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CENTRALIZING OR SHARING THE DIGITAL COMMUNITY CURRENCIES GOVERNANCES? PROPOSING WAYS OF THINKING DCCS FROM THE MUMBUCA CASE

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ABSTRACT

This work deals with the implications of different ways of digitalizing social or community currencies (CCs) in Brazil. It starts from the following tension, verbalized by representatives of Brazilian Community Development Banks (CDBs): on the one hand, the digitalization of CCs would maintain "the same idea, [only] in different ways"; on the other hand, its governance would be nowadays "the most complex issue". The investigation examines this tension in Mumbuca Digital CC (DCC) case (Maricá, state of Rio de Janeiro), one of the greatest world's DCC experiences (considering the number of financial resources involved) and part of the Brazilian CDBs Network - which has brought together around 150 experiences since 1998. We collected data from 2015 to 2021, from semi-structured interviews, fieldnotes from an ethnographic research approach, and the Mumbuca DCC system administrative interface as well. The article advances in understanding DCCs: besides demonstrating that their materialities are inseparable from the "social arrangements" around them, it adds new elements to previous researches, proposing an analysis framework for different sociotechnical governance dimensions of DCC (GDs). Precisely, using tools and concepts from Actor Network Theory (such as translation, symmetry, networks, sociogram and technogram), we begin describing moments of Mumbuca DCC, each one corresponding to different versions of CDBs principles and to different sociotechnical governance configurations. Finally, we present a framework that brings together new DCC governance dimensions (like "management" dimension and "economic appropriations" involved) dialoguing with previous investigations GDs ("requirements", "data" and "source code" of a DCC), and classifying each one as "Centralized" (meaning strong state / private company presence) or "Shared" (strong self-management / community approach).

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KEYWORDS

Community Development Banks, community currencies, digital currencies, governance, solidarity economy.

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1. INTRODUCTION

This work deals with the implications problem of different ways of digitalizing the so-called social or community currencies (CCs) in Brazil, considering as reference the practices and the principles of the Community Banks of Development (CDBs). We dialogue with a vision of currencies as constitutive of society and as a common (Dissaux, Fare 2017), and additionally we seek to associate the reflection, already well consolidated by different studies in the Science and Technology Studies (STS) field, which technological issues are not separated entities from the political-social world. The problem presented is considered decisive by the Brazilian CDBs themselves, as well as it matters for different knowledge communities, related to digital currencies, complementary currencies (Siqueira, Diniz, Pozzebon 2020; Faria, Severo, Cukierman, Diniz 2020; Dissaux, Fare 2017; Blanc 2011; Théret, Zanabria 2007), democracy (Yates, Bakker 2014) and development (Walsham 2017). To analyze the digitalization of Brazilian CCs implications, the starting point taken is the following tension, concerning two statements assumed by CDBs representatives: community banks would have remained with "the same idea, [only] in different ways", but the digital community currency (DCC) platform governance used by banks is "today the most complex issue" – both assumed by CDBs representatives. The work examines this tension in Mumbuca DCC case (city of Maricá, state of Rio de Janeiro), one of the greatest world's DCC experiences (considering the amount of financial resources involved) and part of the Brazilian CDBs Network - which brings together more than 150 experiences. The authors collected data from 2015 to 2021 through semi-structured interviews, materials provided by Mumbuca CDB, data access at the digital platforms involved, and adopting an ethnographic research approach and organizing discussions with CDBs representatives as well.

The paper advances on DCCs understanding, and particularly demonstrates the materiality of the digital community currency is inseparable from the "social arrangement" around it. A point "some way surprising in relation to theory or to common sense" (Burrel, Toyama 2009, 87), not only for the "popular knowledge community" around the CDBs, but also for some academic approaches in CCs knowledge community. We do so by discussing how some elements of the discourse of the community development banks (practices of autonomy, proximity, and financial sustainability (Faria 2018)) were reconfigured, to a certain extent, during the CCs digitalization process - our first research question (RQ1): the digitalizing process implications concerning CDBs practices and principles. As a result, also considering the CDB principle of economic democracy, we propose what we nominated the five "sociotechnical governance of DCCs" dimensions: their requirements, data, codes, the platforms management, and their economic appropriation - our second research question (RQ2): the digitalizing process implications concerning the governance of CDBs social currencies.

The article is organized as follows: initially, methodological options adopted in approaching the case in study are presented. In the second section, we address CDBs principles and practices discussed here (and captured from our field work), as well as some of the partnership first effects with Maricá local government on them. Then, we emphasize the scale effects required to implement the DCC Mumbuca, and the decision to use the magnetic cards materiality as well. The following section narrates the E-dinheiro platform entrance (which stands for "electronic money", also "it is money") on the network, and some of its consequences. Next, we discuss the inseparability between "technical aspects" and "social aspects" (precisely among the practices of the CDBs) in each DCC Mumbuca configuration, and finally present the "sociotechnical governance of DCCs" five dimensions. The discussion is supported by the sociogram/technogram approach (Latour 1998), in dialogue with the notions of discourse (Edwards 1996) and DCCs governance (Diniz, Siqueira and Heck 2019).

2. METHODOLOGICAL APPROACH

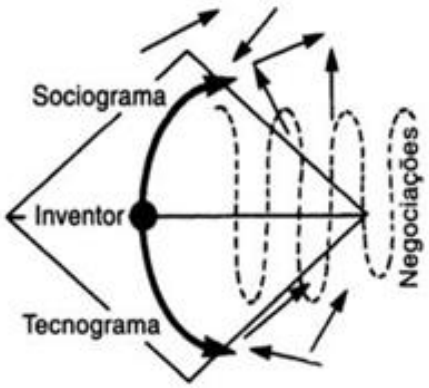
This work dialogues with the notion of local / emergent approaches (Avgerou 2008), in an effort to seek developing concepts and knowledge regarding the organizations under study. Thus, it aims to address of one of the problems in the ICT4D (Information and Communication Technologies for Development) field, according to Qureshi (2015, 1), namely the "ICT4D researchers do not engage closely with the users of their research findings thus disconnecting findings from real-world issues". In this way, research accuracy is achieved through "closeness of the researcher to the phenomenon under study - with the strength of claims of what is directly observed trumping second-hand reports" (Burrel, Toyama 2009, 84).

