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Designing Solidarity Cryptocurrencies: Dialogic Tension Between Community-Centered and Techno-Centered Design Frames

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Abstract

While cryptocurrencies are related to profit-driven actors, communitarian movements have decades of experience with social-driven currencies, such as community currencies. This research investigates the meshing of these two disparate worlds that results in the design of a solidarity cryptocurrency, a phenomenon that connects the blockchain infrastructure of cryptocurrency to scaling the social perspective of community currencies. However, making the connection between these two technologies brings a new question to IS design: how can different frames from multiple social actors be integrated into designing a solidarity cryptocurrency infrastructure? We drew upon the design ethnography methodology and actively participated in designing a solidarity cryptocurrency to answer that question. Based on concepts from infrastructuring, a multi-relational and socio-technical approach to infrastructure designing, we propose that designing a solidarity cryptocurrency lies on a dialogic tension between techno-centered and community-centered frames, representing the relational process that emerges when connecting two disparate technologies.

Keywords: cryptocurrency, blockchain, community currency, information infrastructure, IS design, social technology

Introduction

Designing and managing cryptocurrencies are one of the society's grand challenges (Dodgson et al. 2015). Until 2012, the cryptocurrency movement was mainly composed of radical developers, attracted by the opportunities of developing a digital monetary system that would work without institutional intermediaries and walk towards a utopian online society (Kow & Lustig 2018). Since then, cryptocurrencies have started a revolution in the global financial industry by enabling financial transactions without the intermediation of third parties (Miau & Yang 2018). In the meantime, grounded on decades of experiences with community currencies, social movements and grassroots financial institutions worldwide have been developing solidarity digital currencies, i.e., alternative money designed and managed under solidarity finance principles (Diniz et al. 2020).

Solidarity cryptocurrency connects the social and grassroots perspectives of community currencies with the technological architecture of the blockchain. Community currency is a long-standing concept generally used to represent a set of non-state-issued "local" currency with circulation limited inside a territory (Larue et al. 2022). On the other side, cryptocurrency is a recent phenomenon related to the financial market and startup entrepreneurs (Rossi et al. 2019). Therefore, the challenge of designing a solidarity cryptocurrency is about making possible the connection between those two distinct worlds (Diniz et al. 2020): (a) community currencies, technologies collaboratively designed by civil society organizations to strengthen local economies, promote job creation, and foster solidarity among citizens in a particular community (Lietaer & Dunne 2015); (b) cryptocurrencies, technologies grounded on the idea of a borderless decentralized world mediated by digital technology (Scott et al. 2017).

We approached solidarity cryptocurrency as a relational infrastructure (Reimers et al., 2022). Therefore, its design is an ongoing process of combination of different practices and technologies, performed by local communities and technology experts. The design of infrastructures turns towards the continuous alignment between multiple social actors and artifacts (Ciborra & Hanseth 1998), that have the challenge of integrating different "frames" (i.e., assumptions, knowledge, and expectations) that participants bring to the design effort (Karasti & Blomberg 2018). Thus, our research question is: *how can different frames, from multiple social actors, be integrated in the design of a solidarity cryptocurrency infrastructure?*

To answer our research question, we draw upon the design ethnography approach (Baskerville & Myers 2015), and we participate in a project involving the development of solidarity cryptocurrency. Our results show a rich process of negotiation where an arrangement progressively evolves, and the participants' shared imaginary emerges from the negotiation of multiple object worlds through the mediation (partial translation) of some social actors. At the heart of this process, we have the dialogic tension between different design frames, one techno-centered, the other community-centered. This understanding of the design process produces contributions to the literature of information infrastructure (II) by arguing that disparate design frames might not be conciliated or resolved - as in a dialectical process - but they can coexist in the same space, in such a way that an II project evolves through continuous learning iterations between disparate frames. In addition, we contribute to the literature on community currencies by, first, shedding light on the tensions that emerge when one attempts to scale community currencies through blockchain, and second, by pointing out that the design process of solidarity cryptocurrency as a relational process that continuously moves towards both techno-centered and community-centered directions.

Literature Background

From Community Currencies to Solidarity Cryptocurrencies

Alternative - or complementary - currencies are non-government-backed monies that circulate alongside fiat currencies (Larue et al. 2022). Examples of that range from global initiatives such as cryptocurrencies (e.g., Bitcoin) to local currencies restricted to small communities (e.g., Bristol Pound) (Larue et al. 2022). Localized monetary experiences have long been studied as important innovations to strengthen local economies, create work and foster solidarity among its citizens-users (Lietaer & Dunne 2015). In this work, we refer to these experiences as 'community currency', which are alternative currencies designed and managed by grassroot social movements or non-profit organizations and operating in delimited territory to achieve special social goals (Larue et al. 2022). Community currencies have been valuable in facing local

social problems and fostering local resilience (Lietaer & Dunne 2015), although, remained limited to small and marginal endeavors (Seyfang & Longhurst 2013).

In another spectrum of alternative currencies, cryptocurrencies started a revolution in the global financial industry by enabling financial transactions without third parties' intermediation and have attracted growing attention of the IS community (Rossi et al. 2019). Albeit cryptocurrencies might be portrayed as community-driven technologies as they attend specific communities' interests, it would imply "changing the meaning of 'community' from a geographically 'local community' to a virtual 'community of interest" (Nishibe 2020, p. 315), missing the social purpose of community currencies. Nevertheless, recent empirical experiences around the world lend our attention to the emergence of cryptocurrencies operating with social and environmental purposes (Diniz et al. 2018). Among such initiatives are groups of people working on merging the cryptocurrencies' technological architecture with the social purpose of community currencies. Aligned with Diniz et al. (2020) we name these experiences of 'solidarity cryptocurrency', i.e, "cryptocurrencies designed to achieve solidarity finance principles such as financial inclusion and local economic development" (Diniz et al. 2020 p. 2).

Scholars, activists, and entrepreneurs have anticipated that blockchain – the cryptocurrencies' underlying technology - might become a technological platform capable of outstripping community currencies' scale and endurance constraints (Larue et al. 2022; Scott et al. 2017). However, conflating these two technologies' currencies might seem incompatible at the outset due their disparate design perspectives. While cryptocurrencies are high-complex technology designed to scale without geographic boundaries and intertwined with startup culture, community currencies rely on low-tech infrastructures designed for regionally limited circulation and grounded on local relations (Diniz et al. 2020). Nevertheless, these two presumably disparate technologies are expressions of dreams of alternative monetary systems that would serve the many (Barinaga 2020; Swartz 2018) and both share a foundational spirit of collaboration and mutual aid (Diniz et al. 2021).

Experiences of solidarity cryptocurrencies are still scarce and in experimental stages, despite that, these are exciting in-the-making projects catching up the attention of the academic community. Among the noteworthy solidarity cryptocurrencies projects are: Sarafu, based on local savings and loans groups (*chamas*) operating in urban informal settlements and rural villages in Kenya (Barinaga 2020); Moneda Par in Argentina, inspired by the local exchange trading system (LETS; Orzi et al. 2021); Faircoin, operated by a cooperative grassroots organization in Spain with its own validation system based on collaboration (Barinaga & Ocampo 2019); Freecoin, an open source toolkit for social currency design piloted in Iceland, Spain and Finland (Roio & Sachy 2015). Not different from general blockchain initiatives, these projects' sustainability and unfolds are yet to be seen and are still speculative visions of their creators. Even so, such experiences show that connecting the disparate design perspectives of community and cryptocurrency might be possible, but it is a paradoxical relation full of tensions emerging from the attempt to fuse conflicting values of both technologies.

