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Sharing communities – Community currency in the sharing economy

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ABSTRACT

For the further development and more efficient operation of the sharing economy, a fast and inexpensive peer-to-peer payment system is an essential element. The aim of this study is to outline a prototype that ensures the automation and decentralization of processes through smart contracts without blockchain technology. The model has been built based on the narrative that a community currency created through smart contracts can promote genuine practices of sharing as opposed to the profit-oriented approach that most of the currently operating sharing economy platforms have. Features of the model, such as ease of use, high-speed transactions without transaction cost are benefits that can provide a more efficient alternative to the traditional or to the cryptocurrency-based centralized sharing economy platforms.

KEYWORDS

sharing economy, smart contract, community currency

JEL CODES

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1. INTRODUCTION

Fuelled by the financial instability and the general loss of trust in institutions generated by the global financial crisis of 2008, economic actors started to search for alternative forms of

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cooperation that eliminate third-party intermediaries and ensure direct interaction between peers. As a result, the sharing economy and solutions based on blockchain technology have started to grow exponentially. Both of them enable peer-to-peer transactions without the need for trusted third parties and both of them have been framed as models that disrupt the established economic structure and existing business models (Andreoni 2020). According to Killen (2015: 488), "the connectivity between peers is the infrastructure both of Bitcoin and the Sharing Economy." As models grow across sectors and activities, they can lead to significant social and economic changes, which have been studied by academics (e.g. Davlembayeva et al. 2020; Frenken and Schor 2017; Min et al. 2018) and international organizations such as the IMF and the OECD.

There is a rapidly growing body of literature analysing and discussing the development of the sharing economy, the possible uses of blockchain technology (e.g. Wamba et al. 2020; Čavalić and Bećirović 2017) and the interplay of the two (e.g. Menne 2018; Huckle et al. 2016). However, in Hungary, there has been scant research on the ways the sharing economy and solutions based on the technology and logic of blockchain could be combined. This paper attempts to fill this gap and proposes a sharing economy model that ensures full automation and decentralization of processes through smart contracts and enables transactions without any technological cost.

Several prototypes have been presented to build decentralized sharing economy businesses e.g. by Menne (2018) or Kosba et al. (2016), but these are based on public blockchains. Our model has been built based on the narrative that a community currency created through smart contracts without blockchain technology can promote genuine practices of sharing as opposed to the profit-oriented approach that most of the currently operating sharing economy platforms have. Our goal is not to analyse the technicalities related to the interplay of the two but to present the questions to be answered during the design of the model and the answers that could be given. Thus, the aim of this study is to demonstrate the applicability of the outlined community currency in the sharing economy, through comparing it to solutions based on blockchain technology and on a traditional online payment system. The following research questions were formulated:

- How can virtual community currencies promote practices of genuine sharing?
- How can smart contracts be applied to create a community currency for the virtual community of a sharing economy platform?

In the sharing economy, transactions between members most often are small-purchase amounts, so-called "micropayments" (Fressancourt – Hodam 2011) and "incur such high transaction costs in the traditional payment system, that often make them illogical" (Killeen 2015: 493). We argue that the use of a peer-to-peer payment system based on a community currency can eliminate the transaction costs associated with traditional payment systems and the financial risks and difficulties associated with cryptocurrencies, thus contributing to the growth of the sharing economy. It can also be a solution to income inequality, in particular it can enable unbanked people to take part (Killeen 2015). Community currency also offers an alternative solution to the crisis-enhancing mechanisms of money created by banks (Varga 2018). The use of smart contracts can make payment processing automatic and decentralized, thus addressing many of the problems of centralized sharing economy platforms, e.g. high service fees. Based on Szabó (1997), we argue that the automation of processes could be achieved without using blockchain technology, which could simplify the operation of the underlying system.

At the present stage, the discussion in this paper provides a general overview of our concept and the possible advantages and challenges of the described system compared to existing models. The

first section presents literature regarding the conceptual issues of the sharing economy, followed by the background of blockchain technology and smart contracts. This is followed by an analysis of the strengths and shortcomings of current payment systems based on blockchain technology in the sharing economy model. Based on our analysis, we present our theoretical model using Wieringa's (2014) design science approach. While we provide an overview of the main socio-economic implications of the system, additional research needs to be done on the social, economic and environmental impacts and the practical issues related to the operation of the system. The final section contains our main conclusions and future research directions.

