested many hours in something that doesn't yield great impact, staying motivated is tough. I believe that's what happened [with blockchain developers]. There was a gap between expectations and reality. It's not just about funding. The other group members had a more activist mindset [than blockchain developers]; they keep fighting despite limitations and frustrations, even if the results are not as expected. In contrast, those without that [activist] mindset, motivated by impact rather than ideology, move on to other projects where they believe they can make a difference» (Moneda PAR leader A)

This suggests that initial motivations of grassroots activists, political party members, and academics differed from those of the blockchain developers. While the former were interested in changing the living conditions of communities struggling with liquidity issues, the latter were driven by pioneering the first blockchain complementary currency. When their expectations were not met, they moved to other spaces and projects where they could generate impact.

Overall, Moneda PAR's blockchain technology offered significant advantages, particularly in overcoming the shortcomings experienced by CT. It provided a trustworthy, decentralised platform to record transactions, which was secure and scalable. The organisation was built on the expertise of technical professionals, with a robust governance structure comprising locally autonomous nodes and a nationally coordinated umbrella, ensuring project coherence. As a result, Moneda PAR proved more resilient than CT. However, it never achieved widespread adoption. We suggest that while Moneda PAR's blockchain technology had notable benefits, the withdrawal of software developers introduced new limitations. These limitations were not adequately addressed due to the blockchain developers' detachment from the project, in contrast to the strong engagement of activist-politicians and activist-academics. Their detachment ultimately compromised the currency's success.

DISCUSSION

Although SIs seek to address social challenges, they can create unforeseen difficulties related to the democratic sustainability and resilience of initiatives. The case of Moneda PAR illustrates how this financial social innovation based on blockchain technology, offered advantages over its predecessor CT in areas such as legitimacy, rule enforcement, resource synergies, and reduced transactional and organisational costs. Table 1 summarises the comparison between Moneda PAR and CT, focusing on three of the main networks under the CT umbrella: Red Global de Trueque (RGT); Red de Trueque Zona Oeste (RTZO); Red de Trueque Solidario (RTS) (Gomez, 2012). Moneda PAR provided a central organisation characterised by clear leadership and close relationships with nodes, alongside a trustworthy, secure currency that could be used everywhere. These benefits partially resulted from the involvement of outsider experts—activists, developers, and politicians—who contributed their knowledge to the development of Moneda PAR.

Table 2: Comparative analysis between Clubes de Trueque and Moneda PAR

	Clubes de Trueque	Moneda PAR
Input legitimacy & rule enforcement	RGT: While rules were set by leaders, compliance was assumed to happen although hardly checked. There was no capacity for central control, and coordinators either did not know how to do it or did not see it as their responsibility. Loose franchise system RTZO: Strong charismatic leader and hierarchical decision-maker. Traditional franchise system RTS: participatory process of rule definition and consensus. Coordinators were active controlling in some cases, while in others rule enforcement was loose.	Rules were discussed in the Federation Nodes meetings and assembly and emerged from democratic participation process and consensus. Moreover, Moneda PAR had a national statute from the outset. Node coordinators had an active role and, although not all, participated in Federation Nodes meetings Training program available for new nodes' coordinators before being granted the credit capacity As rules regarding the monetary system were coded in the blockchain, were not able to be changed by other than software developers. However, detachment of developers made transference of rules into the code slow and ineffective.

Resource synergies	RGT: No specific actions to ensure food supply RTZO: active actions to ensure food supply –deals with businesses in exchange for services; collective factories; urban gardens RTS: coordinators arranged actions to increase the supply of food products, although in small quantity	Federation Nodes aimed to establish deals with association of food producers although unsuccessfully. Individual nodes ensured food supply temporarily or intermittently.
Transaction costs	RGT had the largest network, and its currency was the largest used, making forgery attractive and easy. While having a long-extended currency was desirable, it increased the vulnerability of the system RTZO: Clear actions were made when forgery started. RTS: Acceptance of various regional and local currencies brought high transaction costs. This required monthly cross-check meetings, making it burdensome.	Due to blockchain technology, Moneda PAR offered a single currency impossible to forge, that enabled transactions across the country.
Organisational costs	RGT: Weak relationships between nodes and leaders. Loose coordination structure. RTZO: The hierarchical organization brought high costs, paid by membership RTS: monthly cross-check meetings were burdensome, too slow and became conflictive over time.	Tight relationships between nodes and leaders. Acknowledging nodes' self-autonomy, node coordinators were invited to participate in Moneda PAR training, while also participation in Federation meetings was encouraged. While organizational costs were very low when blockchain developers were actively engaged in the project, when they (partially) detached this changed.