This engaged approach considers an openness regarding the categories that emerge from the field, as we can see throughout the text. In the case studied here, we use data collected from 2015 to 2021. It includes semi-structured interviews, specifically in 2015 and 2016[i]. Data collection also considered materials provided by the Mumbuca CDB (2016), as well as Mumbuca E-dinheiro DCC data, accessed through the administrative interface system (2018-2019)[ii]. Additionally, to achieve a "closeness of the researcher to the phenomenon under study" (Burrel, Toyama 2009, 84), an ethnographic research approach (which generated field notes) was also used, thusly producing a more detailed description of the referred Mumbuca CDB culture. It relied on immersive observations about Banco Mumbuca (in Maricá, from 2015 to 2016), for six months[iii]. Finally, a Banco Palmas Coordinator took part in a debate at the Esocite.BR[iv] meeting in 2021, presenting the E-dinheiro platform[v] experience.

To analyze our study object, we looked for approaches which would allow us to carefully discuss this supposed separation between "social aspects" and "technical aspects". Here we emphasize contributions related to ICT4Ds and STS (Science and Technology) fields, such as the Actor Network Theory (ANT), considering "the constructions of sciences and technologies [are analyzed] as phenomena in which the 'social' and the 'technical' are inseparably intertwined in a seamless network" (Marques 2003, 678). Precisely regarding to ANT, we use translation, symmetry, networks, sociogram and technogram concepts. As highlighted by Callon (1986, 18-19), "the notion of translation emphasizes the continuity of the displacements and transformations which occur in this story: displacements of goals and interests, and also, displacements of devices, human beings (...). To translate is to displace (...). Translation is the mechanism by which the social and natural worlds progressively take form". We use translation to narrate the facts (such as CDBs methodology) and artifacts (such as digital community currency) displacement, from which we can understand as its origin (Banco Palmas) to the different stabilizations of Mumbuca network.

In this approach, the symmetry concept is also fundamental: seeking to include non-humans and their agency, for ANT not only people do act, but also software, protocols, computers, the Internet, and other technologies do act (in the sense of making difference), e.g., when performing a currency functions. In Bruno Latour's terminology (1998), if we want (albeit provisionally) to separate a network into technical characteristics (technogram) and social characteristics (sociogram), the analysis of an artifact technogram would provide clues to the sociogram that makes up its network (Faria 2010), and vice versa, as shown by figure 1.

Figure 1. Sociogram and technogram (Latour 1998).



Despite some critics regarding this approach - such as "paying little attention to broader social structures that influence the local", or offering "no view, in itself, of the meaning of the term development" (Walsham 2017, 4) –, we consider that ANT seems adequate in this case. Further the reasons already explained, ANT is a research approach that promotes a cross disciplinary perspective on the DCCs topic, something relevant to ICT4D field, according to Walsham (2017)[vi].

3. CONSTRUCTION OF AUTONOMY OF THE MUMBUCA CDB

Structured from local associative dynamics, CDBs rely on a series of tools to generate and expand income in the territory. With this purpose, four central action axes are articulated in its intervention process: (1) solidarity credit fund; (2) local current social currency; (3) fairs of local producers; and (4) training in solidarity economy. CDBs invention has gained relative scale since its first experience, the Banco Palmas (2000), and has been spread around one hundred and fifty (Pupo, 2022) of them in Brazil. It has achieved the status of a "social technology", which may be replicated in different contexts (Brasil 2012), or which some call "frugal innovation" (Radojevic, Peerally 2016). More recently, especially since 2013, Brazilian CDBs have been promoting their community currencies digitalization, in a context particularly fostered by Brazilian legislation for electronic payments (eg. law 12865/2013 (Faria 2018)).

Mumbuca DCC was based on the Banco Palmas model (where one CC is worth one Real, Brazilian national currency) and was initially proposed by the local government [vii]. It circulated around two million Reais per month (backed by Reais, the national currency) from 2015 until 2019 (Faria et al. 2020), which makes Mumbuca the Brazilian community currency with the greatest circulation volume. Mumbuca DCC has been implemented by different materiality forms: technological artifacts, at the first moment, which were like those usual electronic card networks, rather than paper money, and lately a digital application for mobile devices "E- dinheiro" - the platform currently under implementation by the CDBs Network community banks. Through the "Mumbuca card", from 2013 on, 14,000 low-income families in Maricá (RJ) started receiving monthly M$ 84.00 (eighty-four Mumbucas, eighty-four Reais, or around US$15, fifteen dollars) to be used at the local commerce, configuring the start of a minimum income program financed by the town government.

We propose the notion of discourse to deal with CCs materiality changes. In the historian Paul Edwards' (1996, 31) perspective, a discourse is "a self-elaborating 'heterogeneous ensemble' that combines techniques and technologies, metaphors, language, practices, and fragments of other discourses around a support or supports". This concept is useful to exam RQ1 (the digitalizing process implications concerning CDBs practices and principles), helping us to observe the extent to which changes in the support of a speech (in this case, the community currency on "paper-money", on a magnetic card or on a mobile application) are also related to other characteristics of this speech. Faria (2018) highlights fundamental elements that constitute the community development banks discourse: autonomy, proximity, financial sustainability, economic democracies, community mobilizations and mediations. In this article we will focus on the first four practices, and in their reconfigurations observed on the transformation of the paper-money (as a CC) into other supports.

Consolidation traces of the proximity and autonomy notions are found in the 1st Brazilian Thematic Conference of Solidarity Finance, which formalized that "solidarity finance practices are distinguished from other economic organization forms by their initiatives self-managed character. It is because the community is autonomously responsible for such practices management; [...] Solidarity finance practices are distinguished from other economic organization forms, as they work according to a proximity finance logic. In it, human relations, personal contact, and social mediation (based on values such as trust, loyalty, and solidarity) are exchange relations structuring" (Brasil 2012, 180).

