Taxonomy for Understanding Digital Community Currencies: Digital Payment Platforms and Virtual Community Feelings

Paper Category: Research Paper

Eduardo H. Diniz
Escola de Administração de Empresas de São Paulo, Fundação Getulio Vargas
Eduardo.Diniz@fgv.br

Erica S. Siqueira
Escola de Administração de Empresas de São Paulo, Fundação Getulio Vargas
erica_ssiqueira@hotmail.com

Eric van Heck
Rotterdam School of Management,
Erasmus University
evanheck@rsm.nl

ABSTRACT

Community currencies are known for decades and observed in developing and developed countries. They are, usually, created to fight financial and social exclusion and promote local development. Although there are several community currency projects around the world, very little studies have covered the particular case of those that circulating in digital format. Regarded as a way to improve management of community currency systems, new implementations based on plastic cards cell phones, or blockchain technologies, are becoming more common, as technology is becoming more accessible and financial crisis creates opportunities for the emergence of alternatives to the traditional financial system. If technology is expected to collaborate in transparency, costs and speed of transactions, it also imposes challenges to communities that implement them. In this scenario, the objective of this article is to explore conflict and benefits of the community currency that circulates in a digital format, investigating this phenomenon as a particular case of digital payment platform. Analyzing 22 digital community currencies, we propose a taxonomy that divided them in four groups, and then explore emergent conflicts and benefits for each of them.

Keywords: community currencies; digital payment; digital currencies; payment platforms; taxonomy

INTRODUCTION

Virtual currencies can be defined as "a type of unregulated, digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community" (European Central Bank, 2012:13) or as "a medium of exchange that operates like a currency in some environments, but does not have all the attributes of real currency" (US Department of Treasury, 2013:1). It is implicit in those definitions the concern of regulation institutions with the emergence of digital currency platforms and the communities surrounding these platforms. Taking the incredibly complex arena of digital currencies, this paper will concentrate only on digital community currencies universe, despite their potential connections with the mainstream payment industry.

Community currencies are generally regarded as tools for fighting social exclusion and encouraging local development by promoting financial inclusion (Blanc, 2011). The same way as all currencies are increasingly becoming digital, community currencies are also entering in the digital payment platforms universe as the so-called digital community currency (DCC). Based on the use of cell phones, plastic cards, blockchain, or the Internet, DCC is being considered one of the main trends in the field of community currencies (Freire, 2011; Warner, 2014) and also regarded as a way to promote cost reduction and better management of community currency systems (Diniz, Nascimento, & Cernev, 2016).

Although there is some knowledge already built around community currencies and its role to promote social and financial inclusion, studies on DCC, however, are rather rare. In one hand, previous studies extensively covering worldwide cases of community currency – in developing and developed countries – have not been paying much attention on the particular issues related to its digital format (Freire, 2011; Schroeder, Miyazaki, & Fare, 2011; Fare & Ahmed, 2014). On the other hand, studies on digital payments usually ignore the particular case of community currencies. Comprehensive studies on mobile payments for financial inclusion (de Albuquerque, Diniz et al., 2016; Dahlberg, Guo, & Ondrus, 2015; Duncombe & Boateng, 2009), for example, do not mention any case of DCC.

In this sense, this article aims to shed light on the subject of DCC by understanding it as part of the digital payment platform scenario and, given the general trend towards digital payments, the research question guiding this study presented on DCC is: *what are the conflicts and benefits*

faced by community currencies when implemented in digital platforms? To answer this question, we propose a taxonomy for classifying DCCs based on combination of elements taken from the literature about community currencies and digital platforms. We then discuss conflicts and benefits of each group of DCC identified in the taxonomy.

This taxonomy was created to classify 22 selected cases of DCC, captured from an extensive search in sources related to the community currencies. Based on this analysis, four different categories of community currencies circulating in digital format were noted. The presented taxonomy is useful to researchers interested on the community currency topic, as well as the ones investigating digital payments platforms. Discussing each of the emerging categories from the proposed taxonomy helped us to provide insights about the conflicts and benefits for implementing DCCs, offering a new theoretical frame for investigating particular cases of digital payment platforms.

Although digital payment platforms, in particular mobile payment, has been described as a topic of relevance for financial inclusion in developing countries (Duncombe & Boateng, 2009), the importance of DCC is not only restricted to developing countries, since there are many projects also in developed countries, as we show in the selected cases for this study.

The main dimensions adopted in this paper to analyze DCCs were built according to community currency and digital payment platforms literature and are presented in the next two sections. The following sections describes the taxonomy building method used to classify the DCCs. Then the 22 selected currencies are presented and analyzed according to their classification in the proposed taxonomy. The paper closes with a discussion of the conflicts and benefits for implementing each group of DCC identified and comments on the digital payments platform as a way to understand community currencies.

COMMUNITY CURRENCIES

While money has intrinsic relationship with a territory (Santos, 2009), community currency redefine the hierarchy between the local and the national in order to stand as a means of payment, which may also be an instrument for fighting the problems caused either by money in the capitalist system or by the system itself (Burigo, 2001). In addition to being “a trading instrument and means of payment created and operated by self-managed associations” (Singer,

2009, p.3), community currencies generally circulate in a restricted geographic region or community (Freire, 2011).

Important to notice that, by studying the theme of community currencies, we find references mentioning "complementary currencies", "social currencies" or "local currencies" (Renert, 2013; Blanc, 2011) as well as references to Local Complementary Currency Systems and Local Exchange Employment and Trading Systems as common names used for identifying the same phenomenon (Gómez, 2010; Seyfang & Longhurst, 2013). In this paper we will adopt the broad term community currency for all kinds of alternative currencies with an explicit social goal (Place & Bindewald, 2013).

There are several community currency goals in the literature. For example, Ranalli (2013) discuss the usefulness of community currencies in the refugee camps, suffering from shortage of currency and local resources. Bácsi and Herczeg (2014) explore the potential of local currencies as a useful tool for liquidity risk management for small and medium-sized enterprises. Coetzee (2010) discusses the use of community currencies in virtual communities. Gomez (2009) studied the case of “Club de Trueque” in Argentine, that achieved more de 2 million people during a financial crisis, and Freire (2011) discusses the potential of community currencies as a tool for improving financial inclusion and for strengthening solidary relationships.