The community currencies' potential is enacted by the social relationships of proximity among money's users and designers, nurtured in its designing, governance, and circulation (Lietaer & Dunne 2015). At the same time, Barinaga (2020) points out that the very geographic limitations of community currencies constrain their ability to diffuse and grow. On the other hand, cryptocurrencies enthusiasts claim that blockchain is a trustless infrastructure, essentially replacing human interaction with automated code (Swartz 2017. Hence, essentially replacing human interaction with automated code (Reijers & Coeckelbergh 2018) and moving the center of decisions regarding the currency design from local community to technical experts (Barinaga 2020). Therefore, whereas blockchain is seen as a promise to scale the social impact of community currencies hitherto restricted to small localities (Seyfang & Longhurst 2013), it risk losing the social relationships and local protagonism of people designing community currency, which is essential in developing mutual trust, cooperation and solidarity among its users (Lietaer & Dunne 2015).

Despite the potential and challenges of solidarity cryptocurrencies, we know little about how the disparate perspectives embodied in their design practices can be conciliated. To investigate its peculiar design practice, we approach solidarity cryptocurrency as an infrastructural technology (Reimers et al. 2022) with the potential to develop a digital community infrastructure that supports a large-scale solidarity network (Roio & Sachy 2015). We aim to explain how financial organizations based on social and solidarity principles could craft an infrastructure that works as a decentralized bank in itself (Scott et al. 2017). Therefore, in the section that follows, the concepts related to the design of infrastructures will be introduced.

Designing infrastructures

Information systems (IS) scholars generally inquire about infrastructures as a technical system underlying social practices (Reimers et al. 2022) or a type of IT artifact (Tilson et al. 2010). From these perspectives, the design of II is approached as a generative mechanism (Henfridsson & Bygstad 2013). The generativity properties of the II delineate the openness of the system in a way that users become innovators (or designers) of the system rather than mere consumers (Yoo et al. 2010), and the infrastructure evolves over time through the contributions from broad and varied audiences (Henfridsson & Bygstad 2013). In other words, II are designed by the uncoordinated actions of heterogeneous actors operating upon the infrastructure and seeking individual or organizational interests.

In this study, we adopt the relational view of II (Neumann & Star 1996; Star & Ruhleder 1996), a perspective that has received growing attention in the IS field (e.g., Pipek & Wulf 2009; Reimers et al. 2022) and correlated areas (e.g., Bødker et al. 2017). Conceptualizing the relational view of infrastructure unfolds into different approaches that can be seen as ambiguous and incomprehensible (Reimers et al. 2022). Without delving in this debate, we take side with those defining infrastructure as a continuous process of connecting technologies and practices (more in Reimers et al. 2022), which is related to the sociotechnical perspective of IS field (Sarker et al. 2019), referred here as 'infrastructuring' (Karasti & Blomberg 2018).

The concept of infrastructuring was first used by Karasti and Syrjänen (2004) to write about an ongoing, multi-relational and processual phenomenon in a context of an emerging participatory design. As Karasti and Blomberg (2018) pinpointed, infrastructuring is about "moving from a fixed to a process ontology" (p. 5), a process of perpetual and mutual reconfiguration of technology, nature, and people altogether. Also, Karasti and Blomberg (2018) propose a formal distinction between II and infrastructuring. While they used 'infrastructure' to describe a given phenomenon's characteristics and dimension, 'infrastructuring' was used to denote its open-ended, uncertain, and dynamic qualities (Karasti & Blomberg 2018).

Infrastructuring is usually loosely defined and may assume quite different connotations. Even so, we devise three main assumptions by scholars sharing the above-mentioned perspective. First, infrastructuring is understood as a collaborative design process, which could be entangled in a project (see Bødker et al. 2017) or an open-ended phenomenon (see Kow & Lustig 2018), is a multi-relational phenomenon interrelated to its surroundings (Bødker et al. 2017) and moves towards the construction of socio-material resources for further and unforeseen uses (Ehn 2008).

Within this interpretation, Karasti and Blomberg (2018) demonstrated that the design process needs to be seen as juxtapositions and connections of new everyday practices with existing ones. It is a process of 'becoming' since the infrastructure is never finished but continuously reappropriated and expanded upon its previous form (Karasti & Blomberg 2018). Therefore, the alignment of heterogeneous groups' interests is recurrent in infrastructuring (e.g., Bødker et al. 2017; Pipek & Wulf 2009), due to the need to encompass the multiple – sometimes divergent – perspective of designers, developers, potential users, and other stakeholders. In this regard, Neumann and Star (1996), portray infrastructure-building as an arrangement of multiple object worlds (see more in the Conceptual Framework), and the most important part of infrastructuring is the work of "mediating demands of multiple groups and making connections between them possible" (p. 238). To the authors, infrastructuring is about "designing linkages between multiple groups, making connections between many people, their world views, and their goals in order to make strong connections to extant infrastructure" (p .234),

IS community has long held that groups with different interests might collaborate in the development of technological artifacts. Many studies have been drawn on boundary objects (Star 2010) to explore how shared artifacts create a mutual space for action and enable knowledge sharing and cooperation among heterogeneous actors. These studies generally inquiry organizational (e.g., Carlile 2002) or cross-organization (e.g., Gal et al. 2008) context. One exception, Puri (2007) explored the collaborative design of IS in a community context, involving rural villagers and farmers, scientists, government officials, and non-governmental organizations. Overall, in the empirical context of these studies (Carlile 2002; Doolin & McLeod 2012; Gal et al. 2008; Harrison & Windeler 2020; Mark et al. 2007; Puri 2007) boundary objects are created by design experts to facilitate or translate knowledge between different stakeholders. This perspective has been valuable for studying structured projects and established technologies; however, it departs from the premise of the existence of boundary objects (or the design of such by experts). Therefore, this IS's dominant perspective might not be suited to capture the antecedents of boundary objects nor to

describe loose-bounded design's contexts, and the design of ambiguous and in-the-making technologies. Hence, there is a gap in the understanding of how different and divergent design perspectives are integrated into speculative technologies with ambiguous values, with their potential mostly held in their proponents' imaginary, such as the case of solidarity cryptocurrencies.

Conceptual Framework

From our reading of the infrastructuring literature, we outline three concepts that we consider central to our analysis of the solidary cryptocurrencies design: *shared imaginary, multiple object worlds* and *partial translation*.

First, we borrowed the concept of **(1) shared imaginary** that represents the common visions and dreams regarding an expected building infrastructure, "constitutive of, and constituted by, ontic and epistemic commitments" (Neumann & Star 1996, p. 245). Imaginaries are "pictures and stories inherent in our knowing" (Verran 1998, p. 243) that help us to work with the pictures and stories of others. Shared imaginary is the common visions and dreams that people participating in the process hold regarding an expected becoming of the infrastructure, "constitutive of, and constituted by, ontic and epistemic commitments" (Neumann & Star 1996, p. 245). Ontic/epistemic commitments are basic belief systems of social groups, so that ontic commitment is something inherently meaningful to a group, and epistemic commitments take account of explaining why something is meaningful. Therefore, shared imaginary is the capacity to integrate distinctly – sometimes divergent – meanings about something, constructing an integrating alternative to distinct dreams and visions in one joint perspective.

Shared imaginary in central in mediating multiple demands of heterogeneous social actors in the design of infrastructures. It is formed by common dreams and visions among participants, progressively constituted before and throughout the infrastructure project, and might determine its success (Neumann & Star 1996). The concept of shared imaginary has been largely neglected in the IS community, despite its relevance to explain points of understanding in the design of blockchain (Kow & Lustig 2018). In this paper we recall the concept of shared imaginary as important to inquiry the design of solidarity cryptocurrency.