The initial umbilical relationship between the bank and the municipality of Maricá (which instituted its own legislation for BCD operation) constituted an important difference compared to the original proposal by Banco Palmas, especially concerning the population autonomy idea involved regarding governments. We are dealing with an experience that, on one hand, injects millions of Reais per month into the local economy using a local currency; but on the other hand, it embodies the dependence of a partnership governed by a specific agreement between the Maricá government and Banco Palmas.

Over this period (from 2013 to 2017)[viii], Banco Mumbuca was not able to use some of the fundamental tools of CDBs due to a limit imposed by the local government: its DCC only circulated among grant beneficiaries. In that digital version, Mumbuca was limited to just "one spin": after the beneficiary made his purchase at a local store, the bank deposited the corresponding amount, in Reais, into the merchant's account. Hence, despite having a relatively high resources volume, the currency circulation was interrupted when the beneficiary shop.

This evident prominence of the government (during that period) could also be noticed in the tasks division between the community bank and the government. Usually, the benefit candidates listened from the CDBs attendants: "do you know where the City Hall is?", which indicates that the bank had no autonomy to solve that issue. However, the limited local autonomy was not only related to the link between the community bank and the local government. Paradoxically, it was possible to notice the constitution of a new center-periphery relationship: in Maricá, CDB members were then Banco Palmas employees. Despite the wish expressed by Banco Palmas coordinator for an autonomous local entity, what we experienced in Maricá's CDB first years daily life was a Banco Palmas centrality. This relative centrality could be noticed both in procedures terms - as research authorizations - and when someone mentioned the bank name: "you may go over there, at Banco Palmas", or "good morning, Banco Palmas" were phases commonly heard in the period experienced in Maricá, either at the City Hall or at the community bank itself.

Thus, Brazilian CDBs practices, important references in the literature related to community management of a local currency and understood as common resources (commons) (Dissaux, Fare 2017; Hudon, Meyer 2016) faced challenges concerning autonomy and local management in Maricá. The complexity (and the delay) in consolidating a local entity was a key element for this CDB (lack of) autonomy. Mumbuca CDB team was not capable of managing completely the community bank, such as which projects conducting, which technologies adopting or when starting other CDBs practices, like microcredit. These seem important effects, at least partially related to the scale involved, one of the main actors in the next section.

4. SCALE AND MAGNETIC CARDS: CHALLENGES FOR AUTONOMY AND PROXIMITY

Maricá government secretary has decided to recommend a translation: according to him, after witnessing a Palmas paper-money theft during his visit to the pioneer CDB experience, he decided to recommend that CC should take a magnetic card form in Maricá, as a way to meet Mayor Quaquá's demand to implant a social currency in town (a much bigger territory when compared to Conjunto Palmeiras). Banco Palmas was hired for the task, and its practices were then faced with an artifact hitherto unknown: the magnetic card and the POS[ix]. They formed the main materiality of Mumbuca DCC from 2013 to 2017 and were provided by the ValeShop enterprise.

As can be seen, the scale required at the Mumbuca case for DCC implementation was inseparable from its materiality, a card inspired by the Federal Government Bolsa Família Program (PBF) – which provides financial aid to poor Brazilian families. A solution hybridized with community banks methodology: if local government drawn its attention to the fact that with PBF "unfortunately" the population could use the money for alcohol and drugs, Bolsa Mumbuca provided a control of the registered establishments. Furthermore, while the federal program beneficiaries had to use their cards to withdraw Reais into paper-money, with Maricá's DCC the paper-money materiality would never pass through the beneficiaries' hands: the currency was used exclusively in a debit card form.

In a larger scale reality (when comparing to other Brazilian CDBs), in addition to the local wealth maintenance, Mumbuca DCC promised more security and more control, important characteristics to consolidate the results obtained with Maricá public policy. During one of our interviews in 2015, the local government mentioned the "control" over currency data: seventy percent of Mumbuca's expenses would have been spent in grocery stores and twenty percent in pharmacies. In the light of a new scale and the presence of a state actor, a proximity new idea was emerging among the community bank, residents, and traders, now mediated by artifacts such as beneficiary cards and merchants' machines.

As a strategy to follow the effects of this "controlled proximity", we propose a (temporary) division among use, management, and production / maintenance of technologies. Starting with the use of technological devices dimension, rather than a possible expected variety of ways to appropriate the use of technological devices, we observed an absence of relevant difficulties evidence in Mumbuca cards usage. This absence dialogues more with an entity that emerged in the work field itself: a certain "card culture" that circulates in the population, pointed out by Banco Palmas. A culture that is certainly related to the Brazilian banking services digitalization process, accompanied by cards and POSs. Beneficiaries often revealed a preference for this digitalization type, rather than paper-money: some interviewees' statements, such use seems associated with the possibility of controlling the spending type on the grant. Hereupon, the card would be better than paper-money because whoever receives the resource could only use them in registered places, "otherwise people would spend on anything", according to Maricá inhabitants. With

the card culture associated with a new control praise, barriers to this digitalization version of Brazilian social currencies seemed small regarding these artifacts usage.

Proceeding with the observation of the beneficiaries' data management, it was not difficult to notice the Mumbuca Card network complexification, at least in two directions. Firstly, documents profusion has increased as a requirement to enter the database. Hereupon, delay to analyze new beneficiaries' applications (government responsibility) was not seldom questioned to the bank employees. Secondly, the registration process started including promises associated with its computerization, which faced obstacles in the beginning – e.g., during a beneficiaries' update registration event, the system went down and there were delays in all service stations. Therefore, it seems clear that, considering these examples, a new kind of proximity, more mediated and controlled, enters the scene. This proximity is connected to not only a beneficiary and his/her card equipped with Mumbucas, but also to rules (including options concerning who were the beneficiaries and how could the beneficiaries spend the Mumbucas), documents, registers in the databases and software used for the registration process, which were essential to Maricá currency infrastructure.