The use of community currency has been rising over the past two decades and it is possible to count a large number of active community currencies (Seyfang & Longhurst, 2013). Crisis in the mainstream global economy and new possibilities enabled by information technology can be the main reason to explain the growth of community currency projects worldwide (Carroll and Bellotti, 2015). Despite their differences, these currencies represent an alternative financial system and, together with community banks, mutual credit, crowdfunding, and credit unions, they are said to promote a financial revolution led by civil society (Sanchis-Palacio, 2015).

Typologies of Community Currencies

It is hard to say the exact number of systems in operation in the world due to the lack of reliable data on the matter (Seyfang & Longhurst, 2013), nevertheless there are several tentative classifications for this phenomenon. Blanc (2011), for instance, proposes a typology dividing the currencies according to their nature covering territorial, community and economic dimensions.

Another classification (Martignoni, 2012) organizes community currencies into eleven different groups, according to their purpose, trust mechanism, issuance, and circulation. Seyfang & Longhurst (2013) used a community currency database with 3,428 currencies from 23 countries in 6 continents to propose 4 categories based on the projects' goals and Tichit et al. (2015), based on lexical analysis of 320 community-currency websites, proposed 5 categories considering how those projects defined themselves in relation to the standard monetary system.

Although it is very difficult to compare all these classifications, they seem not to properly explore the technological dimension of the community currency projects. This gap is very important, especially when considering the disruptive potential of digital payments combined with alternative payment methods that community currencies represent.

Digital Community Currencies

Even though the use of community currencies is spreading, problems related to community currencies management and implementation can undermine their acceptance (Warner, 2014). Some problems, such as difficulty in making community currencies to be used as change, to access exchange channels, and to be accepted by local businesses, are commonly mentioned (Freire, 2011). Other problems, such as operational management of paper money, its durability, and storage security, are related to the paper-printing format (Diniz et al., 2016; Lietaer & Hallsmith, 2006). Blanc and Fare (2013) also mention problems with fraud and counterfeiting.

Although those mentioned problems could damage the reliability of community currencies, as pointed out in a Bank of England document about banknotes, positioned as local initiatives "the limited scale of current schemes is also a mitigating factor" (Naqvi & Southgate, 2013). On the other hand, issuing community currencies in a digital format could represent a solution to some of the aforementioned problems, besides allowing cost savings and better management of the money circulating within a community (Diniz et al., 2016; Cassoni & Ramada, 2013; Schroeder, 2013). However, the creation and maintenance of DCC do not take place without some difficulties.

One difficulty discussed by Diniz, Cernev, and de Albuquerque (2013) is related to interaction among actors that bring the new technology infrastructure and the community that issues the currency. The authors analyzed a Brazilian DCC implementation via mobile phone that did not prosper and pointed out the project governance as the main cause of its failure.

Another difficulty is related to how technology affects social aspects of financial transactions in a community. Ferreira et al. (2015) explored the technology dimension of the British local currency Bristol Pound and found out that face-to-face transactions help to reinforce the trust on payment. These authors noted that the SMS (acronym for Short Message Systems, used in mobile phones) payment system implemented in this project required more time to complete the transaction, allowing buyers and sellers to talk more to each other, increasing the "conversation and sociability" within the community (p.6). However, they pointed out that this social ties came from the weakness of the implemented technology (SMS and more time to complete transactions), thus the expected rapid, anonymous digital transactions will reinforce the potential for losing sociability and interaction between local buyers and sellers, weakening social bonds, and consequently the community connections.

Weakening social bonds could be a seriously problem that could compromise the success of social goal of a community currency as Nascimento (2015) observes, studying another Brazilian DCC based on card technology. For this author, the failure of a DCC implementation is related to the loss of community feelings and shared understanding about concepts such as "local belonging" and "solidarity". So, while digital format can lower the operational costs and provide a better management to the use of the community currencies, on the other hand, it might not contribute to improve transparency and to increase the desired community feelings expected from them.

As the mentioned projects vary from technology infrastructure, partners involved, types of transactions allowed and many other aspects, we believe that a deeper understanding of DCCs will be more valuable if we could classify them in a way that conflicts and benefits imposed to community currencies in digital format could be analyzed by groups of projects, instead of just looking to each independent project. Thus, we propose a classification for DCCs considering them as a particular case of digital payment platform.

DIGITAL COMMUNITY CURRENCIES AS DIGITAL PAYMENT PLATFORMS

Platform architectures are complex modular systems built in such a way that a stable core group of components (the platform itself) interacts with another group of complementary systems that varies in cross-section or over time (Baldwin & Woodard, 2009). These platforms mean to provide economies of scale and scope within and across companies, offering low-cost,

decentralized solutions for the various groups that transact with each other, either in a single company or supply chain or spread over ecosystems that comprise many different companies.

In this sense, digital payment platforms are, using Abbott (2007) classification, a platform is a specialized system that provides payment services through any form of digital technology (Bapna, Goes, Wei, & Zhang, 2011). In general, considering retail applications, these digital payment platforms allow users to access funds in their deposit or credit accounts in financial institutions to initiate payments using plastic cards, the Internet, or mobile devices (Fung, Molico, & Stuber, 2014).

Four Dimensions of the DCC as digital payment platforms

An extensive literature review on the concept of platform in main journals and conferences of the IS field (Sun, Gregor & Keating, 2015) proposed six dimensions to be considered when investigating platforms. We took three of these dimensions that are directly related to the particular case of digital platform represented by DCC: technological base (here named as "architecture"), governance and transactionality. We also propose another dimension – virtuality – because it is particularly important for the discussion of community currencies, besides being also relevant for other cases of payment platforms. Each of these dimensions is explained next.

Platform architecture

Magnetic and electronic card systems are the base of a technology infrastructure that has dominated digital payment platforms for decades. In the card infrastructure, one dominant partner (the card issuer) issues cards to consumers and processes payment transactions from data collected by outsourced partners (acquirers). These platforms are highly centralized because of the card issuer's control over the whole payment-processing system (Baldwin & Woodard, 2009).