Second, infrastructuring encompass **(2) multiple object worlds**. Object worlds are particular things and specialized modes of representation characteristics of each community (Neumann & Star 1996). They resemble boundary objects (Star 2010; Star & Ruhleder 1996), however, objects worlds are not shared between different communities of practice, on the contrary, they are particular representations to each group. As stated by Bucciarelli (1988), object worlds are "patterns of belief grounded in the object and how these guide (rule) participants' thought and action throughout all of design activity, not just when they engage the object alone" (p. 162). Simply put, object worlds are a "belief system grounded in, and about, objects" (Bucciarelli 1988, p. 162). Therefore, the constitution of a shared imaginary is about the conciliation (at least partially) of multiple objects worlds operating in the infrastructuring. The concept of multiple objects worlds is important to our conceptual framework for two main reasons. First, as mentioned earlier, our study looked at a design process prior to the formation of boundary objects. In this regard, object worlds take into account participants' beliefs about the object being designed. Second, the design of solidarity cryptocurrencies is about the convergence of two distinct belief systems. From this perspective, this concept helps us to understand that people holding distinct object worlds might cooperate through a shared imaginary.

Third, in order to social actors with distinct object worlds to come up with a shared imaginary, we argue that it would require a **(3) partial translation** among their multiple object worlds. Partial translation was conceived by Haraway (1988) and associated with infrastructuring by Karasti & Syrjänen (2004). Design can be seen as a translation process (Ciborra & Hanseth 1998). The translation is a collective process of continuous negotiation in which constructors of facts and artifacts move into aligned interests (Latour 1987). In this process, the users' specific "needs are translated into more general and unified needs so that these might be translated into the same solution" (Ciborra & Hanseth 1998, p. 314).

However, from Haraway's (1988) perspective, translation can never be fully achieved, as it is always situated and contextualized. In other words, a translation between different object words is based on its very belief systems, which are different among the social actors. Hence, the translation will only communicate things that can be understood and accepted between the different belief systems – a partial translation. The partial translation is important in our conceptual framework because we need to acknowledge that technology

design is generally performed by actors who dominate the languages of specialized technical work of the design process (Feenberg 2017). The design of a solidarity cryptocurrency needs to integrate the local knowledge of community currencies – which might be technical, but also empirical and popular. Therefore, technical expertise would not be the necessary and sufficient form of knowledge in technology design (Suchman 2002). To integrate the community knowledge, designers should engage in partial translation**,** i.e, translate knowledges and world views among very different – and power differentiated – communities (Haraway 1991, as cited in Wagner 1994, p. 258). It is a process of translating community knowledge into technical specifications and technical specifications into community knowledge (Suchman 2002).

Our conceptual framework is composed of these three concepts and will work as a starting point for our exploration of how to integrate perspectives of different social actors involved in designing a solidarity cryptocurrency infrastructure.

Methodology

Design Ethnography

We investigated the design of a solidarity cryptocurrency to answer our research question. Given our objective of understanding a design phenomenon, we selected "design ethnography" as our mode of inquiry, grounding on Baskerville and Myers (2015). Ethnography has been considered an important research method in exploring II (Star & Ruhleder 1996). While early ethnographic studies focused on inquiring about the past, revealing infrastructure's invisible structures, and tracing back its formation, Design ethnography combines design and ethnography in a future-oriented and interventionist method (Baskerville & Myers 2015). While prior methods separate the design and ethnography process, design ethnography merges them so that the researcher is a designer and an ethnographer in the field. In design ethnography, "the ethnographer is actively immersed and engaged in a setting where people are either designing artifacts, producing artifacts, or introducing artifacts into a social and cultural context" (Baskerville & Myers 2015, p. 29). We argue that this methodological choice is coherent with the theoretical realm we are navigating in our research.

The Setting: Design of a Solidarity Cryptocurrency Infrastructure

We start by presenting the context and the social actors involved in designing a solidarity cryptocurrency. The design setting involves the building of a blockchain infrastructure for the e-Dinheiro, a digital community currency shared by community banks in Brazil (Ansorena et al. 2021). e-Dinheiro was important in fostering the local economy during the COVID-19 pandemic (Gonzalez et al. 2020). In 2020, it handled around U$ 260 million (R$ 1.3 billion), fostering the local economy during the COVID-19 pandemic (Garcia 2021). Unlike other similar projects, as far as we know, the design setting inquired in this paper is the only one where a blockchain infrastructure is being built for an established community currency that is widely used. These characteristics make this field a rich and unique opportunity to study the phenomenon of solidary cryptocurrencies.

Table 1 represents the collaborative design arrangement that integrated multiple social actors: the Community Banks, represented by the Brazilian Network of Community Banks (RBBC) and by a local community bank (Banco Preventório); a research center for microfinance and financial inclusion studies (CEMIF); a blockchain developer company; and a research center for studying technologies' social impacts (LABIS). Both CEMIF and LABIS are research centers of prestigious Brazilian universities, respectively in business administration and engineering.

In Brazil, community currencies are generally operated by community banks, grassroot organizations created and managed by populations from vulnerable locations (Ansorena et al. 2021). They are organized around RBBC, while still maintaining their principles of self-management and community participation. The RBBC created the mobile payment platform called 'e-Dinheiro', which combined the characteristics of digital payment systems with the social purpose and geographic boundaries of community currencies (Ansorena et al. 2021). The e-Dinheiro, shared by community banks, has become the current technological platform for community currency in Brazil.

Social Actor	Type	Role
Banco Preventório	Local Community Organization	Test Field
LABIS	Research Center	Intermediaries with the field
CEMIF	Research Center	Main proponents
RBBC	Network of Community Organizations	Representative of Community Banks
Blockchain Developer	Private Tech Business	Blockchain solution developer

Table 1. Summary of social actors involved in PROJECT

Currently, blockchain is seen as the new technological frontier for community currencies and solidarity institutions (Scott et al. 2017). Therefore, community and academic leaders have discussed the possibilities and controversies of integrating the e-Dinheiro platform with blockchain technology (Faria et al. 2019). In this regard, researchers from CEMIF proposed to build a blockchain infrastructure prototype (hereafter named PROJECT) to test and learn about the potential and challenges of using blockchain within the e-Dinheiro platform.

The design and development phase of the PROJECT started in July 2021, after a long negotiation and struggling to raise the necessary resources. PROJECT aimed to build a blockchain infrastructure for e-Dinheiro. For the technological development of the PROJECT, a Blockchain Developer Company was hired. The Blockchain Developer Company is a Brazilian startup company with blockchain development and research in its core business. Also, they are B Corporation certified, and their projects generally revolve around the deployment of blockchain for socio environmental impacts.

For the initial test field, the Banco do Preventório was selected. Banco do Preventório is one of the community banks of the RBBC, which uses the e-Dinheiro platform. Founded in 2010 in Morro do Preventório, in Niterói, Rio de Janeiro, the Banco do Preventório is a reference for its solidarity initiatives (Ferreira 2018). Therefore, Banco Preventório's members participated in the project meetings and design sections. PROJECT also held a partnership with the LABIS. A research center from an engineering school, LABIS's role was to intermediate the relationship between researchers, developers, and the community and ensure the technological transfer to the community banks. Institutionalized in 2018, LABIS has maintained a work front and strong relationship with Banco Preventório.

Data Collection

Our research is informed by empirical data collected over six months of fieldwork, from June to November 2021. One of us participated as a PROJECT member, actively contributing to the design process, collecting data mainly through participant observation at the project meetings, informal conversations and participation in related events. The researcher in question.

Participant observation was important to identify people's vision, aims, and dreams in the design of solidarity cryptocurrency and also to identify the shared imaginary formation and its mechanism of negotiation and crystallization. The project participant's interactions took place online during the Covid-19 isolation period. Therefore, we adopted a co-presence strategy (Beaulieu 2010) where our field setting was beyond a specific physical location and also considered participants' online interaction and textual production. It is necessary to say that the Blockchain Developer Company used to work online in their projects, even prior to the pandemic period, allowing constant interactions among people living in cities hundreds of kilometers away from each other.