Finally, if when examining the card and the beneficiary we were led to the database registration and construction processes, when we listened to the merchants, we quickly arrived at the machines and the systems that communicate them with ValeShop computers. We arrive here at the third dimension that we proposed, namely the machines production and maintenance and their communication system, which are the ValeShop company responsibility. It is worth saying that Banco Palmas coordinator was uncomfortable with the fact that poor communities where BCDs are do not have another control type, the technology of producing machines. We understand this annoyance as a clue that Banco Palmas' practices faced artifacts relatively unknown to that community. Autonomy sense that circulates in the social currencies proposal of community banks is manifested here regarding the information technologies used, both in terms of knowing how to use them understanding and even being able to produce them as well.

Practices of autonomy and proximity were thus challenged from different angles during the program implementation, whose process was characterized "much more [by] a bank serving a city" than by a city meeting the demands of a community bank, as Banco Palmas coordinator admitted. The initial nuisance, "why can't we produce these little machines?" (the POS's), which embodies an autonomous approach, faced the possibilities of a "card culture" reasonably established among the population (and connected to a relatively desired sense of control), which paradoxically conferred a certain stability and trust in Mumbuca DCC.

5. E-DINHEIRO APP AND A NEW TECHNO-LEGAL FINANCIAL SUSTAINABILITY

A new translation acted to stabilize the DCC network at Maricá, entangled by juridical entities: in addition to the municipal legislation created in Maricá (which regulates Mumbuca), the 2013 Brazilian electronic payments legislation entered the scene as an opportunity for CDBs to become "digital banks" and achieve a desired so-called financial sustainability. This legislation formed a new market of alternative electronic payment means, a market into which CDBs entered due to a 2014 proposal by the MoneyClip enterprise: digitalizing BCDs Network social currencies using the E-dinheiro platform, whose most visible element is an application for cell phones. E-dinheiro gained centrality among CDBs as "[...] the first Social Electronic currency in Brazil, from the Brazilian Community Banks Network, which proposes to serve as the payment means for products and services sold in the solidarity economy" (Carta... 2015).

In Maricá, the proposal to switch from the ValeShop card to the MoneyClip App only took place in 2018, when the MoneyClip's proposal materiality (translated into a smartphone app associated with a card) replaced those operated by ValeShop, not without financial, technological and governance changes connected to the process. Infrastructure change was associated with negotiations with Maricá government, ValeShop and Banco Palmas, according to local governments representatives: in Latour's (1998) terms, technogram and sociogram were connected.

Furthermore, the material change of the payment method would bring a new actor to the BCD network, the cell phones. It should be noted here that Mumbuca Card easy using - "the card culture" - was not verified with a hypothetical scenario of an application with smartphones. When asked about the possibility of Mumbuca grant being

paid only through cell phones, we collected expressions from beneficiaries such as "Oh, no…", "It is very complicated.", "I don't even like cell phones. (…) Leave it as it is". Although considering a more positive reception of the proposal by young people, it was clear that the promises of a mobile payment system would need to be situated.

Despite these obstacles, digital payment method became a central matter to the CDB Network, which was beginning to bet on the new legal framework for electronic payments and on the E-dinheiro application as inseparable from its future: "I think community banks either migrate to electronic currency or they will have problems", said a Banco Palmas coordinator. If in Maricá municipal legislation already strengthened its local currency network, the national picture was different. CDB Network and its paper-moneys, on one hand, relied only in BACEN's (Brazilian Central Bank) technical notes, which guaranteed the operations legality, but did not allow community banks being paid for the paper community currencies administration (Faria 2018). On the other hand, electronic payments legislation (law 12865/2013) allowed non-financial institutions to administer electronic payment systems with remuneration for that. As we can observe, legislation was a fundamental actor for the Brazilian community currencies framework to gain digital features.

Thus, from 2013 onwards, electronic payment legislation has been understood as an ally of Brazilian community banks, now candidates to be "payment institutions" whose low financial volumes operated left them relatively free from BACEN inspection (Ibid. 2018)[x]. Along with the new legislation, MoneyClip proposal came to the BCD Network: the small company from Brasília proposed sharing the fees (collected by the platform) with the Network, due to the currency circulation (2% of each trade sale, and 1% of each local currency exchange for Reais) – a more advantageous agreement to the BCD Network, if compared with ValeShop deal[xi].

An analysis of Banco Mumbuca data (Faria, Pupo, Braga, Silva, Severo 2019) revealed significant revenues for the bank, of approximately 2% of the amount allocated by the town to Maricá residents (between forty and fifty thousand Reais monthly, in 2018 second semester and in 2019 first one). This amount allowed the bank to launch an interest-free microcredit program, with its own resources, for the local population. Additionally, in parallel with E-dinheiro platform adoption (fully implemented in 2018 first semester), there was an "explosion" in the trades' adhesion: associated local producers/commerce number went from the magnitude of one hundred to one thousand trades in one year (Faria et al. 2019). Such a phenomenon met the demands of the own beneficiaries and traders, and it covered not only small businesses, but large businesses chains as well. As a result, while Mumbuca BCD's financial sustainability was increasing, a reorientation of beneficiaries' purchases towards large chains of enterprises was identified, causing a relative loss for small local businesses (Ibid. 2019).