More recently, technologies related to internet and smart phones have raised the interest on digital payment platforms. Mobile payment (m-payment) is defined as any payment that requires a mobile phone to initiate, authorize, and confirm a payment transaction (Kim, Mirusmonov, & Lee, 2010). M-payment is a natural evolution of digital payments and can be made via SMS or other protocols and provides access to money transfers and online payments (Kim et al., 2010). These digital payment platforms tend to include a bigger number of technology elements –

mobile applications, devices, mobile operators, etc. – having a more complex interaction among all of the elements since the hierarchy level among them is not so straightforward as it is in the card platforms.

Jamari, a currency that circulates in the Brazilian Amazon is an example of digital payment platform that architecture is based on card (Gondim, 2012). The British Bristol Pound, in turn, operates in a more complex architecture, supporting transactions through mobile devices (SMS or mobile applications) and over the internet, through specific software (Ferreira et. al., 2015).

Architecture describes how a complementary set of modules (technology infrastructure) is designed to operate into a relatively stable platform (Tiwana et al., 2010). From the architecture dimension perspective, we could see DCC divided in two broader groups: one, named "simple" that operates based on cards, and the other, named "complex" operating through the internet, mobile phones and other new technologies, such as blockchain.

Platform governance

Governance refers to the power of decision on what a platform effectively does, and who will approve its future directions. The degree of openness in a platform is one of the keys issues about governance (Staykova & Damsgaard, 2015; Ondrus et al, 2015). If the governance over a platform is shared among multiple owners or it is based on open standards, it represents a shared rather than proprietary platform (Tiwana, 2014).

When a platform is not locked down, it can be adapted through the addition of new modules that enable a range of new uses (Tilson et al., 2013). While openness is important in terms of potential marketing (Staykova & Damsgaard, 2015), the control (or ownership) of the platform's stable core is critical to its performance, affecting technical issues as well as business arrangements that involve all the participants (Ballon et al., 2011). Thus, the decision of what a platform effectively does and who will approve its future directions is vital to its technical performance and business success.

An example of proprietary governance is the currency Sardex, from the region of Sardina, Italy. Based on a mutual credit with zero balance – when two local businesses transact with each other, credit for one of them is recorded as debit for the other – it is a business-to-business (B2B) system fully controlled by the company that provides the technology (Littera, Sartori, Dini,

Antoniadis, 2014). A different model, Palmas, a Brazilian DCC, is an example of shared control on the platform, since the community bank take strategic decisions about the currency in a communitarian forum with the neighborhood association (Fare at al., 2015).

Thereby, taken the governance dimension, it is possible to capture the diversity of a DCC business model by understanding the payment platform according to two broader categories: shared or proprietary.

Platform transactionality

Another critical dimension of platforms is the transactionality, referring to the distinct groups of users that the platform brings together (Staykova & Damsgaard, 2015). From this perspective, a platform could perform one-sided, two-sided and multi-sided transactions (Hagiu, 2006).

When a payment platform allows transactions between peers, such is the case of peer-to-peer (P2P) and B2B payments, it is called one-sided platform. This is the case of Wir, a Swiss DCC based on a B2B payment platform designed to operate transactions between small businesses in a delimited region of the country (Seyfang & Longhurst, 2013). A P2P example is Faircoin, a Spanish cryptocurrency system, designed for payments between people that avoid the banking system (Lucarelli et al., 2014).

In cases where transactions happen between users with two different profiles, then we have a two-sided platform. UDIS, a community currency from Costa Rica, is an example, which connects producers/merchants to consumers (Brenes, 2011).

A multi-sided platform places more than two economic agents making transactions among themselves (Evans & Schmalensee, 2013; Hagiu and Wright, 2011). Chiemgauer, a German DCC, is a platform that connects business to consumers, but can also connect charity institutions that could receive donations through it (Thiel, 2012). Social government benefits can be also delivered through social currencies, allowing beneficiaries to buy basic products in local stores. Such is the case of currency Mumbuca, in Brazil, another case of multi-sided transaction.

As DCCs can perform these three different ways of transaction – isolated or altogether –, this should be considered as a dimension for analysis when investigating them (Ramada-Sarasola, 2012). This way, from the perspective of the transactionality dimension, we could see DCCs

focused in one-sided (e.g., P2P), two-sided (e.g., business-to-customer, or B2C) or multi-sided (e.g., government-to-person, or G2P) transactions in a single platform.

Platform virtuality

Based on two constructs proposed by the process virtualization theory: sensory and relationship requirements (Overby, 2008), we add a fourth dimension to a discussion about digital payment platforms: virtuality of the payment, since this is a point of concern when evaluating digital payments (Jansen, 2013).

In the DCC scenario, the sensory requirements construct represents the first aspect of the virtuality dimension based on the fact that the convertibility to the official currency provides the "sensory connection" needed to ensure its real value, thus making it more amenable to adoption. An example of a convertible currency is Brixton, from England, issued by a community bank and backed 1-to-1 with the official currency, also possible to be redeemed (Blanc & Fare, 2015).

On the other hand, there are a number of community currencies operating totally in parallel with the official currency system, without caring about any convertibility rate or not having any way to make a correspondent value between the two. Auroracoin, a criptocurrency from Iceland, is an example of totally virtual DCC that has transactions digitally signed in a blockchain (Lucarelli et al., 2014). Another criptocurrency without convertibility to the official currency, Cadastral, from Ghana, is used to pay for real states services and land registering in the countryside by means of blockchains to guarantee transparency for the parts involved. Many time banking type of currencies are also included in this category (Carroll, 2013).

Relationship requirements represent the second aspect of the virtuality dimension. It is related to the physical closeness between the two sides operating a payment transaction. The face-to-face transactions improve "knowledge acquisition, trust and friendship" since buying physically in local shops offer opportunities for sociable interactions in local communities, reinforcing the community feelings desired for a community currency.