Source: Own elaboration. Information about CT is based on the research conducted by Gomez (2012; 2022).

While blockchain technology was selected by the diverse group that founded Moneda PAR, many of the benefits it delivered could have been achieved using general digital tools such as self-developed or externally-sourced card-based or mobile app systems (Diniz *et al.*, 2019). The decision to use blockchain reflected the expertise and influence of the group involved in the currency's creation, and was guided by the knowledge of the software developer members. Importantly, while blockchain technology addressed the earlier limitations of CT necessary for legitimising the new CC for user, it also introduced a reliance on technical experts to develop and maintain the system. This highlights a broader point, that although has the potential to empower local communities, its outcomes are shaped by the tools and actors involved. By being attentive to both the positive and negative aspects of SI communities can remain adaptable to emerging situations that might compromise sustainability to maximise their social impact.

This paper makes three key contributions. Firstly, it adds nuance to existing research on social innovation as an interactive space, highlighting its complexity and the crucial role of diverse outsider experts in the success of

the process. Our article responds the call for more research on interactive spaces as crucial forms of organisation in contemporary society (Ahrne and Brunsson, 2011; Ahrne, Brunsson, and Seidl, 2016) and the challenges of creating digital or web-based platforms (Grönroos, 2012; van Wijk *et al.*, 2019) in community initiatives. Diniz *et al.*, (2024) also point to the need for closer examination of how digital platform design mediates participation and democratic co-creation in CC, particularly where governance is shared between technical experts and community activists. Moneda PAR illustrates how these interactive spaces allow outsider experts to generate, promote, and sustain co-creation and negotiation (Haug, 2013), and the variety of expertise these groups bring enables social innovations to be tailored to the problems they aim to solve. By bringing together networked politicians, political and grassroots activists, academics experts in monetary theory, and blockchain developers, Moneda PAR was able to overcome many of the limitations experienced by CT two decades earlier. This chimes with studies that suggest that social innovations move in different timescales as they «need to be analysed not just in terms of what they directly achieve and the resistances they encounter. It is also important to examine the ‘seeds’ and ‘sediments’ they leave behind as positive and negative resources for future initiatives» (González and Healey, 2005, p. 2065), underlining the need for the historical approach adopted here (Rowlinson, *et al.*, 2014). Rather than judging CT as a failed social innovation, the successful engagement that Moneda PAR developed with its former users is a clear example of this. Nonetheless, agents’ heterogeneity may trigger governance challenges (Ferraro *et al.*, 2015), which remained unaddressed in Moneda PAR as the different agents’ motivations were unrecognized, which leads to our second contribution.

Our analysis of Moneda PAR brings to the fore the complexity of integrating different frameworks for social innovation, particularly the tension between democratic and technocratic models proposed by Montgomery (2016). This arises partly from the diverse motivations behind different actors’ participation in social innovations, and from their varied and sometimes contradictory expected outcomes related to social impact and scaling. Democratic social innovations, such as Moneda PAR, are grounded in democratic governance and community empowerment, giving users control over financial matters based on practices of commoning (Barinaga *et al.*, 2021). They depend upon the commitment and dedication of activist communities who are motivated to enhance the quality of their offerings and deepen social value and impact (Andre and Pache, 2016; Smith and Stevens, 2010). Over time this leads to collective empowerment, as communities take ownership of decision-making about their futures. Moreover, because motivations shift and evolve over time, it is crucial the development of embedding dynamics to sustain the efforts to bring social change (van Wijk *et al.*, 2019). This article highlights the consequences of unsuccessful embedding dynamics and how their absence jeopardizes the long-term sustainability of democratic social innovations.