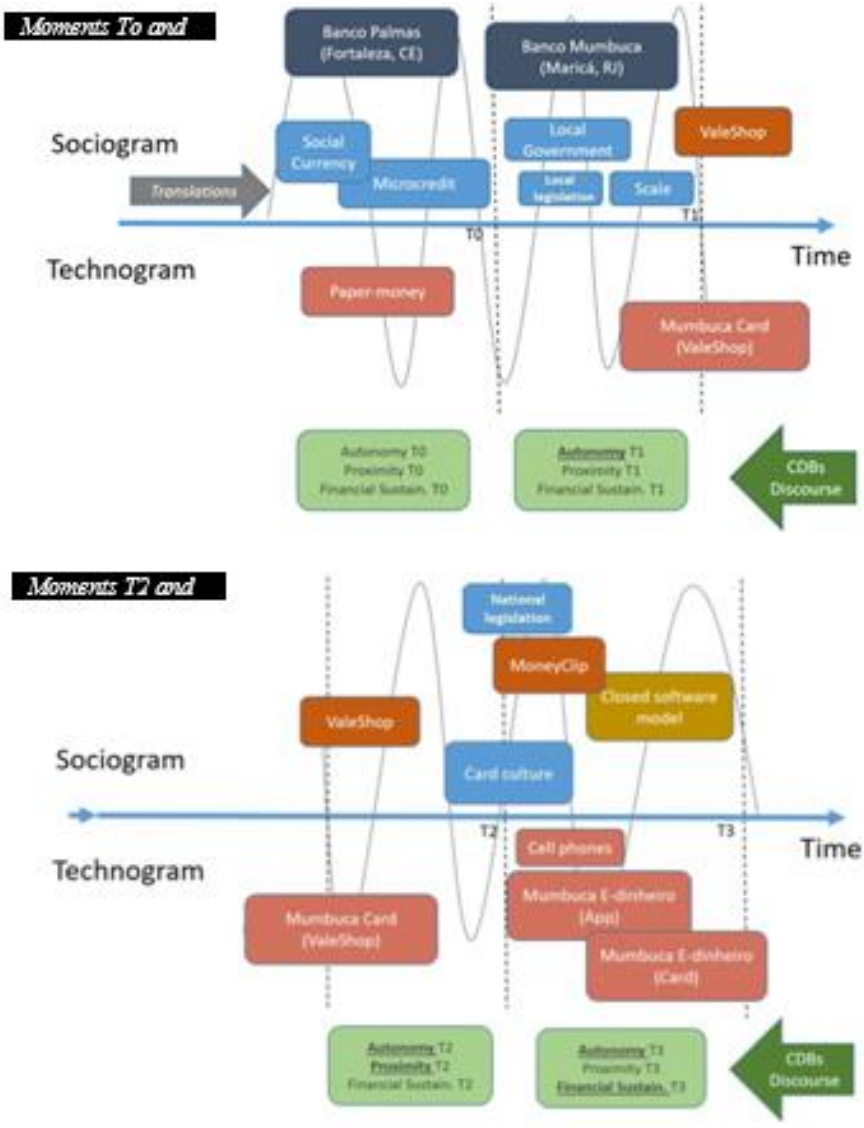
Finally, in what someone could call "technical" new platform characteristics, it is worth mentioning some elements highlighted by Faria et al. (2019). From the DCC platform users' viewpoint, the field interviews pointed E-dinheiro application was hardly used by beneficiaries, among whom the use of the E-dinheiro card predominated, according to the interviewed merchants, reinforcing the "card culture" presence, already discussed here in this text. Concerning the platform transparency and reliability: "[we] recommended 'transparency panels' for Mumbuca circulation in different levels [...]: to support the CDB Brazilian Network discussion with local governments and institutions; to increase community confidence where CDBs are situated, so that the [CDBs] Network itself could have a better data view and plan joint actions; every CDB could ascertain circulation in its own community" (Ibid. 2019). The research also recommended turning E-Dinheiro into an open-source software to facilitate security testing and possibly new software contributions. According to the authors, it would also enhance the dialogue among CDBs Network and other Brazilian collectives closer to solidarity-based economy and free software field.

6. DISCUSSION: SOCIOTECHNICAL RECONFIGURATIONS IN DISCOURSE AND GOVERNANCE

To illustrate the CDBs methodology translation into its Maricá's version, we understand that Latour's approach (1998) is interesting. The author proposes that every change in the sociogram of an artifact, in our case Mumbuca DCC, may foster technogram tensions (and vice-versa). Figure 2 portrays these changes, which we propose (schematically) happen at least in four different moments in Maricá, based on descriptions in the previous sections. For each moment, there is a temporary stabilization of CDBs principles first examined here, namely, autonomy, proximity, and financial sustainability (RQ1).

Taking Banco Palmas methodology as a starting point (T0), Mumbuca first moment (T1) represents this methodology translation for Maricá, with local government partnership, its social assistance program and local legislation. Here, a specific autonomy configuration of Banco Mumbuca was verified (symbolized in figure 2 with the word autonomy in bold and underlined), with challenges regarding the government (e.g., DCC initially only circulated among beneficiaries), also in relation to Banco Palmas. Due to a larger scale of this new network, magnetic card and ValeShop company entered the scene (second moment, T2 in figure 2). Proximity finance notion is then (T2) translated into what we called a controlled proximity scenario, where new mediations emerge (with artifacts like POSs, cards, and databases), as described.

Figure 2. Sociogram and technogram (Latour 1998) adapted to the Mumbuca case. Successive translations lead to the network provisional stabilizations at different moments: different "social" and "technical" actors; in green, CDBs discourse, with relatively reconfigured CDBs practices.



Finally, in a third network stabilization investigated here (T3), migration aspects of the currency infrastructure were verified: smartphones, application and E-dinheiro card, as well as the MoneyClip company and its closed model of software development. Here, a greater financial sustainability perspective at Banco Mumbuca (and the CDBs Network) is central. The new stabilization also reconfigures the BCD autonomy, which started to implement a "zero interest" microcredit program in 2018. Indeed, it is worth mentioning the beginning of a T4 stabilization moment, as presented by Joaquim Melo during the Esocite.BR discussion: in this new configuration, which begun in

2021 first semester, CDB Network is no longer connected to Moneyclip, and software developers dialogue directly to the CDBs[xii].

This process allows us to affirm that different stabilizations of the discourse (Edwards 1996) of Banco Mumbuca are inseparable from its practices (from which were highlighted different practices of autonomy, proximity, financial sustainability arrangements) and its artifacts (paper-money, cards, applications). Hereupon, the case demonstrates that these elements are intertwined, a conclusion that remains far from the idea that changing the DCC materiality would not affect its principles and practices (or "the same idea, [only] in different ways", as verbalized by one of the Banco Palmas founders).