Payments made by inserting cards or Near Field Communication (NFC) technologies are examples ot transactions where physical presence is demanded. For DCCs, the face-to-face payment can have effects on the community feeling usually associated with the level of acceptance of the currency. Transactions happening without physical presence could affect the

raison d'être of the community currency itself, which was created to keep the money circulating inside a particular community, and thus compromising its local development goals (Warner, 2014; Ramada-Sarasola, 2012). In the case of afore mentioned Brixton, face-to-face payments are kept to reinforce community feelings.

Considering these two aspects of the virtuality dimension – convertibility and physical closeness –, we see the extreme case of a totally virtual DCC, one that is not convertible or not demand users to be physically close to each other to perform a payment, in opposition to the others with a lower level of virtuality, being either convertible to official currency or being used only when users are in the physical presence of each other (or both at the same time).

METHODOLOGICAL APPROACH FOR CREATING A TAXONOMY FOR DCC

Classifying emergent phenomena is an important first step for science (Carper & Snizek, 1980) and is useful in the construction of descriptive theories (Fawcet & Downs, 1986; Gregor, 2006). In social science, classifications are commonly made via taxonomy or typology. These two approaches are different since typologies are based on classes that have been previously defined whereas, in taxonomies, classes emerge in the course of the empirical research (Bailey, 1994).

Considering that DCC is an emergent phenomenon and that previously typologies do not properly include the technological dimension of them, we propose a new taxonomy. We first identified a number of DCCs to be investigated and classified according to the main attributes to be compared. Then, we developed the taxonomy in three steps (Miles and Huberman, 1994).

At the first step, also known as the open coding phase, we started with the identification of relevant attributes gather from an intensive search about selected DCCs. In the second step, we looked for connections between the labels found in the previous step in order to aggregate them in more abstract concepts, or classes. The taxonomy itself came in the third step, when classes are integrated in higher-level categories of attributes and the selected currencies are classified according to these categories. This procedure is detailed bellow.

Selecting a list of DCCs to be classified

Based on secondary data, an extensive search to identify existing DCCs was carried over initially from August 2015 to November 2015 and then updated from August 2016 to September 2016. The search was taken on the literature about community currencies and on cases of DCC

available online. The main sources of data collection in this search were the International Journal of Community Currency Research, and two data bases containing information about community currencies: Community Currency Info and Community Currencies in Action.

From an initial list of more than 100 community currencies identified in this first search, some of them were excluded due to: a) do not circulate in the digital format, b) do not have a clear social goal (Place & Bindewald, 2013), c) do not circulate as a particular community currency (only as official currency) and e) do not have enough information available about the currency in its digital format (the used technology, for example). After this filtering process, 22 digital community currencies were selected for this study, circulating in thirteen different countries in Europe, South America, Asia and Africa.

From this selection of currencies, we proceeded to a new search to find out more about the features and characteristics of each selected DCC. Besides the references previously used for finding the DCCs, we used Google and Google Scholar to obtain more detailed information about the currencies. In order to "avoid creating an inflexible model", as described by Blanc (2011:2), a number of features for each currency were also highlighted, what could help us to understand and/or formulate the taxonomy, as well as contribute to the discussion of suitability and the benefits and conflitcs facing the studied DCCs.

Open Coding based on Data Collection of Existing Community Currencies

In this first step, 28 features of currencies were labeled for all 22 selected DCCs: provider/partners; social goal; type of sponsor; existence of demurrage rate; charge fee for conversion to official currencies; charge fee per transaction; charge membership fee; scriptural condition (the use of technology just in order to assign debit and credit); use of card; use of SMS; use in a mobile applications; use through the internet; use NFC; operates in online market places; works as cryptocurrency; circulate as P2P, B2B, B2C, B2E (business-to-employee, or salary payment), G2P (via government benefit); is integrated to transportation services; is integrated with telecom services; is integrated to donation projects; keep the circulation of the paper version in parallel with the digital version; is paired with the official currency (1 unit of community currency corresponding to a x units of official currency); is valued in hours; is backed by official currency (convertible in official); works under the zero balance system (one person's credit

equals another's debit, accounts sum to zero). Thus, in this step, we listed all the potential features that were possible to find for all the analyzed DCCs.

Hierarchizing and grouping DCC features (or labels) in classes

Comparing the 28 initial labels with concepts from the literature review we then created 9 second order classes. This way, the labels providers, partners and sponsors, were aggregated under a class named *management*; demurrage rate and fees for transaction, conversion and membership were joined under the *business model* class; scriptural type, online market place and card became a class named *simple*; SMS, mobile applications, internet, NFC and criptocurrency were aggregated in another class, titled *complex*; P2P, B2B, became *one-sided*; B2C and B2E became *two-sided*; G2P and integration with transportation, telecom and care systems became *multi-sided*; DCCs that are paired with official currencies, also circulate in paper format and is valued in hours (time banking) were considered in a class named *valued*; backed by official currencies and zero balance system were aggregated under the class *backed*. Thus, in this step, we came up with second order codes and more abstract categories aggregating attributes from digital community currencies.

Creating the categories for a taxonomy of DCCs

The 9 classes of the previous step were then grouped in 4 more comprehensive categories related to the 4 dimensions of payment platform of the community currency previously presented in this paper: architecture, governance, transactionality, and virtuality. Thus, for creating the taxonomy, we ended up with four major categories to discuss DCCs in a more abstract way. All the four categories found are also based in the literature on digital platforms and community currencies presented previously in the paper and were important help in the creation of this higher level of aggregation for DCCs categories. The final aggregated categories and their elements are presented in figure 1.