2. RELATED LITERATURE

2.1. The sharing economy

The concept of the sharing economy – the practice of granting each other temporary access to idle capacity – is considered to be one of the most important recent business trends. The sharing economy is gaining ground, and has the potential to increase European revenues from 28 billion euros to around 600 billion euros by 2025. At the heart of this change is the Internet and the spread of mobile devices, but online payment systems also play an important role in the growth of the sharing economy (PWC 2015).

In general, academic literature offers often very inconsistent conceptualisations of the phenomenon (Curtis – Lehner 2019). It has been framed as a complex, disruptive and controversial socio-economic phenomenon (Schor 2014), with no clear definition (e.g. Lengyel 2017), rather a large set of related definitions, such as collaborative, peer-to-peer or platform economy (Andreoni 2020). Depending on the discipline and the focus of research, there is a difference between academics in how much emphasis they place on IT support, on the genuine practice of sharing and on the role of money. The two opposites are profit-oriented, business-to-consumer platforms and non-profit peer-to-peer platforms (Curtis – Lehner 2019). Without being exhaustive, Table 1 presents some of the conceptualisations of this phenomenon.

There is one common feature in the definitions listed in Table 1: the temporary access to unused resources; but there are differences in their nature, in the actors involved and in the monetization of transactions. Dudás and Boros (2019) link one of the narrowest definitions to Frenken and his co-authors. According to them, in the sharing economy, "consumers grant each other temporary access to under-utilised physical assets ("idle capacity"), possibly for money." (Frenken et al. 2015, cited in Dudás and Boros 2019: 117–118). In Botsman's (2015) definition, besides under-utilised physical assets, the term 'sharing of services' appears too. Botsman also stresses that sharing can be done either for free or for a fee. The definitions of Frenken et al. (2015) and Botsman (2015) provide a framework for this study. The definition of Matzler et al. (2015) provides a further insight, as they identify three main categories of the sharing economy:

(i) a product service system in which members share products mainly owned by companies or by private persons (e.g. Uber);
(ii) a redistribution market (e.g. NeighborGoods);
(iii) a collaborative lifestyles environment in which people share interests, money, space, abilities, time (e.g., TaskRabbit, Timebanks).

Based on Matzler et al.'s definitions, any transaction between private individuals that involves the sharing of assets or services in exchange for free or for a monetary return, can be

Table 1. Various definitions of the sharing economy

Author(s)	Definition
Hamari et al. (2016)	"an umbrella concept that encompasses several ICT developments and technologies, which endorses sharing the consumption of goods and services through online platforms." (Hamari et al. 2016: 2)
Heinrichs (2013)	"individuals exchanging, redistributing, renting, sharing and donating information, goods and talent" (Heinrichs 2013: 229)
European Commission (2016)	"business models where activities are facilitated by collaborative platforms that create an open marketplace for the temporary usage of goods or services often provided by private individuals" (European Commission 2016: 3)
Barnes and Mattsson (2016)	"involves access-based consumption of products or services that can be online or offline" (Barnes and Mattsson 2016: 200)
Lengyel (2017)	"an economic distribution system, that includes all kinds of innovative business models, platforms and technologies, that enable the renting, exchanging, sharing and gifting of idle tangible and/or intangible resources providing wide access and high efficiency" (Lengyel 2017: 3)
Szűts and Yoo (2015)	"a sociological and economic model based on the sharing of physical and human resources. It involves community production, distribution, trade, and service exchange between private individuals and organizations" (Szűts and Yoo 2015: 78)

Source: compiled by the authors.

classified as part of the sharing economy. We focus only on peer-to-peer interaction, as we do not consider platforms that are not based on non-ownership forms of consumption activities part of the sharing economy.

We frame the sharing economy as a socio-economic model that is able to disrupt the traditional way of doing business and to increase social bonding and collaboration. It empowers individuals through making people aware of the opportunities to share their abilities, their time and "to use their excess capacity embedded into shareable goods" (Andreoni 2020: 4). According to Davlembayeva et al. (2020), the underlying motives of the users' collaborations lead to two different paths – the social and the economic one. The monetary-based transactions aiming to increase income opportunities lead to the economic path, while collaborations based on reciprocity, social and altruistic motives lead to the social one. In sharing economy relations, reciprocity can be monetary or non-monetary, immediate and mutual or postponed and without mutuality. Based on

social exchange theory, people take part in the exchange with the aim of producing reciprocal relationships. "In the case of non-monetary exchanges, peers give favour to one another and the nature obligation and the timeframe for return is not specified" (Davlembayeva 2020: 3). The exchange is based on the belief of supportive transactions (Belk 2010). The social path leads to the development of a social network and to the sense of belonging to a community. Through the network, users may access resources that otherwise would not be available to them (Anderson et al. 2013) and while the social form of exchanges is usually postponed and non-monetary, there are good examples from practice supporting the success of these exchanges. For example, time-banking is the form of social exchange of services, in which transactions are postponed and measured in time-units, instead of money (Davlembaleya et al. 2020).