Alongside with these findings, Mumbuca DCC case allows us to discuss some aspects of what we call here DCC democratic governance connected to our RQ2 (implications concerning the governance of CDBs social currencies). We propose connecting it to two works concerning DCCs and governance views. On one hand, Diniz, Siqueira and Heck (2019) framework proposes a DCCs taxonomy, including architecture, transactionality, virtuality, and finally governance. For the authors, governance dimension may be classified in "shared" or "centralized". On the other hand, Faria, Severo, Cukierman, Diniz (2020) discuss three sociotechnical dimensions, namely "requirements", "data" and "source code".

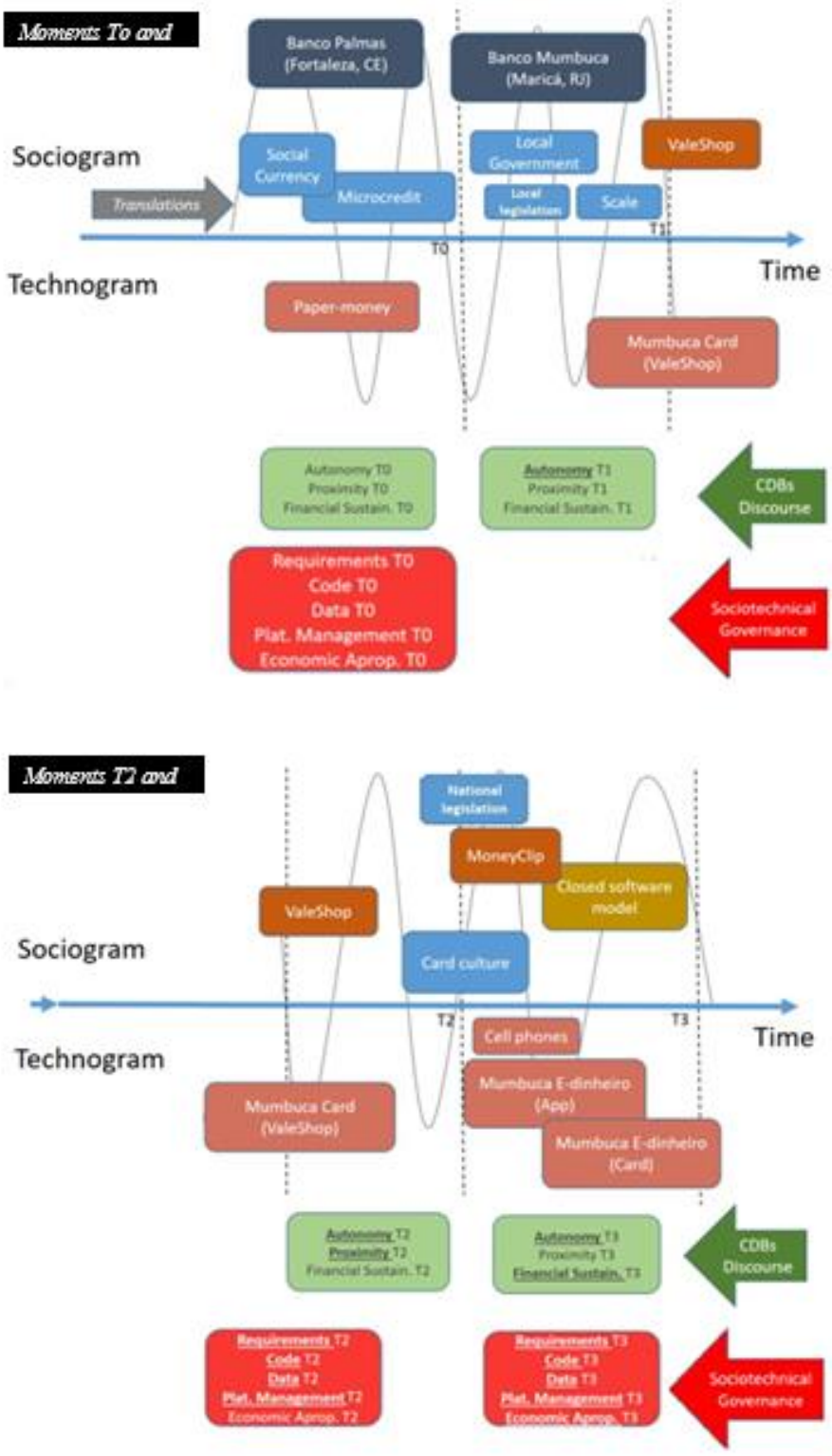
Faria et al. (2020) point the importance of what CDBs call "economic democracy": "[the] history of Brazilian Community Banks shows that democratic practices include not only disputing institutionalized politics power, but also community mobilization in the sense of currency management as common goods." The authors dialogue with Théret and Zanabria's (2007) classification, concerning the "states of a currency", namely, the "incorporated currency" (connected to the users' habits), the "objectified currency" (which serves as a payment mean) and the "institutionalized currency" (which captures rules that unify a monetary space). Based on this classification, Dissaux and Fare (2017) understand that institutionalized currency dimension would be a preponderant state, insofar as a currency is abstract and immaterial: "it is first and foremost about the institution management at issue, much more than its objective expression in the payment means. [...]Social practices are built around it (self-organization, rules transparency, collective regulation, actors' participation, individual non-appropriation of surplus, members cooperation, participatory and collective decision-making process, etc.) which should be analyzed and that allow considering the resource (the currency) to be instituted as a common good" (Dissaux, Fare 2017, 13, our translation).

Here, we share with Dissaux and Fare (2017) the attention to a democratic governance of community currencies, which is coherent to community banks and solidarity economy networks. However, when agreeing with Faria et al. (2020), we propose that materiality is connected to social practices, and therefore they should be placed in equal importance status. Thinking about democratic governances does involve considering social and technical (intertwined) dimensions, that is sociotechnical dimensions. We believe that dimensions proposed by Faria et al. (2020) ("requirements", "data" and "source code" of a DCC) are connected to the CDBs practices examined here, as follows: the discussions around the CDB practices of autonomy are strongly connected both to the possibility of defining DCC requirements (with which rules and functions will be incorporated?) as well as with its source code (who would be able to access the "cake recipe", the instructions executed by the software?). The proximity (and the discussions regarding the information control) is strongly connected to the data dimension (who does have access to it?).