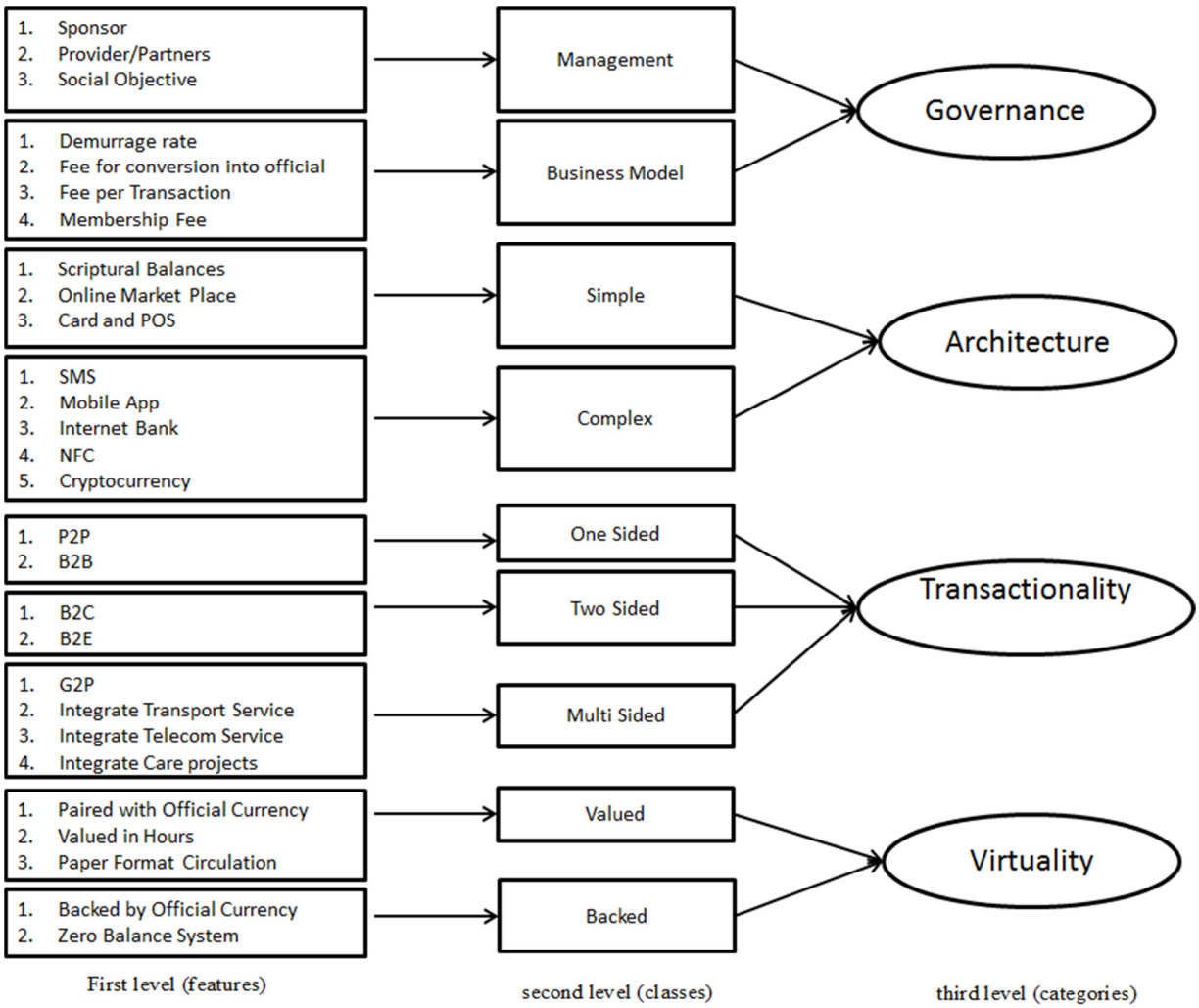

Figure 1 – Aggregated Categories

The taxonomy for DCC

Based on the four categories identified in the previous step, four questions were proposed to each DCC in order to classify them in groups:

- Concerning the architecture dimension, is the DCC architecture simple or complex?
- Concerning the governance dimension, is the DCC platform shared or proprietary?
- Concerning the transactionality dimension, is the DCC focused on: one-sided, two-sided or multi-sided transactions?
- Concerning the virtuality dimension is the DCC totally virtual or non-virutal (operates in presence of the users or is convertible to official currency)?

Based on answers to these 4 questions, we group the 22 DCC in 4 distinct groups and named them: Restrict, Intensive, Proprietary and Closed. There are, for each created group, relevant dimensions that group the currencies, e. g. governance and virtuality are the most relevant

dimensions for Restrict group. Table 1 present currencies and their groups according to the taxonomy.

Currency	Country	Architecture	Transactionality	Governance	Virtuality	Taxonomy
Bristol Pound	*England*	Complex	MultiSided	Shared	non-Virtual	**Restrict**
Brixton	*England*	Complex	MultiSided	Shared	non-Virtual	
Chiemgauer	*Germany*	Simple	MultiSided	Shared	non-Virtual	
Neuro	*Brazil*	Complex	MultiSided	Shared	non-Virtual	
Palmas	*Brazil*	Complex	MultiSided	Shared	non-Virtual	
Sampaio	*Brazil*	Complex	MultiSided	Shared	non-Virtual	
UDIS	*Costa Rica*	Complex	Two-Sided	Shared	non-Virtual	
Jamari	*Brazil*	Simple	Multi-Sided	Proprietary	non-Virtual	**Proprietary**
Mumbuca	*Brazil*	Simple	Multi-Sided	Proprietary	non-Virtual	
Sardex	*Italy*	Simple	Two-Sided	Proprietary	Virtual	
WIR	*Switzerland*	Simple	One-Sided	Proprietary	Virtual	
Zolkin	*Brazil*	Simple	Two-Sided	Proprietary	Virtual	
EuroCat	*Spain*	Simple	One-Sided	Shared	Virtual	**Closed**
Fureai Kippu	*Japan*	Simple	One-Sided	Shared	Virtual	
Tovi	*Finland*	Simple	One-Sided	Shared	Virtual	
TradeQoin	*Netherlands*	Simple	One-Sided	Shared	Virtual	
Auroracoin	*Iceland*	Complex	One-Sided	Proprietary	Virtual	**Intensive**
Cadastrals	*Ghana*	Complex	Two-Sided	Proprietary	Virtual	
EcoSol	*Spain*	Complex	Two-Sided	Shared	Virtual	
FairCoin	*Spain*	Complex	One-Sided	Shared	Virtual	
Positoo	*Netherlands*	Complex	Two-Sided	Shared	Virtual	
Sonantes	*France*	Complex	Two-Sided	Shared	Virtual	