At the same time, when innovations are anchored in digital technology, particularly those relying on specialist knowledge such as blockchain, power over decision-making might shift away from communities toward outsider experts such as software developers who have different motivations. Our Moneda PAR case chimes with other digital CC projects in that digital systems can reinforce technocratic forms of innovation (Faria *et al.*, 2020; Diniz *et al.*, 2019), bringing to the fore that technocratic social innovation inherently limits decisions made democratically. These models are typically led by outsider experts aiming to scale up social impact by increasing activities to reach more people, following market-driven principles that prioritise individual empowerment over collective governance. Our case shows that if social innovators can maintain all outsider expert groups involved, the social innovation remains anchored in democratic principles, as seen at the beginning of Moneda PAR. Conversely, the withdrawal of the small group of software developers when their expectations of success failed to materialise, points to the incommensurability of interests and expectations. Chiming with recent research (Diniz *et al.*, 2024), decisions became contingent on the engagement of those with technical blockchain expertise, hindering the prompt implementation of democratic decisions. Their withdrawal highlights how it is crucial for SI to develop strategies to maintain sustained engagement across diverse groups, to ensure technical expertise remains in the project and committed to supporting its governance system. Only by doing so can SI remain resilient and able to challenge rather than replicate, the vertical distributions of power in society (Montgomery, 2016, p. 10).

Finally, this article adds to the scholarship on the political aspects of social innovation, particularly how technologies can act as mechanisms of both inclusion and exclusion. Both money and technology enable participation in economic exchanges, but if people lack access to either they are effectively excluded (Ward and Lewis, 2002). This is

particularly important in the context of digital CCs, as their effectiveness depends on who can access, use and influence the systems. The adaptability of CCs allows communities to maintain access to monetary resources, especially in situations where conventional financial systems fail or exclude them, promoting fundamental economic inclusion (Barinaga and Zapata Campos, 2023). However, when these systems are digitalised, particularly when based on complex technology such as blockchain, access to money becomes entangled with access to technology.

While technology is often seen as a mere facilitator, its political dimensions are significant. The case of Moneda PAR sheds light on power dynamics in technological SI, particularly the incompatibility between blockchain technology and grassroots innovation goals. Although blockchain is often portrayed as a decentralising tool, our case reveals that although *decisions* were democratically made, the software developers held the power in translating these decisions into *actions*. As power is relational force, both enabling and constraining, empowering or disempowering, depending on the social context (Barnes [1988] 2002, p. 127). The case shows how in the context of a technologically complex SI, power rests with those who have knowledge, creating a stalemate. Rather than the SI transforming social relations, they remained unchanged (Avelino *et al.*, 2019). Technology and new developments impact the organisational process in social innovations. By reflecting on which groups gain or lose power with the adoption of specific technologies and the compatibility between blockchain and social innovation goals, the paper brings to the fore the political implications of technology in social innovation.

CONCLUDING REMARKS

This paper has examined the case of Moneda PAR to shed light on the process of social innovation and its potential to transform or reproduce of power relations. While blockchain technology can address the limitations of earlier forms of CC, the case illustrates how it can both empower and constrain communities. We argued that grassroots complementary currencies are grounded in a democratic framework of social innovation, aiming to deepen their impact by putting financial tools into the control of local communities. However, digitalisation, particularly when relying on complex technology like blockchain, can position software developers as gatekeepers, as only they can maintain and develop the code. Their technocratic approach relies on technical expertise and seeks to scale up social impact, driven by market ideas that can over-ride community-led governance and decision-making.

Integration of democratic and technocratic models within a single innovation process – as in a digital community currency based upon blockchain technology – can result in friction, and in some cases the subsumption of democratic principles by technocratic control. As demonstrated by Moneda PAR, when technical actors disengage from the development and maintenance of the system, democratic decisions cannot be actioned. These tensions raise important questions for the future of technically complex social innovations. We call for further research on how these divergent approaches – democratic and technocratic – can co-exist within interactive spaces (Montgomery, 2016; van Wijk *et al.*, 2019), and the factors that enable their coexistence. We also encourage greater attention into the unintended disempowering effects of technology-mediated social innovation, particularly when their design and implementation become disconnected from community goals.

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to the Moneda PAR participants, whose involvement made this research possible. We are also thankful to the organizers and participants of the 7th Biennial RAMICS International Conference (November, 2024) for their valuable engagement and feedback. Our appreciation extends to the editors of this special issue and the anonymous reviewers, whose insightful and constructive comments greatly strengthened this work.

DECLARATION OF COMPETING INTERESTS

The authors of this article declare that they have no financial, professional or personal conflicts of interest that could have had an inappropriate influence on this work.

FUNDING SOURCES

We appreciate the generous support of the Sten K. Johnson Stiftelse and Lund University School of Economics and Management (Sweden), which provided a postdoctoral grant to Paola Raffaelli, enabling the extensive field-work that underpins this research.

AUTHORSHIP CONTRIBUTION STATEMENT

Paola Raffaelli: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft.

Vicky Nowak: Formal analysis, Methodology, Writing – original draft, Writing – review & editing.

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