The mass of empirical data collected from participant observation was triangulated with interviews and document analysis (see a summary in Table 2) to provide a deeper relational and contextual understanding of the findings. The documents analyzed consisted of over 21 megabits of official documents, internal email correspondences, meeting minutes, and slideshows. Interviews were conducted to deepen our understanding of some participants' points of view and stories. For each respondent, we designed a specific semi-structured questionnaire. This questionnaire contained topics related to the theoretical framework and issues that emerged during the meetings. Three participants were interviewed, a community leader at Banco Preventório, a researcher at LABIS, and an undergraduate fellow selected to follow the technological

development and assist with technology transfer to community banks in the future. Altogether, around four hours of interviews were recorded.

Type of data source	Purpose	Amount of time	Number
Online Meetings TOTAL	Main data source to understand the design process	Around 30 hours	29
Interviews TOTAL	To complement notes from observations	Around 4 hours	3
Documents TOTAL	To increase the understanding of PROJECT	Around 21 MB in volume	

Table 2. Summary of data collection

Data Analysis

Our data analysis used the coding approach as a "deep reflection about and, thus, deep analysis and interpretation of data's meanings" (Miles et al. 2014, p. 79). From this perspective, data analysis was intertwined with data collection from the very start (Miles et al. 2014). For every meeting we attended, we first wrote jotting notes with the main observation points, including key quotes and observations from the context of the meeting. Next, we developed full-field notes from each jotting note. Then, we listened to the meeting's audio records and documents to transcribe selected excerpts to get longer details and quotes. In this process, insights, doubts, and important passages were highlighted. These points were turned into in-process memos, which consisted of preliminary interpretation and theorization about the data. Altogether we produced seventy-seven in-process memos, ranging from one sentence to texts with more than three hundred words. These memos formed the basis for our initial insights during data analysis.

Field notes and documentation were included in the qualitative analysis software Atlas.ti. The software helped us organize the data and its initial coding. We started with an open code process when we assigned categories to each text chunk, ranging from one line to one paragraph. Interactively, these categories were grouped based on the conceptual framework. We then read the field notes and documentation several times, following an abductive approach to better understand the field's design process. We organized the codes to present a narrative that reflects the main design perspectives of the PROJECT's participants.

The research criteria used to guarantee quality and robustness to our methodological design are authenticity, plausibility, criticality, reflexivity and recoverability (Pozzebon et al. 2014).

Presentation of the Results

We collected a huge amount of empirical material from the Design Ethnography. From this material, we selected a portion of the episodes that marked the solidarity cryptocurrency design of the PROJECT (dialogues and negotiations among community leaders, researchers and developers from June to September 2021).

Vignette: Moments of the Project's PD

Given its characteristics, community participation is central to the PROJECT. By community, we mean here people engaged with the community bank's activities, including community leaders, residents, volunteers, activists, and researchers. As the community leader points out, this is one of the issues that has been around since the beginning of the Project:

> One of the things I wanted to point out... this is one of the issues that are at the beginning of the project... and we talked about it last week, is that **all the development should be done linked to the issue of the participation of community banks**, let's call it that not in the construction process (emphasis added) (Community leader 3, June 2021).

However, the form and scope of this participation was loosely defined and open to negotiations. In this regard, as one of the researchers spotlighted, the more we continue dialoguing with the community, the more time-consuming and expensive the Project becomes:

> **[...]the more we talk, the longer and more expensive the project becomes.** [...] But as a project, we have to start, considering that there are deadlines and everything, [...]**.** So, all this **dialogue**, which will probably have a break due to this new E-Dinheiro, ok, it's part of this dynamic... but **I think it has to be delivered. Good project is project delivered** (emphasis added) (Researcher 2, July 2021).

LABIS assumed the role of overseeing this participation and acting as an intermediary between the PROJECT and community banks. In a design meeting, one of the researchers asks the Blockchain Developer Company's team about the PROJECT timeline. *"Twelve months,"* said the Blockchain Developer Company manager. Then, sounding enthusiastic, she adds that twelve months was the initial plan, but it could be reduced to up to six months. To that, the researcher responded:

> The most important thing for me is [...] the point of the research being collaborative [...]. **That to me is the most important thing, it's more important than delivering fast.** [...] The most difficult thing is to **translate this to the community banks**. And that might take a little more time. (emphasis added) (Researcher 3, July 2021).

Some weeks later, we were advancing in the design and discussing the role of users in the system. Then, Community Leader 4, who was in silent until now, said:

> **We are here as a community, actively listening, trying to understand this universe...** so, what do you think we should contribute? You said "user" [...] **it would be nice for us to contribute in some way, but everything is very new..** I've never participated, not even the [Banco Preventório] and then you give us the tip [...] (emphasis added) (Community Leader 4, August 2021).

To which Blockchain Developer Company Manager responds:

> [...] in this first part of defining the journey, it may not make sense, **but certainly in the part of validation and understanding of the flow, we will call you. So, I think it makes sense for us to use you to test and validate the solutions that we design.** (emphasis added) (Blockchain Developer Company Manager, August 2021)

The next day, part of the research team discussed this tension between the PROJECT participatory context required and the fast and technically oriented logic characteristic of digital design and startup culture. Rather than coming to a single understanding, we kept these two design modes in the PROJECT. As Researcher 3 summarized, *"we will navigate with these two parameters, participation and deliveries."*

Dialogic Tension: Techno-centered and Community-centered Design Frames

The vignette above illustrates the tensions between different ways of perceiving and acting regarding the PROJECT and the solidarity cryptocurrency, being community participation versus project deadlines one of the most relevant. We conceptualized these perspectives, as design frames, that is, different perspectives on what is a solidarity cryptocurrency and how it should be designed. Design frames resonate with object worlds, but while the last is about the basic assumptions of a social group, we devise design frames as belonging to the values and expectations grounded on the object that is intended to be created. However, by joining the technology of community currencies with cryptocurrencies, the PROJECT has embraced two design frames: techno-centered and community-centered. Techno-centered resembles the idea of design as a project, i.e., the design process conceived as a set of steps in an arrangement of objectives, timelines, and deliverables (Bjögvinsson et al. 2012). Here, the techno-centered represents a design frame based on deadlines, planning, budgets, tasks, and the delivery of a self-contained artifact, where the design of a technology artifact is a priority, and the role of technical designers is predominant. It aims to deliver fast to evaluate and engage with the artifact, and it is constrained by limited resources and bureaucratic rules in which the PROJECT is submitted. Techno-centered design frame was mostly, but not exclusively, carried

out by the Blockchain Developer Company's participants (who held knowledge of designing cryptocurrencies).

The community-centered design frame resembles infrastructuring as approached in this research, and it is a processual, sociotechnical, connected, and situated frame. The community-centered design frames hold the intentional effort to build socio-material assemblies situated within solidarity economy values, such as local protagonism, community appropriation and participation, which attempt to develop local resources beyond the PROJECT scope and temporality. It is important to note that although the community-centered design frames were primarily brought by researchers connected with the local community and the community itself (who held knowledge of designing community currencies), the community-centered design frames were not restricted to one social actor or other. The community-centered design frame is associated with the PROJECT aim to design technology for the grassroots communitarian organization operating in the solidarity economy and based on the principles of community participation and characteristics of community currencies.

These two frames coexist in the PROJECT at the same time, but not without tensions. To clarify the interaction between these two design frames, we reproduced some quotations from the PROJECT's episodes mentioned in the vignette presented earlier. We marked **(T)** for each quotation associated with the techno-centered design frame and **(C)** for the community-centered design frames.

The vignette shows that community participation was a core principle in the PROJECT – a principle shared by participants. "*The community needs to be involved. They need to understand what they are doing"* **(C)**. However, this community participation had to be balanced with the PROJECT limited resources. "[...] *We have to start, considering that there are deadlines and everything, [the Blockchain Developer Company] will commit some people in a certain time for this construction. [...] I think it has to be delivered. Good project is project delivered*" **(T)**. The dilemma was that the more community participation and involvement, the more resource consumption the PROJECT would have. "*The more we talk, the longer and more expensive the project becomes"* **(T)**. At the same time, by prioritizing community participation, the PROJECT progression was dictated by the participants' ability to mediate the demands and arrangements of the community. "*It can be done faster, but what will dictate the pace will be how much we can involve community banks in this*" **(C)**.