Table 1: Currencies, countries and their classification in each group

Characteristics of each DCC group

The group **Restrict** comprises shared governance DCCs, generally operated by a community or cooperative bank, and they are all non virtual. Its social objectives are related to reinforce the community feelings, thus rely on face-to-face transactions to reinforce human values in financial transactions. They also have a paper circulating in parallel with de digital version. Those DCCs located in this group are typically created to promote local development and can simultaneously support B2C and P2P transactions. In general, their use is limited to geographically restricted communities; these currencies tend to strengthen the feeling of belonging to a community (Lietaer & Hallsmith, 2006). As this kind of community currency usually requires more complex architecture (with the exception of Chiemgauer), they also often involves many social groups in its implementation, which may increase the risk of failure due to the difficulties of coordinating those different groups (de Albuquerque et al., 2016). Its redeemability into official currency increases the users' trust in this type of DCC, because it allows them to enter and exit the currency circuit whenever convenient (Renert, 2013). The architecture required, however, can generate costs for users (the cost of holding a mobile phone, for example) and currency managers

(better technological infrastructure), besides excluding the digitally illiterate (Menezes & Crocco, 2009). Designed to restricted communities, those currencies may require a considerable effort to be interoperable with larger systems, such as the traditional financial system.

The DCCs in the group **Proprietary** have proprietary governance and do not make multi-sideness transactions, being also based on card architecture. This group of DCCs may be associated with the distribution and control of a social benefit, sometimes being in fact designed to serve this particular purpose (Nascimento, 2015). They generally have a wider geographic coverage, transcending the boundaries of a local community, but hardly exceeding the boundaries of a city, for example. Because they are based on a less complex architecture, those DCCs are usually integrated to networks belonging to more traditional systems, such as credit or debit card operators (de Albuquerque e al., 2016), though with low interoperability with networks outside this particular loop. As it involves a smaller number of groups to be implemented, the acceptance of those DCCs is facilitated, which increases the trust on it. Acceptance is also reinforced when associated with social benefits.

The **Closed** group comprises virtual DCCs operating in a closed system that could be based on mutual credit system with zero balance between companies (B2B) or time banking (P2P). DCCs classified in this category support exclusively B2B or P2P transactions. Because they are based in closed networks, when they are created to make B2B transactions, those currencies are designed to primarily favor the interests of local merchants, the social issues being only a secondary objective. The ones that support P2P transactions, on the other hand, were clearly designed primarily for social purposes. They demand less complex technology architecture of all DCC analyzed, often requiring only record of transactions, such as DCCs of the "time banking" type (Fare & Ahmed, 2015). In many cases, the technology is used just to support the basic infrastructure to process community currency transactions, but is not an essential part of their operations. They generally cannot be exchanged for official currency, but technology can play an important role in the transparency of transactions, which helps to increase trust in the DCCs.

The DCCs in the **Intensive** group are based in more complex architecture and operate in a total virtual way, usually with no equivalent in paper format. The currencies grouped in this category have greater territorial coverage and are more comprehensive in supporting concurrent transactions (B2B, B2C, and P2P) on the same platform. They are exclusively digital currencies

and may involve payments via mobile applications or SMS, cryptocurrencies, or the operation of an account via the Internet. They keep high interoperability between different systems, which may increase trust in the use of those DCCs (Renert, 2013). However, the focus on local development is not clear, betraying community currencies' traditional role (Lietaer & Hallsmith, 2006). They depend on the integration with other networks, such as the telecom and financial systems, and may exclude less technologically literate users and those who cannot afford the costs of technological devices needed to transact in these systems (Menezes & Crocco, 2009).

FINAL COMMENTS

This paper seeks to deepen the discussion on the role of community currencies' digital format, identifying categories of use and technology incorporation in the various DCC existing projects. From the analysis of 22 DCCs, a taxonomy of four categories was proposed, based on the architecture, governance, transactionality and virtuality of the adopted digital payment platform for each currency, what led to a four different groups of currencies. For each of these groups we could explain the potential benefits and conflicts that digital platforms can bring to community currencies.

For the **Restrict** group, while is possible to see some improvement in the currency management, as well as a reduction in the costs to keep it operating, there is a clear risk for the purpose of develop a community feeling, the most common declared reason for the very existence of this type of currency. For the **Proprietary** group, while the main benefit is the potential inclusion of social grants into the currency circulation the main conflict is expected within the control of the platform, usually centralized and not well adapted to communitarian goals. For the **Closed** group, the main benefit of the digital platform is the cost and practical use, particularly if used from a mobile device, with not a clear conflict since by the own nature of the currencies in this group, technology is simple, governance is shared and the community feelings are kept intact in a closed circuit of users. The **Intensive** group is the more aggressive in adopting new technologies and benefit from the potential of expand the territorial base of a community and is probably the best-suited model for virtual communities, however it can demand users more digitally include and literate.

As a practical contribution for the DCC managers, this paper organizes the discussion on potential benefits and conflicts of each type of currency. In sum, the most relevant issues found

are the risk to the community feelings because of the virtuality dimension, and the introduction of new actors that comes along the technology and can compromise the shared governance spirit of most community organizations. On the other hand, virtual communities – that were not the focus of this research that listed only currencies from territorial communities – and closed communities have almost no restrictions to adopt digital platforms for their currencies.

The theoretical contribution of this paper is the proposition of a model of four dimensions to analyze one particular case of digital payment platform, including the virtuality dimension, original in the literature on platforms in the IS field. From the model developed in this paper, it is possible to design new investigations on other cases of financial oriented platforms, which is an open field since the emergence of the Fintech phenomenon in the last few years. Since among the issues related to digital platforms are metrics and, by consequence, their evolution (Tiwana, 2014), this model of four dimensions can represent a good point to start new researches.

On the limitations of the paper, the most important one is the choice of relying only in secondary information about the currencies, what in first place limited the number of currencies that were included in this study and, secondly, could not clarify many aspects of the studied DDC projects. Another limitation was the manual process of coding the features to turn them into classes, what was possible only because of the limited number of 22 currencies investigated. For coding features of a bigger number of currencies, this manual process would not viable and the use of tools to support the analysis would be mandatory. A third limitation is the exclusion of the dimension interoperability from the analysis. This is surely an important aspect, but it was a decision taken based in two rationalities: first is the fact that community currencies are in general limited in circulation and thus based on little interoperability; second is also related to the access of information about the currencies, meaning that by including this dimension it would be necessary to focus only in a even more limited number of currencies to be studied.