In peer-to-peer transactions, the sharing economy platforms act as intermediaries helping to match supply and demand (Selloni 2017). In addition, the platforms provide services, such as a user rating system or an automatic payment system (Frenken 2017). If the sharing involves monetary compensation, the payment incurs a technological transaction cost, which compared to the usually small amount of money appears to be unrealistically high (Killeen 2015). In the sharing economy, transactions between users are usually small amounts, so-called "micropayments" (Fressancourt – Hodam, 2011) and "a micropayment assumes that the benefits of a low-value transaction outweigh the costs of the transaction" (Horváth 2007: 20). If this condition is not met, it could lead to the failure of the process, as the individual user must decide whether the amount paid is worth the access to the resource. Although online payment solutions such as Paypal are more secure and have lower transaction costs than credit card payment, there is still an intermediary that charges a transaction fee (Killeen 2015). The elimination of multiple bank fees is of great importance for micropayments (Pass – Shelat 2016) as the user is more likely to opt for payment at a lower transaction cost (Killeen 2015).

A payment made in cryptocurrency incurs much lower transaction fees than a payment made through the traditional payment system. According to the European Parliament (2016), payments made in cryptocurrency "lower transaction and operational costs for payments and especially cross-border transfer of funds, quite possibly to well below 1%, compared to the traditional 2–4% for online payment systems –, and to more than 7% on average for the cross-border transfer of remittances, hence, in an optimistic estimate, it could potentially reduce total global costs for remittances by up to EUR 20 billion." We argue that transaction costs can be eliminated entirely with the use of a virtual community currency that serves only as a unit of account within the community and is created through transactions automated by a smart contract. Our concept is based on the social form of exchanges, on the practices of time banking and LETS. In our model, the users' transactions are measured not in the official currency or in a cryptocurrency, but in a virtual community currency, which cannot be exchanged for the official currency or any other cryptocurrency. The timeframe for return is not specified, the obligation is represented as a debit or credit line in the virtual community currency. We will further elaborate on that in the following section. In the next section we also review the background of virtual currencies, blockchain technology and smart contracts as these serve as building blocks for our model.

2.2. Blockchain technology, virtual currencies and smart contracts

Virtual currency schemes according to the ECB (2012: 5) "are defined as digital money, which is issued by independent and decentralised entities and propose an alteration from the traditional

design of the financial system." The European Parliament's Committee on Economic and Monetary Affairs (Dabrowski – Janikowski 2018: 1) frames virtual currency as a contemporary form of private money that "is able to ensure a transparent global network for circulation and a transaction mechanism that is relatively safe, fast, and inexpensive." Based on their briefing, the rapid expansion of virtual currencies worldwide indicates a growing market recognition and openness to innovation. The majority of virtual currencies are based on blockchain technology; examples not based on cryptography are Ripple, Stellar and online game currencies (Josavac 2017). According to Swan (2017) "a blockchain is a network software protocol that allows money, assets, and information to be transferred over the Internet without the intervention of a "central authority" or a "third party" acting as intermediary" (Swan 2017: 6).

> It is an IT protocol that dates back to the 1990s, but it became well-known in 2009. Its success is closely linked to the spread of cryptocurrencies, the best known of which is Bitcoin. Blockchain is a public register, in which all transactions between network participants are recorded one after the other. This order of records comprises a set of 'blocks' (parts of code) that are linked together cryptographically, making each part of the block that forms the chain traceable and unchangeable. These 'chain-linked blocks' are simultaneously recorded on each of the devices through which the blockchain participants connect. Each participant is a link in the chain, helping to validate and store the data that is being exchanged. (European Economic and Social Committee 2019; see Fig. 1)

According to Walport (2016), "the high speed of transactions stems from the decentralised architecture of distributed ledger technology, which might continue to operate reliably even if parts