Overall, the above quotations illustrate the tensions that emerge in a design process that attempts to merge the technologies with two different intrinsic values. These two frames are opposing, as the community-centered design frame, for instance, prioritizes the community participation over the fast delivery of an artifact, and at the same time, the techno-centered design frame prioritizes the fast delivery and approached the community participation as an instrumental tool to build a more efficient artifact.

However, at the same time, these two frames are not antagonists, and the tensions between them are neither reconciled nor resolved. Both frames coexisted in a **dialogic process**, in such a way, that the techno-centered design frame **provides the concreteness** and resources necessary for people to organize around a shared purpose and work with the technical requirements of cryptocurrencies, and the community-centered design frame **expands the limitations** of the techno-centered design frame to connect with the community and empowers **the imagination of alternative technological futures**.

It is important to note two important aspects of this central concept: dialogic tension. First, it did not come from the literature, but it took form from our abductive process of analysis. Second, while refining the conceptualization of dialogic tension as it emerged from our analysis, we realized that it differed from well-known concepts like dialectical tension (Benson 1977; Bjerknes 1992) or paradoxes (Poole and Van de Ven 1989; Smith and Lewis 2011). Indeed, we argue that "our" dialogic tension has resemblances with the meaning developed by authors like Freire (2000), Morin (1998) and Bakhtin (1981), where the expression designates the presence of more than one pole (forces or logics) that are distinct and complementary at the same time (Malo et al. 2012). This form of tension is not confrontation, contradiction or antagonism as the tenants of dialectical and paradox approaches claim (Hargrave & Van de Ven 2017). It is rather a dialog, like two different logics or principles interacting without the duality being lost in this negotiation, accommodating next to each other, with slight transformations.

Under the dialogical tension logic, the PROJECT moves forward, incorporating the community context and translating it into achievable and concrete functions to address the available social and technical resources. Both frames dialogue in a continuing and iterative way, advancing the project path, at times oriented

towards issues related to the techno-centered design frame, and at times towards the community-centered one. The concept of dialogic tension helps us to understand how the three conceptual elements of our conceptual framework dialogue with each other (Figure 1). The **participants' shared imaginary** – common visions and dreams regarding the future impact and possibilities of blockchain in the community currency's context – enables people with **multiple objects worlds** to work together towards a mutual purpose. **Researchers' partial translation** mediates the differences among participants' object worlds. Despite having their own object worlds, researchers are specialists who have transit among all the social actors. In this process, the **project arrangement** functioned as social glue, grouping participants with multiple objects worlds to work together while maintaining flexibility to accommodate the divergences among them.

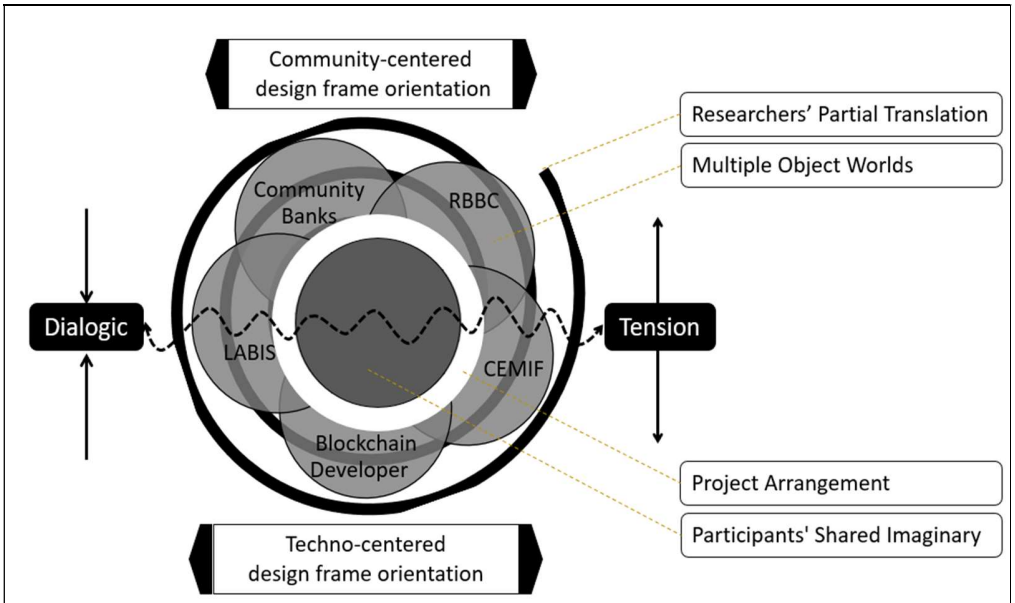

Figure 1. Dialogic tension in the collaborative design of information infrastructure

Participants' Shared Imaginary

At the beginning of the PROJECT, researchers and community leaders already had a relationship of many years and shared a common space in the financial inclusion ecosystem, which enabled them to create mutual trust and bonds of empathy. Therefore, researchers had already situated themselves in the context of community banks and e-Dinheiro, i.e., they knew how things work in the context where the technology would be used. In this sense, the researchers' contextual knowledge seems essential to form a shared imaginary among PROJECT's participants. Neumann and Star (1996) noted that imaginaries are formed by visions and dreams of what a particular technology (an infrastructure in their case) might become. It is an expected future regarding a given technology. Participants' dreams and visions regarding the blockchain future were not just about the technology itself, but also about its impacts on the regulation of community banks. It was possible to notice a shared imaginary regarding an envisioned future where community banks would have a regulatory demand to deploy blockchain: *"We visualize, […] that it won't take long, and that's not such an absurd forecast. The courts of accounts are going to start demanding blockchain […]"* (Researcher 1, July 2021). This envisioned future was one of the justifications behind the PROJECT, a vision shared by community leaders and other researchers, as illustrated in the following dialogue:

> Researcher 2: We are taking that step because we really believe that in the future, the regulator, a sort of central bank, will say. "Oh, we accept, as long as it is on the blockchain, why do we trust the blockchain.
>
> Community Leader 1: I think so. The idea of the blockchain is something that does not even need so much effort for us to know how important it is. […] I think the advantage of the blockchain in terms of transparency, in terms of the court of

> auditors, the central bank, is a given thing for me, it does not even take much effort to explain this (July 2021).

Neumann and Star (1996) proposed that shared imaginary mediates the iterative process where f particular things and specialized modes of representation characteristics of each community of practice are formed and produce a collective view of infrastructure possibilities. It promotes the establishment of common dreams and visions regarding the future of the II among people participating in the PROJECT. In this sense, it was possible to observe that each social actor has particular views regarding the role of blockchain. For instance, to a Blockchain Company's executive, blockchain was a tool to materialize socio-environmental impact through a new sharing and collaborative economy: *"[The possibility of blockchain is to] make the new collaborative, shared, more transparent economy tangible, with the attributes that blockchain provides for us, traceability, audibility"* (Blockchain Company's executive, July 2021). As for a community leader, blockchain may mobilize new resources and actors, and community banks should adapt themselves and cope with these changes: "*I think that this blockchain issue may mobilize new resources, new actors. So, in the same way that we had to adapt to this national law in relation to the creation of electronic social currencies, we are also in this discussion. So, we have to go little by little, even if it's a rehearsal, experiences* (Community Leader 2, July 2021).