REFERENCES

Abbott, R. (2007). Putting complex systems to work. Complexity, 13(2), 30-49.

Bácsi, J., & Herczeg, I. (2014). Local currency as a tool of risk management in the small and medium enterprises sector. Roczniki Naukowe Stowarzyszenia Ekonomistów Rolnictwa i Agrobiznesu, 16(3), 18-23.

Bailey, K.D. (1994). Typologies and taxonomies: an introduction to classification techniques. Thousand Oaks: Sage.

Baldwin, C. Y. and Woodard C. J. (2009) "The architecture of platforms: A unified view" in Platforms, Markets and Innovation, A. Gawer, Ed., ed Cheltenham, UK: Edward Elgar Publishing, pp. 19-44.

Ballon, P., Bouwman, H., & Yuan, Y. (2011). Special Issue on Business Models for Mobile Platforms: Guest Editors' Introduction. Journal of theoretical and applied electronic commerce research, 6(2), v-vi.

Bapna, R., Goes, P., Wei, K. K., & Zhang, Z. (2011). A finite mixture logit model to segment and predict electronic payments system adoption. Information Systems Research, 22(1), 118-133.

Blanc, J. (2011). Classifying" CCs": Community, complementary and local currencies' types and generations. International Journal of Community Currency Research p.4-10.

Blanc, J., & Fare, M. (2013). Understanding the role of governments and administrations in the implementation of community and complementary currencies. Annals of Public and Cooperative Economics, 84(1), 63-81.

Blanc, J. & Fare, M. (2015) Contrasted cases. Successes and failures of local currency schemes in France since 2010. 3ªConferência Internacional em Moeda Social e Complementar. Bahia.

Brenes, E. (2011). Complementary currencies for sustainable local economies in Central America. International Journal of Community Currencies Research, 15, 32-38.

Burigo, F. L. (2001). Moeda social e a circulação das riquezas na economia solidária. Florianópolis, SC, fev. 2001. Disponível em: <http://www.ifil.org/rcs/biblioteca/burigo.htm>. Acesso em: 10 ago. 2015.

Carper, W.B & Snizek, W.E. (1980). The nature and types of organizational taxonomies: an overview. Academy of Management Review, Briarcliff Manor, v.5, n.1, p.65-75, Jan. 1980.

Carroll, J. M. (2013, June). Co-production scenarios for mobile time banking. In *International Symposium on End User Development* (pp. 137-152). Springer Berlin Heidelberg.

Carroll, J. M., & Bellotti, V. (2015, February). Creating Value Together: The Emerging Design Space of Peer-to-Peer Currency and Exchange. In Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing (pp. 1500-1510). ACM.

Cassoni, A., & Ramada, C. (2013). Digital Money and its Impact on Local Economic Variables: The Case of Uruguay. Document of Investigation, (92).

Coetzee, L. (2010). Local exchange through community currency in an alternative gift economy: an anthropological analysis of the Cape Town talent exchange (Doctoral dissertation, Stellenbosch: University of Stellenbosch).

Dahlberg, T., Guo, J., & Ondrus, J. (2015). A critical review of mobile payment research. Electronic Commerce Research and Applications, 14(5), 265-284.

De Albuquerque, J. P., Diniz, E. H., & Cernev, A. K. (2016). *Information Development,* June 2016; vol. 32, 3: pp. 527-553.

De La Rosa, J. & Stodder, J. (2013). On Velocity in Several Complementary Currencies. 2nd International Conference on Complementary and Community Currencies Systems, The Hague.

Demeulenaere, S. (2008). Yearly report of the worldwide database of complementary currency systems. International Journal of Community Currency Research. Vol 12, pp.2-19, 2008.

Diniz, E. H., Cernev, A. K., & de Albuquerque, J. P. (2013). Mobile Platform for Financial Inclusion: the Case of an Unsuccessful Pilot Project In Brazil. *Proceedings of SIG GlobDev* Sixth Annual Workshop, Milan, Italy December (Vol. 14).

Diniz, E. H., Cernev, A. K., & Nascimento, E. (2016). Mobile social money: an exploratory study of the views of managers of community banks. *Revista de Administração*, *51*(3), 299-309.

Duncombe, R., & Boateng, R. (2009). Mobile Phones and Financial Services in Developing Countries: a review of concepts, methods, issues, evidence and future research directions. Third World Quarterly, 30(7), 1237-1258.

Evans, D. S. and R. Schmalensee (2013). "The Antitrust Analysis of Multi-Sided Platform Businesses." In R. Blair and D. Sokol (Eds.) Oxford Handbook on International Antitrust Economics, Oxford University Press.

Fare, M. (2010). The SOL: a Complementary Currency for Social Economy and Sustainable Development. International Journal of Community Currency Research, 15, 57-60.

Fare, M. & Ahmed, P. O. (2014). Complementary currency systems questioning social and economic changes. 2014. At: http://hal.ird.fr/ird-01088492/document

Fare, M., De Freitas, C., & Meyer, C. (2015). Territorial development and community currencies: symbolic meanings in Brazilian community development banks. International Journal of Community Currency Research, 19(D), 6-17.

Fawcet, J. & Downs, F.S. (1986). The relationship of theory and research. London: McGraw-Hill/Appleton & Lange.

Ferreira, J., Perry, M., & Subramanian, S. (2015, February). Spending time with money: From shared values to social connectivity. In Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing (pp. 1222-1234). ACM.

Freire, M. (2011). Moedas sociais: contributo em prol de um marco legal e regulatório para as moedas sociais circulantes locais no Brasil. [Tese de Doutorado]. Brasília: Universidade de Brasília (UNB).

Fung, B., Molico, M., & Stuber, G. (2014). Electronic money and payments: Recent developments and issues. Bank of Canada Discussion Paper, (2014-2).

Gondim A. (2012). O desenvolvimento do seu município passa pelas suas mãos.. Vencedores do VII Prêmio Sebrae Prefeito Empreendedor 2011 – 2012. Brasília: Serviço Brasileiro de Apoio às Micro e Pequenas Empresas – Sebrae.