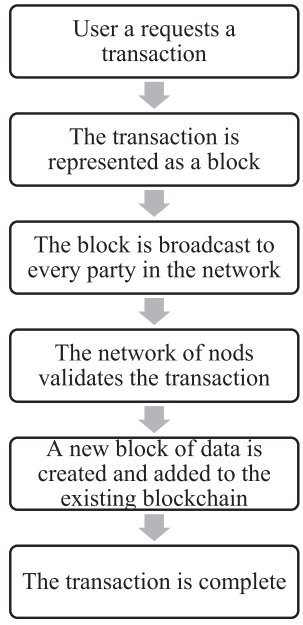

Fig. 1. How a blockchain works.
Source: Hassan et al. (2018)

of its network were to malfunction or to be hacked." The Chief Scientific Adviser of the UK Government Office for Science pointed out in his report on "Distributed Ledger Technology: Beyond Block Chain," that clearing, settlement and other post-trade management processes currently cost the global financial industry more than 50 billion euros per year and these could be highly improved in efficiency, speed, and resilience through the use of blockchain technology. He emphasizes that the technology could be used to increase transparency and trust between private sector actors and clients (Walport 2016). A paper by the OECD separates the issues related to the currency from the potential benefits of the underlying technology and underlines that it could "ultimately shift the entire basis of trust involved in any financial transaction" (Blundell – Wignall 2014: 3).

There is an increasing interest in using blockchain technology in online voting (Racsko 2019), in healthcare (Yoon 2019), or in logistics (Perboli et al. 2018), but it is best known as the infrastructure for virtual currencies. There are more than 600 cryptocurrency schemes based on blockchain technology, the most significant of which is Bitcoin, created in 2009 and currently with a market share of more than 60% among cryptocurrencies (Coinmarketcap 2020).

A study done by IMF (He et al. 2016) frames cryptocurrencies as innovative means of executing and tracking a large number of transactions. While cryptocurrencies offer many benefits, they also offer "considerable risks as potential vehicles for money laundering, terrorist financing, tax evasion and fraud" (He et al. 2016: 5). The European Parliament's Committee on Economic and Monetary Affairs (2018) also emphasizes that these may also be subject to speculative bubbles and bursts. The IMF (He et al. 2016) highlights the need for regulation but not with the intent of stifling these schemes.

When defining blockchain technology, many academics, e.g. Irwin and Milad (2016), Extance (2015) or Sklaroff (2017) link it directly to the operation of Bitcoin, but blockchain technology can be used in many other ways, such as to develop self-executing contracts, known as smart contracts. These intelligent contracts enable transactions to be customised in detail. The smart contracts are programs built into the blockchain and are triggered by pre-defined conditions forcing the parties to abide by the terms of the contract. By moving the data, the smart contracts are able to facilitate large numbers of microtransactions in a timely and cost-effective manner based on pre-defined contractual terms (Dannen 2017). Smart contracts are triggered by a set of pre-recorded conditions and are immutable as all transactions are time-stamped and included in the blockchain in a chronological order. While a traditional sales contract is a reciprocal and consistent declaration of rights by both parties from which obligations arise and the parties trust that their partners will meet their obligations, a smart contract eliminates the need for trust between parties, as it operates in a self-enforceable way based on a code (Menne 2018). One of the misconceptions associated with smart contracts is that they are an essential part of the blockchain. However, blockchain technology is not absolutely necessary for the automation provided by a smart contract. The term was first used by Szabó in a 1997 study. He emphasizes that executable codes for automating operations can be run on any central system, be it a central system of a bank or a platform that operates intelligent contracts. The Bank of Canada emphasizes that smart contracts, distributed ledger and encryption can be implemented independently and "the proposed benefits of blockchain technologies do not really come from elements unique to blockchain. Instead, they come from more conventional elements such as encryption and smart contracts. Moreover, even those applications that would benefit from a distributed system may benefit more from a distributed database designed differently than blockchain" (Halaburda 2018: 2). An example demonstrating the possibility of deploying smart

contracts without distributed ledger technology is the system implemented by S&P Global Platts. The world's biggest commodities pricing firm set up a smart contract system, the Trade Vision, run in a centralized ledger. The Trade Vision is an online platform for participants of the natural gas market to voluntarily submit price information to the company. Their reason for choosing a centralized ledger lies in cost efficiency. Those who argue that smart contracts cannot be implemented without blockchain technology reason that for smart contracts to be safe and effective both encryption and multiple nodes need to be used. S&P Global Platts uses a central server instead of multiple nodes, which reduces energy and cost (Medium 2019).