However, despite some particularities, the participants had a common idea of blockchain as a technology that would be consolidated and necessary for community banks to deal with, whether due to regulatory requirements or to harvest its technological potential. In other words, the multiple object worlds converged on a common point between the imaginaries of social actors, which can be summarized as the aim of testing and learning about blockchain for the benefit of community banks. This common point served as the basis for participants organizing around the PROJECT and committing themselves to a shared purpose. The shared imaginary was an intention, an aim to be reached, shared by the PROJECT's participants and formed the basis for participants' commitment to the Project. The next excerpts illustrated this shared aim:

> Every effort will be for us to start together. So later on, we don't have to stop and see how it comes together. If there are equal purposes, and there is no divergence of purpose among everyone who is here at this meeting (Community Leader 1, July 2021); We are among friends. So, if you want to see the source code of e-Dinheiro, we don't have any problem with that... I think that's the purpose. Both ours and yours, that is, our purpose and yours is the same (Community Developer, July 2021).

Researchers' Partial Translation

Researchers had a fundamental role in balancing and mediating the dialogic tension between techno-centered and community-centered design frames. "*One important thing, we will monitor the entire project. Our mission here is to do a lot of intermediations with community banks. And watch over that technology transfer issue*" (Researcher 3, July 2021). It is exemplified by several mediations that researchers performed between the need to deliver a technological artifact more quickly and with fewer resources as possible (e.g., Private Company Manger: "*We need to get back to the focus we are on to do the integration in blockchain. We need to be as practical as possible")* and the need to guarantee the independence and technological appropriation of community banks (e.g., Researcher 3: "*Good software is delivered software, but also good software is also used software. It is part of the project's idea to engage the people and communities that use the software")*. The PROJECT's design decisions were critically evaluated by researchers following through the design process. This critical thinking works as a counterbalance of instrumental rationality of technical decisions and brought more contextual knowledge to the PROJECT, concerned with potential users' appropriation and emancipation, and was attentive to the structural values of potential users, as demonstrated in the following excerpt. This excerpt is part of a dialogue about the criteria in choosing the blockchain protocol:

> I get super worried (talking about the definition of the protocol without community involvement). [...] Because I followed very closely [...] the story of e-Dinheiro. [...] it was a partnership where they would give the platform in exchange for some performance targets that the banks would have to do. Like

> using, putting so many users per month... And in the middle of the story, they said that ROI (Return Over Investment) wasn't paying off and went out (Researcher 3, September 2021).

Therefore, researchers' particular position of being situated in the community and at the same time situated in the specialized technical disciplines of software development seems to make possible mediations between techno-centered and community-centered design frames that works as translating social knowledge into technical specifications and technical specification into social knowledge (Suchman 1993).

Project Arrangement and Multiple Objects World

The participants' shared imaginary was organized in a project arrangement, i.e., a set of activities crystallized into Project scoped around deadlines, budgets, resources, and technical requirements mobilized to deliver a digital artifact. The following excerpt is a good illustration of that point:

> We have a deliverable. This deliverable is to build an MVP [Minimum Viable Product] that works with all the requirements of a payment system, with an app and a management system in the end (Researcher 2, July 2021).

The project arrangement was crystallized in formal agreements with financial supporters and subjected to their compliance. "*We have a contract, an artifact that needs to be built. [...] We have gigantic compliance to comply... resources were raised... these resources are invested and what was initially proposed needs to be delivered*" (Researcher 2. August 2021). Therefore, our design process was tightly coupled with the project arrangement, as exemplified in the following excerpt:

> The issue of delivery, I need to keep charging because I am charged, but sooner or later, my controller will ask: Where is the pilot? Where is the delivery? Where is the evidence, where was it, how was it? Can we possibly think of another proposition? You can, but as long as you make this delivery (Researcher 2, August 2021).

Once the project arrangement is settled down, this becomes the meaningful thing that we take for granted in the Project (ontic commitment). We did not question or negotiate the PROJECT's deliverable anymore. Furthermore, the origin of this meaningful thing we take for granted was justified by the formal agreement and bureaucratic rules in which the contract was submitted. However, the PROJECT was also open enough to enable participants to hold different imaginaries loosely coupled with the project arrangement. These were expected PROJECT's contributions beyond its scope and time frame, disassociated from a structured beginning and end plan. This is evident in the case of one researcher's interests regarding the possibilities opened by the PROJECT for integration with other tools developed by and within community banks:

> Blockchain will bring a few changes to the end-user. The main benefit will be the possibility of integration via APIs with other solutions that are developed and demanded by community banks [..]. All this was stuck due to non-integration, non-opening, non-contact with the e-Dinheiro staff. So, if this Project is achieving this opening, this is already a fantastic legacy to make e-Dinheiro more prepared for other integrations (Researcher 3, July 2021).

Implications

Our results have several theoretical implications. Although our findings are based on a specific context, we understand that they can be extended to similar contexts (i.e., an analytical generalization): to complex and ambiguous design projects of II, and in particular, to those involving the design of technologies with social purpose and with the involvement of communities of user.

Regarding the design of II, our first contribution concerns the established debate that complex and ambiguous projects result in a paradoxical process full of tensions that might be resolved through integration of opposing forces – a dialectical process (Hargrave & Van de Ven 2017). In that regard, the success of an IS project is seen in relation to overcoming these tensions, and conciliating or integrating, for

instance, participants' different knowledge domains (Doolin & McLeod 2012), knowledge systems (Puri 2007), backgrounds (Gal et al. 2008), agendas (Harrison & Windeler 2020), or object words as in our study. Our empirical data shows a context where tensions between participants are not resolved. They coexist in a **dialogical** process, from which we devised the concept of dialogical tension. Our concept portrays that the tension generated by the existence of opposing design frames might be held in a design project without being reconciled or resolved. The dialogic tension concept implies that a project might evolve through continuous iterations between the different design frames, which at times orientates the project towards one frame, at times towards another. More specifically, our research demonstrated the relational process that enables disparate design frames *to coexist in the very same project*. By introducing the concept of dialogic tension, our work suggests a path to advance the debate regarding pluralist IS projects that incorporate other ways of design, aligned with the idea of infrastructuring (Karasti and & Blomberg 2018; Pipek & Wulf 2009; Tilson et al. 2010).

Aligned with the abovementioned, our research has a second implication. We point towards the need for understanding IS design projects beyond their instrumental purposes and reconceptualize them as platforms for communication, dialogue, mutual learning, and imagination between different objects worlds. II design is often studied from a project perspective (e.g., Bødker et al. 2017; Henfridsson & Bygstad 2013) or as an open-ended process (e.g., Kow & Lustig 2018). Our concept of dialogic tension connects these two perspectives by arguing that a dialogic tension is possible in a project arrangement that provides the material resources and concreteness to people organized around a shared imaginary, while it remains open enough to work as a platform to other imaginaries beyond its scope and time frame. From this perspective, a project arrangement is a temporary space in which people with multiple object worlds organize themselves with a shared imaginary, while using it as a platform for an open-ended design.

A third implication/contribution concerns cooperation between multiple stakeholders in designing II. The foundational infrastructuring literature portray the constitution of shared imaginary among participants as essential for the success of an infrastructure project (Neumann & Star 1996; Verran 1998). However, since these groundbreaking works, little effort has been undertaken to advance our understanding of the role of shared imaginaries in technological projects (an exception is the work of Kow & Lustig 2018). Our paper advances in such effort by demonstrating empirically that shared imaginary enables participants with multiple objects worlds to work together towards a mutual purpose. This is important, as IS papers inquiring the cooperation between multiple stakeholders departs usually from the existence of boundary objects (or the design of such by experts; Carlile 2002; Doolin & McLeod 2012; Gal et al. 2008; Harrison & Windeler 2020; Mark et al. 2007; Puri 2007), thus, neglecting prior agreements and contextual relations. We also advance on the understanding of shared imaginary by introducing that its constitution was possible due to the long-term relationship and knowledge exchange between researchers (who did the partial translation) and the local community. This assertion suggested the need to expand the inquiring timeframe of II projects, contemplating the *historical and contextual relationships formed before the project begins*, which is especially critical in design projects within disadvantaged communities, where the design-reality gap between the context of use and the context of design is usually broad (Heeks 2002).