When dialoguing with the authors, we propose to add two dimensions to their discussion, in addition to requirements, data and source code: DCC management dimension (who would take care of its functioning/availability?) and that of the economic appropriations involved (who would financially benefit from the activity?). Such dimensions may easily be coupled to the previous diagram, highlighting diverse sociotechnical governance configurations at different moments (figure 3).

The present research allows us to propose that Mumbuca DCC management (with ValeShop (T2), at the first moment, and after with Money Clip (T3)) is more centralized than "Palmas model" (T0). It is because, once the paper money was available to the community, it did not depend on an institution to manage the digital platform functionalities and its availability. Concerning the economic appropriation dimension, we may advocate that transition from ValeShop to MoneyClip allowed a more shared distribution of the financial benefits provided by DCC circulation (due to the interest-free microcredit program achievement).

Figure 3. Sociogram and technogram (Latour 1998) adapted to the present case, including new governance sociotechnical configurations. Regarding the figure 2, we add (in red) sociotechnical governance dimensions: requirements, source code, data, platform management and economic appropriation.



Coming back to the categorization proposed by Diniz, Siqueira and Heck (2019) (governance dimension classified in "shared" or "centralized"), we consider this paper contributes with the authors' discussion by emphasizing its inevitable "sociotechnical" aspect and by detailing this sociotechnical governance with the dimensions proposed

(requirements, source code, data, management, and economic appropriation). We argue that each one of these dimensions may be categorized as "centralized" or "shared". As a result, we propose a centralized/shared classification for the three moments of stabilization of different sociotechnical governances (T0, T2, T3), considering dimensions discussed here (table 1). "Centralized" means, for us, that there is a strong participation either by the state or by a private enterprise at this dimension; "shared" governance indicates a stronger self- management / community approach.

Table 1. Classification for each dimension of DCC sociotechnical governance: Centralized = strong state / private company presence; Shared = strong self-management / community approach.

DCC SociotechnicalGovernance *DCC Cases*	Requirements	Code	Data	Management	Economic Appropriation
Palma *(Paper-money,T0)*	**Shared** CDB	**Centralized** Printing enterprise	**Shared** CDB	**Shared** CDB	**Shared** CDB
Mumbuca Card *(ValeShop, T2)*	**Shared** CDB Network	**Centralized** ValeShop	**Centralized** ValeShop	**Centralized** ValeShop	**Centralized** ValeShop
Mumbuca E-dinheiro *(App + Card, T3)*	**Shared** CDB Network	**Centralized** MoneyClip	**Centralized** MoneyClip	**Centralized** MoneyClip	**Shared** Banco Mumbuca / CDB Network
E-dinheiro *(CDB Network developers, App + Card, T4)*	**Shared** CDB Network	**Shared** CDB Network	**Hybrid** CDB Network / Provider	**Hybrid** CDB Network / Provider	**Shared** Banco Mumbuca / CDB Network

Then, we considered the platforms requirements are shared, from when it is decided with the CDBs Network - despite improving participation among CDBs might be interesting (Faria et al. 2020); CCs "source code" is centralized with capitalists enterprises (at any configuration, there are not "solidarity collectives" involved). T4 configuration points to a more shared stabilization, whether developers are directly connected to CDBs Network. Even so, both data and platform management dimension are more centralized with T2 and T3 CCs digitalized versions. We might say it considering that both all the network data and operating software are stored in centralized servers (computer), which are primarily administered by a capitalist enterprise – a different situation from T4, which could be even partially changed in the future, considering new technologies, such as blockchain (Diniz, Siqueira and Heck 2019). Finally, this framework makes more visible that transition from Mumbuca Card into Mumbuca E-dinheiro was an achievement in terms of a CDBs better financial appropriation. The whole framework points to a centralization bias as a risk when information technologies come to the scene. However, it is possible to point out some paths to reverse this possible bias. In the code dimension, a more shared approach (which has already begun with the T4 configuration) could involve development models closer to the so-called free software. As for the data, for example, one can think in levels of aggregated data sharing (with communities involved and other CDBs) and in less centralized storage forms, as used in blockchain technology. Such technology could be promising even from the viewpoint of a more shared platform management, as well as used software improvements, towards more possibilities of local customization.

These assumptions dialogue with Diniz, Siqueira and Heck (2019) discussion, and makes sense to our case, as far as this categorization is a central issue to the idea of democratic governance in the solidarity economy proposition. It is aligned with the perception that state ("big government") and corporations ("big business") do not solve all the community problems (Craig 1993). One of the main Brazilian personalities concerning solidarity economy, Paul Singer (2002) calls attention to the fact that capitalism is a mode of production whose principles are the individual property rights applied to capital and the right to individual freedom. On the other hand, solidarity economy, as another mode of production, has as its basic principles the collective or associated property of capital and the right to individual freedom. Briefly speaking, in a capitalist company, a small and select group of owners is responsible

by the main decisions on management processes, on the productive model adopted, on the profit allocation, and usually on tools used for the products / services provided[xiii]. Considering CDBs as participants of the solidarity economy movement, França Filho and Silva Júnior (2009) summarize the CDBs specificity as an experience of solidarity finance lying precisely in the fact that bank coordination and the resource management are carried out by a community organization. The authors also point out that, for a CDB to consolidate, among other aspects, it should establish a technological infrastructure that makes the community bank operations more efficient and effective.

What we argue here is the discussion of DCCs governance dimensions, as technological infrastructures of CDBs, is crucial for (and inseparable from) the "economic democracy" debate among community banks. This inseparability is anchored, for example, on STS field, and may be demonstrated by tools like Latour's (1998) technogram and sociogram. Thus, our critical exercise here lies on the thought that, starting from the analysis of technology used in a determined way to manage work and production, there is a whole ideological and substantial model connected to it: schematically, more centralized systems, in the molds of traditional capitalist and state organizations (hetero management), or, furthermore, more shared systems, focused on principles of solidarity economy (self-managed).