Huckle et al. (2016) illustrate the use of blockchain technology and smart contracts in the sharing economy model with a number of practical examples, such as the Ethereum-based Slock.it, which allows individuals and businesses alike to share any smart item through the application. A smart object can be e.g. a key that gives access to the tenant for a given period of time without any personal interaction between him and the landlord.

One of the best known examples of decentralized sharing economy applications is the Bee Token, which enables the short-term rental of property and is also based on the Ethereum blockchain (Bee 2018). Another well-known pilot project is the ShareRing which provides a blockchain-based platform for businesses and individuals to rent goods or services (Violino 2019). La'Zooz, another blockchain based application for ride-sharing was said to be the new Uber (Yuah and Yue-Wang 2016).

Bogner et al. (2016) model a decentralized application similar to Slock.it, that allows users to share their everyday objects through a smart contract built into the Ethereum blockchain. Other theoretical examples are the decentralized, smart contract-based model for one of the biggest challengers of hotel industry, Airbnb (Strommen-Bakhtiar – Vinogradov 2019) outlined by Menne (2018) or the privacy-preserving decentralized model presented by Kosba et al. (2016).

As it is highlighted, many studies have been conducted on the benefits and drawbacks of distributed ledger technology and virtual currencies. The innovation is not just questioned by international organizations but also in academic literature e.g. by Pandya et al. (2019) or Ohnesorge (2018). Academic critics similarly to the European Parliament, to the IMF and other organizations draw attention to the dangers of data and control concentration in the distributed ledger technology. As mentioned in the papers cited above, the benefits from virtual currencies based on distributed ledger technology can be misused by criminals for their own interests. However, as the community currency in our concept is not applied generally for the sale and purchase of all kinds of commodities, a large number of risks associated with the use of virtual currencies can be eliminated. Our concept of a virtual community currency is largely based on the principles of timebanks. It is tied to the community of a sharing economy platform and acts only as unit of account in the virtual sharing economy, useable only for exchange purposes within it. Its creation is based on the performance of the users within the given virtual economy. Because of its nature, it could not fulfil the store of value function of money – that is, it could not serve as an investment asset. It cannot be exchanged for other currencies and cannot be converted into the national currency. In this way, its inflation and deflation can be avoided and a speculative price bubble could not develop either. Of course, the price ratios within the sharing economy community could change if a growing number of products and services are exchanged. We argue that such a community currency based on smart contracts has a number of features that can increase the level of transparency, trust and reduce or even eliminate the costs of transactions when applied in the sharing economy (Menne 2018). While virtual currencies,

especially cryptocurrencies based on the Value-Sequence Typology of Money (Bendell – Slater 2015) represent a past value created, the virtual community currency is presented as a promise of future value. Based on the typology, Bitcoin is used to reward effort and is accepted because users know it represents or rewards a past value created by nodes/users. In our model "the value is realized when one participant provides goods or services to another participant at a future point in time. Transactions leading to negative and positive credit for participants are recorded in a central ledger, the decentralised issuance of the virtual community currency is triggered by participants' actual transactions" (Friis – Glaser 2018: 73).

In the following section we present our prototype and its main features – based not on cryptocurrency, but on a virtual community currency – following the design science research approach. The main narrative is based on Hart (2006), according to whom "in circuits organized through community currencies, concern with money prices is often secondary to the individual and collective purposes of exchange," so it encourages genuine practices of sharing.

3. A GENERIC MODEL FOR A VIRTUAL COMMUNITY CURRENCY IN THE SHARING ECONOMY

3.1. Methodological approach

In order to describe our generic model, we follow the guidelines of the Design Science Research approach which, according to Wieringa (2014), consists of six methodological steps (Fig. 2).

The first two steps are made explicit in Section 3.2. The subsequent sections describe the model we outlined, present the questions to be answered during the design of the model and the answers that could be given. We evaluate the model based on how it is able to fulfil the identified objectives and the communication of our results is achieved by this article.