In the same direction, we devise a fourth contribution regarding 'translations' and 'intermediaries' in design of II. As already mentioned, the cooperation between multiple stakeholders in IS projects are generally approached in organizational or cross-organizational settings. However, in design settings with broader power imbalance, such as in projects with social purposes and within vulnerable groups, we need to consider that actors who dominate the languages of specialized technical work also dominate the design process (Feenberg 2017). From this perspective, social actors who have the ability to move between the different object worlds and locate themselves within the local community have a critical role in mediating the tensions generated by the coexistence of different design frames. The role of 'translation' in II projects is an old question in the IS field (see, Ciborra & Hanseth 1998). Inspired by Haraway (1988), we argued that this translation might only be partial and might be performed by social actors (researchers in our study) who had a long-term relationship with the local community and knew their practices and aspiration deeply, as well as enjoyed their trust, and at the same time, understood the materials, languages and technical processes of technical designers. Our work implies that these social actors, such as the PROJECT's researchers, who can move between the two worlds, might mediate the relationship between designers and the community, acting in that way, they support the dialogic tension between different design frames by translating social knowledge into technical specifications and technical specification into social knowledge.

Our study has also specific practical implications for community currency and solidarity cryptocurrency. First, by presenting an ethnography study of the initial design effort to join community currencies and cryptocurrencies, our research sheds light on an emerging and still unknown phenomenon. By doing that, we are joining forces with a group of scholars, activists and entrepreneurs who are seeking to deploy blockchain technologies to develop fairer monetary systems (Barinaga 2020; Faria et al. 2019; Orzi et al. 2021; Roio & Sachy 2015). Without providing a solution, our research illuminates the tensions that emerge when one attempts to scale community currencies through blockchain without lapsing back into the constraints of centralized financial systems (Scott et al. 2017).

Also, an open question for the design of solidarity cryptocurrency is that the technical specialization required to develop blockchain technologies moves the center of decisions from local knowledge to techno experts (Barinaga 2020). In this regard, by introducing the concept of a community-centered design frame and explaining its relationship with techno-centered design through the dialogic tension, our work points out a direction to think the design process of solidarity cryptocurrency as not centered on one side or another, but as a relational process that continuous moves towards both directions, at times techno-centered oriented, at times community-centered oriented. More specifically, we highlight that the role of researchers as mediators in the process of partial translation is central to bring the local knowledge back to the center of decisions from time to time and to enable the dialogic tension between the two frames.

Conclusion

In this research, we analyzed the initial design effort of multiple social actors to build a blockchain infrastructure for a community currency, what we called solidarity cryptocurrency. The design of solidarity cryptocurrencies is a recent phenomenon that attempts to mesh two different technology perspectives to scale local currencies designed and managed under solidarity financial principles. To understand the design of solidarity cryptocurrency, we drew on infrastructuring theoretical background to frame the development of blockchain infrastructure as a multi-relational and situated process. From this perspective, we conducted a Design Ethnography strategy to follow an ongoing project where design solidarity cryptocurrency took place. While inquiring about an ongoing project provided a rich understanding of the design process, we acknowledge that not considering the project's final outcomes might be a limitation of our study, something that should be considered in further studies. Our results indicate a number of theoretical implications regarding the multi-stakeholder design project of ambiguous II, in particular, to those involving the design of technologies with social purpose and with the involvement of the communities of users. Also, we brought some practical implications for the design of solidarity cryptocurrency.

References

Ansorena, A., Diniz, E. H., Siqueira, E. S., & Pozzebon, M. (2021). From Community Bank to Solidarity Fintech: The Case of Palmas e-Dinheiro in Brazil. Em T. Walker, J. McGaughey, S. Goubran, & N. Wagdy (Orgs.), Innovations in Social Finance, 251–268. Springer International Publishing. https://doi.org/10.1007/978-3-030-72535-8_12

Barinaga, E. (2020). A route to commons-based democratic monies? Embedding the governance of money in traditional communal institutions. *Frontiers in Blockchain*, 3. https://doi.org/10.3389/fbloc.2020.575851

Barinaga, E., & Ocampo, J. (2019). FairCoop: The Global Cooperative and its Collaborative Cryptocurrency. Copenhagen Business School, CBS. CBS free case collection https://www.thecasecentre.org/educators/products/view?id=165942

Baskerville, R. L., & Myers, M. D. (2015). Design ethnography in information systems. *Information Systems Journal*, 25(1), 23–46. https://doi.org/10.1111/isj.12055

Bakhtin, M.M. (1981). *The Dialogic Imagination. Four Essays*, University of Texas Press, Slavic Series.

Benson, J. K. (1977). Organizations: A Dialectical View. *Administrative Science Quarterly*, 22(1), 1-21.

Beaulieu, A. (2010). From Co-Location to Co-presence: Shifts in the Use of Ethnography for the Study of Knowledge. *Social Studies of Science*, 40(5), 453–470.

Bjerknes, G. (1992). Dialectical reflection in information systems development. *Scandinavian Journal of Information Systems*, 4(1).

Bjögvinsson, E., Ehn, P., & Hillgren, P.-A. (2012). Design Things and Design Thinking: Contemporary Participatory Design Challenges. *Design Issues*, 28(3), 101–116. https://doi.org/10.1162/DESI_a_00165

Bødker, S., Dindler, C., & Iversen, O. S. (2017). Tying Knots: Participatory Infrastructuring at Work. *Computer Supported Cooperative Work (CSCW)*, 26(1–2), 245–273. https://doi.org/10.1007/s10606-017-9268-y

Bucciarelli, L. L. (1988). An ethnographic perspective on engineering design. *Design Studies*, 9(3), 159–168. https://doi.org/10.1016/0142-694X(88)90045-2

Carlile, P. R. (2002). A Pragmatic View of Knowledge and Boundaries: Boundary Objects in New Product Development. *Organization Science*, 13(4), 442–455. https://doi.org/10.1287/orsc.13.4.442.2953

Ciborra, C. U., & Hanseth, O. (1998). From tool to Gestell Agendas for managing the information infrastructure. *Information Technology & People*, 11(4), 305–327.

Diniz, E. H., Cernev, A. K., Rodrigues, D. A., & Daneluzzi, F. (2020). Solidarity cryptocurrencies as digital community platforms. *Information Technology for Development*, 27(3), 1–15. https://doi.org/10.1080/02681102.2020.1827365

Dodgson, M., Gann, D., Wladawsky-Berger, I., Sultan, N., & George, G. (2015). Managing Digital Money. *Academy of Management Journal*, 58(2), 325–333. https://doi.org/10.5465/amj.2015.4002

Doolin, B., & McLeod, L. (2012). Sociomateriality and boundary objects in information systems development. *European Journal of Information Systems*, 21(5), 570–586. https://doi.org/10.1057/ejis.2012.20

Faria, L. A. S., Severo, F. G., Cukierman, H. L., & Diniz, E. H. (2019). Digitalizações de Moedas Sociais Brasileiras E Desafios De Governanças Comunitárias: Os Requisitos, os Códigos e os Dados. *Economia Solidária e Políticas Públicas*, 67, 141–153.

Feenberg, A. (2017). *Technosystem: The social life of reason*. Cambridge, MA :Harvard University Press.

Ferreira, M. R. M. (2018). Banco Comunitário no Preventório: Uma Experiência de Economia Solidária. [Masther's thesis, Universidade Federal do Rio de Janeiro].

Freire, P. (2000). *Pedagogy of the Oppressed*. Bloomsbury Academic.