7. CONCLUSION

This paper is situated in the context of monitoring and analyzing the Brazilian community currencies digitalization process, at the CDBs Network. In this community, the idea that this digitalization process would have occurred with "the same idea, [only] in different ways" was strong. At the same time, DCC governance used by the banks is considered a complex challenge to the Network. Drawing our attention to the study of one of the most relevant Brazilian DCCs, the Mumbuca, the paper the digitalizing process implications concerning CDBs practices and principles (RQ1) and governance of CDBs social currencies (RQ2) demonstrates the digital community currency materiality is inseparable from the "social arrangement" around it.

Dialoguing to the ICT4Ds and STS fields, and especially with ANT, we used the concepts of translation, symmetry, networks, sociogram and technogram to describe different moments of Mumbuca. We showed interconnections between the sociogram and the technogram of Mumbuca DCC, emphasizing two approaches: first, discussing how some elements of the discourse of the community development banks (the practices of autonomy, proximity, and financial sustainability) were reconfigured to a certain extent (figure 2) (RQ1). Briefly, autonomy was challenged by dependencies of Mumbuca CDB regarding the local government, Banco Palmas and technology companies and its artifacts; the proximity notion faced the difficulties of the scale and the control possibilities, embedded in a more traceable network (a digital one); Banco Mumbuca financial sustainability was reinforced with the transition into E- dinheiro platform, increasing the bank financial autonomy.

Finally, we discussed a DCC democratic governance (RQ2), linked to the economic democracy notion – another element of CDBs discourse. We propose that materiality is connected to social practices, and they should therefore be placed a priori in equal importance status, as intertwined dimensions: sociotechnical ones. The discussion was useful for us to evaluate each of DCC governance sociotechnical dimensions, namely, requirements, code, data, platform management, and economic appropriation. Dialoguing with Diniz, Siqueira and Heck (2019), we characterized these five dimensions as "centralized" or "shared", according to each moment of Mumbuca DCC (table 1). Considering a desirable shared approach, in agreement with solidarity economy field, the framework proposed helps to highlight some of the greatest current governance challenges for Brazilian (CDBs) Network.

As future researches, we propose to advance on further discussions towards more shared approaches of code, data, and management dimensions; on the use and improvement of the framework with other DCCs analysis; on the connection of the framework with the discussion of the so-called platform capitalism; and on deepening the framework by analyzing complex governance cases, especially of new and promising technologies, such as blockchain.

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ENDNOTES

i Banco Mumbuca workers (3), Banco Palmas Coordinators (2), local commerce (1), Maricá inhabitants (2), local government (2) and MoneyClip enterprise (1) - the company was originally called MadeApp, which developed an application called MoneyClip (a software used to implement the electronic currency E-dinheiro). Subsequently, the partners opened a company called MoneyClip, a name adopted throughout the text, for simplification. The local commerce and inhabitants' interviews addressed aspects such as difficulties with technologies usage, mistrust in relation to the local currency, and changes in expectations regarding the project (at its beginning and by the interview time). The interviews with MoneyClip, Banco Mumbuca, Banco Palmas and local government addressed broader issues, related to mistrusts concerning Brazilian formal institutions (and their responses to local currencies), differences between paper and electronic currency, how users and traders' data were recorded, and relationship with other parties (Banco Palmas, Banco Mumbuca, local government and ICT companies).

ii The materials: folders used by the bank to communicate with population, and spreadsheets with Mumbuca ValeShop Card circulation data. The system access allowed the elaboration of two reports about the Mumbuca currency circulation. More at https://is.cos.ufrj.br/producoes/. Access: 20 Jan 2021.

iii This approach also involved, during 2018, the organization of three "hackathons" (events that brought together software programmers and users): MumbucHackas I and II, which brought together software programmers, Banco Mumbuca and public managers in the municipality of Maricá-RJ; Hackathon at Solidários 2018, as one of the activities of a global meeting of development solidarity banks, organized by Banco Palmas, in Fortaleza-CE. More at https://www.marica.rj.gov.br/2018/01/10/desenvolvedores-discutem-nova-plataforma-do-cartao-mumbuca/, http://www.ofluminense.com.br/en/cidades/banco-mumbuca-no-2%C2%BA-distrito, http://bancossolidarios.global/ and https://is.cos.ufrj.br/producoes/. Access: 20 Jan 2021.

iv More at https://www.youtube.com/watch?v=wogq8WDKMYE. Access: 20 Jan 2021.

v Esocite.BR is the Associação Brasileira de Estudos Sociais das Ciências e das Tecnologias (Brazilian Association of Social Studies of Science and Technology). More at http://www.esocite.org.br/. Access: 20 Nov 2021.

vi According to the author, "[for] example, computer scientists tend to build ICT applications and then evaluate them in particular field contexts. [...] In contrast to computer scientists, sociologists and anthropologists normally address contextual issues in some depth but do not construct artefacts" (Walsham 2017).

vii Mumbuca DCC started its operation under the administration of the mayor of Maricá, Washington Luiz Cardoso Siqueira (Washington Quaquá), after a visit by its Municipal Human Rights Secretary to Banco Palmas, located in Fortaleza outskirts, in the State of Ceará, Brazil.

viii Banco Mumbuca was formally instituted (as an independent institution) in 2017 second semester.

ix "Little machines" ("maquininhas", in Portuguese) is the way a Banco Palmas Coordinator refers to POS (point of sale) machines.

x In practice, Brazilian State ended up favoring electronic currencies when designing a legislation that built a more advantageous market for arrangements that include ICTs.

xi 3% of merchants sales belonged to ValeShop.

xii In fact, CDB Network had already bought the E-dinheiro platform from MoneyClip in 2018, but CDBs were still depending on services concerning the platform maintenance.

xiii As a general rule, a profit portion is paid in cash to shareholders as dividends and the remaining goes to the investment fund. According to Lima (2009), in work cooperatives, the self-managing organization forms of production, the labor activity control, the product made by the own workers and leftovers have their destination decided by the partners collective. One part is placed in an education fund of their own, other part divided between the use to expand the cooperative assets, another part to the cooperative, and finally the remaining is distributed in cash to the partners by some established pre-criteria.