Gómez, G. M. (2010). What was the deal for the participants of the Argentine local currency systems, the Redes de Trueque?. Environment and planning. A, 42(7), 1669.

Gregor, S. (2006 September). The nature of theory in Information Systems. MIS Quarterly, Minneapolis, v.30, n.3, p.611-642.

Hagiu, A. (2006). Pricing and Commitment by Two-Sided Platforms," Rand Journal of Economics, 37 (3), 720-737.

Hagiu, A. and Wright, J. (2011). Multi-sided platforms. Harvard Business School Working Paper, No. 12–024

Jansen, M 2013, Bitcoin: The Political "Virtual" of an Intangible Material Currency, International Journal of Community Currency Research, vol. 17, A, pp. 8-18.

Kim, C., Mirusmonov, M., & Lee, I. (2010). An empirical examination of factors influencing the intention to use mobile payment. Computers in Human Behavior, 26(3), 310-322

Lietaer, B. & Hallsmith, G. (2006). Community Currency Guide. Disponível em http://cemusstudent.se/wp-content/uploads/2012/11/Community- CurrencyGuide.pdf Acessado em 20/11/2015.

Littera G., Sartori L., Dini P., Antoniadis P. (2014). "From an Idea to a Scalable Working Model: Merging Economic Benefits with Social Values in Sardex", in Inaugural WINIR Conference, Greenwich, UK.

Lucarelli, S., Sachy, M., Brekke, K. J., Bria, F., Giuliani, A., Gentilucci, E., & Idir, G. (2014). D3. 4 Field Research and User Requirements Digital social currency pilots.

Martignoni, J. (2012). A new approach to a typology of complementary currencies. International Journal of Community Currency Research 16 (A), 1-17.

Menezes, M. S. & Crocco, M. A. (2009 August). Sistemas de moeda local: uma investigação sobre seus potenciais a partir do caso do Banco Bem em Vitória/ES. Economia e Sociedade, Campinas, v. 18, n. 2 (36), p. 371-398.

Miles, M.B. & Huberman, A.M. (1994). Qualitative data analysis. 2nded. Thousand Oaks, CA: Sage.

Naqvi, M., & Southgate, J. (2013). Banknotes, local currencies and central bank objectives. *Bank of England Quarterly Bulletin*, Q4.

Nascimento, E. P. C. C. D. (2015). Moedas sociais digitais: estudo de caso de duas experiências em bancos comunitários. Dissertação de mestrado. Escola de Administração de Empresas de São Paulo. FGV. 129p.

Ondrus, J., Gannamaneni, A., & Lyytinen, K. (2015). The impact of openness on the market potential of multi-sided platforms: a case study of mobile payment platforms. Journal of Information Technology.

Overby, E. (2008). Process virtualization theory and the impact of information technology. *Organization science*, *19*(2), 277-291.

Place, C. & Bindewald, L.(2013). Validating and Improving the Impact of Complementary Currency Systems: impact assessment frameworks for sustainable development. 2nd International Conference on Complementary and Community Currencies Systems, The Hague. June.

Ramada-Sarasola, M. (2012). Can Mobile Money Systems have a measurable impact on Local Development? *Available at SSRN 2061526*.

Ranalli, B. (2013). Local Currencies: A Potential Solution for Liquidity Problems in Refugee Camp Economies Oxford Journals Social Sciences Journal of Refugee Studies Volume 27, Issue 3Pp. 422-433.

Renert, J. (2013). Increase Community Currency Circulation: Back it in appropriate core resources. 2nd International Conference on Complementary and Community Currencies Systems, The Hague.

Sanchis Palacio, J. R. (2015). ¿Es posible un mundo sin bancos?: La revolución de las finanzas éticas y solidarias (Spanish). Espanha: Ediciones de Intervención Cultural.

Santos, M. (2009). O dinheiro e o território. GEOgraphia, 1(1), 7-13.

Schroeder, R., Miyazaki, Y. & Fare, M. (2011). Community Currency Research: An Analysis of the literature. International Journal of Community Currency Research. Pag. 31-41.

Schroeder, R. F. H. (2013). The Financing of Complementary Currencies: Risks and Chances on the Path toward Sustainable Regional Economies. The "2" International Conference on Complementary Currency Systems (CCS) 19-23 June.

Seyfang G. & Longhurst N. (2013) Growing green money? Mapping community currencies for sustainable development, Ecological Economics, vol. 86, p. 65–77.

Singer, P. (2009). Finanças solidárias e moeda social. In: L.E. FELTRIM, E.C.F. VENTURA & A.V.B. DOLD. Projeto inclusão financeira. Brasília, Banco Central do Brasil, p. 69-78.

Staykova, K. S., & Damsgaard, J. (2015). A Typology of Multi-sided Platforms: The Core and the Periphery. In 23rd European Conference on Information Systems (ECIS) 2015.

Sun, R., Gregor, S., & Keating, B. (2016). Information Technology Platforms: Definition and Research Directions. Proceedings of Australasian Conference on Information Systems. 2015, Adelaide.

Tichit, A., Mathonnat, C ., Landivar, D. S. (2015). Classifying Non-banking Monetary Systems using Web Data. Études et Documents, n° 30 , CERDI.

Thiel, C. (2012). Moral Money–The action guiding Impact of Complementary Currencies. International Journal of Community Currency Research, 91-96.

Tilson, D., Sørensen, C., & Lyytinen, K. (2013) "Platform Complexity: Lessons from the Music Industry". 46th Hawaii International Conference on System Sciences (HICSS). pp. 4625 – 4634.

Tiwana, Amrit; Konsysnski, Benn; Bush, Ashley A. (2010) "Coevolution of Platform Architecture, Governance, and Environmental Dynamics". Research Commentary: Information Systems Research. 21(4), pp. 675–687

Tiwana, A. (2014). *Platform ecosystems: aligning architecture, governance, and strategy*. Elsevier. 305p.

Warner, Jonathan (2014). The future of Community Currencies: physical cash or solely electronic? *International Cash Conference 2014*. Deutsche Bundesbank.