Gal, U., Lyytinen, K., & Yoo, Y. (2008). The dynamics of IT boundary objects, information infrastructures, and organisational identities: The introduction of 3D modelling technologies into the architecture, engineering, and construction industry. *European Journal of Information Systems*, 17(3), 290–304. https://doi.org/10.1057/ejis.2008.13

Garcia, L. (2021, maio 23). Bancos comunitários digitalizam moedas sociais na pandemia. Folha de S.Paulo. https://www1.folha.uol.com.br/mercado/2021/05/bancos-comunitarios-digitalizam-moedas-sociais-na-pandemia.shtml

Gonzalez, L., Cernev, A. K., Araujo, M. H. de, & Diniz, E. H. (2020). Digital complementary currencies and public policies during the COVID-19 pandemic. *Revista de Administração Pública*, 54, 1146–1160. https://doi.org/10.1590/0034-761220200234

Haraway, D. (1988). Situated Knowledges: The Science Question in Feminism and the Privilege of Partial Perspective. *Feminist Studies*, 14(3), 575. https://doi.org/10.2307/3178066

Hargrave, T. J., & Van de Ven, A. H. (2017). Integrating Dialectical and Paradox. Perspectives on Managing Contradictions in Organizations. *Organization Studies*, 38(3-4), 319-339.

Harrison, A., & Windeler, J. B. (2020). Framing communication: How agenda alignment and media capabilities shape partially cooperative communication. *MIS Quarterly*, 44(2), 771-807.

Heeks, R. (2002). Information Systems and Developing Countries: Failure, Success, and Local Improvisations. The Information Society, 18(2), 101–112. https://doi.org/10.1080/01972240290075039

Henfridsson, O., & Bygstad, B. (2013). The Generative Mechanisms of Digital Infrastructure Evolution. *MIS Quarterly*, 37(3), 907–931. https://doi.org/10.25300/MISQ/2013/37.3.11

Karasti, H., & Blomberg, J. (2018). Studying Infrastructuring Ethnographically. *Computer Supported Cooperative Work (CSCW)*, 27(2), 233–265. https://doi.org/10.1007/s10606-017-9296-7

Karasti, H., & Syrjänen, A.-L. (2004). Artful infrastructuring in two cases of community PD. *Proceedings of the Eighth Conference on Participatory Design Artful Integration*: Interweaving Media, Materials and Practices - PDC 04, 1, 20. https://doi.org/10.1145/1011870.1011874

Kow, Y. M., & Lustig, C. (2018). Imaginaries and Crystallization Processes in Bitcoin Infrastructuring. *Computer Supported Cooperative Work (CSCW)*, 27(2), 209–232. https://doi.org/10.1007/s10606-017-9300-2

Larue, L., Meyer, C., Hudon, M., & Sandberg, J. (2022). The Ethics of Alternative Currencies. *Business Ethics Quarterly*, 32(2), 299–321. https://doi.org/10.1017/beq.2021.52

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society*. Harvard University Press.

Lietaer, B. A., & Dunne, J. (2015). Rethinking money: How new currencies turn scarcity into prosperity.
Malo, M.; Vézina, M. & Audebrand, L. (2012). Deciphering Tensions in the Development of Co-operatives: Insights from the Montréal School on Co-operative management. *Ekonomiaz*, 79(1), 265-296
Mark, G., Lyytinen, K., & Bergman, M. (2007). Boundary objects in design: An ecological view of design artifacts. *Journal of the Association for Information Systems*, 8(11), 34.
Morin, E. (1998). Introducción al pensamiento complejo. México: Editorial Gedisa.
Poole, M. S., & Van de Ven, A. H. (1989). Using Paradox to Build Management and Organization Theories. *Academy of Management Review*, 14(4), 562-578.
Neumann, L. J., & Star, S. (1996). Making Infrastructure: The Dream of a Common Language. PDC'96 Proceedings of the Participatory Design Conference, (4), 231-240.
Nishibe, M. (2020). Special issue "New Possibility of Cryptocurrencies and Digital-Community Currencies". *Evolutionary and Institutional Economics Review*, 17(2), 313–325. https://doi.org/10.1007/s40844-020-00185-y
Orzi, R., Porcherot, R., & Valdecantos, S. (2021). Cryptocurrencies for Social Change. The Experience of Monedapar in Argentina. *International Journal of Community Research*. https://doi.org/10.15133/J.IJCCR.2021.002
Pipek, V., & Wulf, V. (2009). Infrastructuring: Toward an Integrated Perspective on the Design and Use of Information Technology. *Journal of the Association for Information Systems*, 10(5), 447–473. https://doi.org/10.17705/1jais.00195
Pozzebon, M., Rodriguez, C., & Petrini, M. (2014). Dialogical Principles for Qualitative Inquiry: A Nonfoundational Path. *International Journal of Qualitative Methods*, 13(1), 293–317. https://doi.org/10.1177/160940691401300114
Puri, S. K. (2007). Integrating Scientific with Indigenous Knowledge: Constructing Knowledge Alliances for Land Management in India. *MIS Quarterly*, 31(2), 355–379. https://doi.org/10.2307/25148795
Reimers, K., Schellhammer, S., & Johnston, R. B. (2022). Infrastructure as a Home for a Person: A Phenomenological Interpretation of Star and Ruhleder's Relational View. *MIS Quarterly*, 46(3).
Roio, D., & Sachy, M. (2015). Digital Social Currency Infrastructure (Decentralised Citizens Eegagement Technologies Specific Targeted Research Project Collective Awareness Platforms D5.5; p. 1–35). D-cent. https://dcentproject.eu/wp-content/uploads/2015/09/D5.5-Implementation-of-digital-social-currency-infrastructure-.pdf
Rossi, M., Mueller-Bloch, C., Thatcher, J. B., & Beck, R. (2019). Blockchain research in information systems: Current trends and an inclusive future research agenda. *Journal of the Association for Information Systems*, 20(9), 1388–1403. https://doi.org/10.17705/1jais.00571
Sarker, S., Chatterjee, S., Xiao, X., & Elbanna, A. (2019). The Sociotechnical Axis of Cohesion for the IS Discipline: Its Historical Legacy and its Continued Relevance. *MIS Quarterly*, 43(3), 695–719. https://doi.org/10.25300/MISQ/2019/13747
Scott, B., Loonam, J., & Kumar, V. (2017). Exploring the rise of blockchain technology: Towards distributed collaborative organizations. *Strategic Change*, 26(5), 423-428.
Seyfang, G., & Longhurst, N. (2013). Growing green money? Mapping community currencies for sustainable development. *Ecological Economics*, 86, 65–77. https://doi.org/10.1016/j.ecolecon.2012.11.003
Smith, W. K., & Lewis, M. W. (2011). Toward a Theory of Paradox: A Dynamic Equilibrium Model of Organizing. *Academy of Management Review*, 36(2), 381-403.
Star, S. L. (2010). This is Not a Boundary Object: Reflections on the Origin of a Concept. *Science, Technology, & Human Values*, 35(5), 601–617. https://doi.org/10.1177/0162243910377624
Star, S. L., & Ruhleder, K. (1996). Steps Toward an Ecology of Infrastructure: Design and Access for Large Information Spaces. *Information Systems Research*, 7(1), 111–134. https://doi.org/10.1287/isre.7.1.111
Suchman, L. (2002). Located Accountabilities in Technology Production. *Scandinavian Journal of Information Systems*, 14(2), 91–105.
Swartz, L. (2018). What was Bitcoin, what will it be? The techno-economic imaginaries of a new money technology. *Cultural Studies*, 32(4), 623–650. https://doi.org/10.1080/09502386.2017.1416420
Tilson, D., Lyytinen, K., & Sørensen, C. (2010). Digital Infrastructures: The Missing IS Research Agenda. *Information Systems Research*, 21(4), 748–759. https://doi.org/10.1287/isre.1100.0318
Verran, H. (1998). Re-imagining land ownership in Australia. Postcolonial Studies, 1(2), 237–254. https://doi.org/10.1080/13688799890165
Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, 21(4), 724–735. https://doi.org/10.1287/isre.1100.0322