3.2. Problem identification and the objectives for the solution

The typical services offered by the current centralized sharing economy platforms according to Killeen (2015) are "(1) aggregated supply and/or demand, (2) customer relationship management tools, and (3) payment processing" (Menne 2018: 2). In return for these services, a fee is charged, which can be up to 20% of the amount of transactions (Liu – Fraser 2018). As platforms derive their revenue from commissions after the transactions are carried out, they strive to process as many transactions as possible. Reflecting on the phenomenon, Schor (2014) criticizes that the sharing economy has turned into a "business-as-usual economy" and urges businesses to become decentralized. Blockchain-based solutions, especially smart contracts, have the potential to democratize the businesses as there is no central authority needed. A direct connection can be established between the users without an intermediary charging service fees for the transactions.

For sharing economy businesses one of the critical points is the management of user data. On a centralized platform a small group of people manages the data which could lead to an abuse of power. Decentralized platforms enable users to choose which personal data they want to share and they can identify themselves in a more secure and convenient way (Mainelli – Smith 2015).

The practical examples and theoretical prototypes outlined in Section 2 are based on cryptocurrencies that support smart contracts such as Bitcoin or Ethereum, but for the average

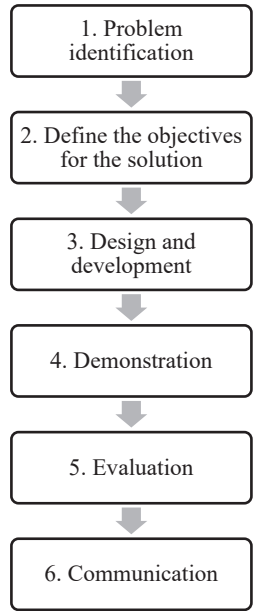

Fig. 2. The steps of design science research approach.
Source: Wieringa (2014)

user these are often difficult to handle. One needs to register on a cryptocurrency exchange platform, convert fiat currency to cryptocurrency and take into account its exchange rate volatility too before using it. Besides the lack of technical knowledge, the lack of legal regulation and privacy concerns might also seriously hamper user acceptance. Furthermore, although cryptocurrencies have the lowest transaction fees, the speed of transactions is much slower than in traditional payment system (BCCRWP 2019).

Halaburda (2018) in her study "Blockchain Revolution Without the Blockchain" argues

> that blockchain technologies - smart contracts, encryption and a distributed ledger - are separate concepts. The three may be implemented together, but they do not need to be. Most of the proposed benefits come from encryption and smart contracts. But encryption and smart contracts do not need blockchain". (Halaburda 2018: 1)

Agreeing with her, we propose a prototype using a smart contract without the blockchain technology.

Based on the literature overview and the problems identified, the study aims to present the steps of creating a decentralized, transparent and freely accessible, smart contract-based sharing economy model, discussing key design issues (Fig. 3). While presenting the design steps, we take into account the different solutions that provide decentralized operation, including solutions based on public and private blockchain. With comparing the different solutions, our goal is to demonstrate the benefits and applicability of a virtual community currency that combines the solutions offered by smart contracts with the features of a community currency.

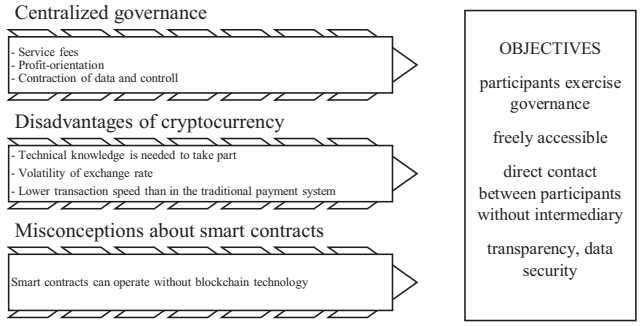

Fig. 3. Problems identified and objectives for the solution.
Source: authors

3.3. Building the prototype

While reviewing the design choices, we used the Blockchain Market Engineering Framework (Fig. 4) by Notheisen et al. (2017), which is used to analyse the elements of blockchain-based platforms, but has been used to build prototypes e.g. by Menne (2018). To categorise the main design steps we used the elements of the framework. The two main elements discussed are the infrastructure and application layer.

The infrastructure layer is the technical background of the platform and is divided into a protocol layer and a hardware layer. Building on the infrastructure, the application layer consists of the platform features and services offered to the users (Notheisen et al. 2012). Based on the framework, the design choices are shown in Fig. 5.

According to Menne (2018), the first design choice regarding the infrastructure is whether to build the model on a public, a private, or a hybrid blockchain supporting smart contracts. We suggest a fourth option: creating a central system that operates smart contracts without blockchain technology.

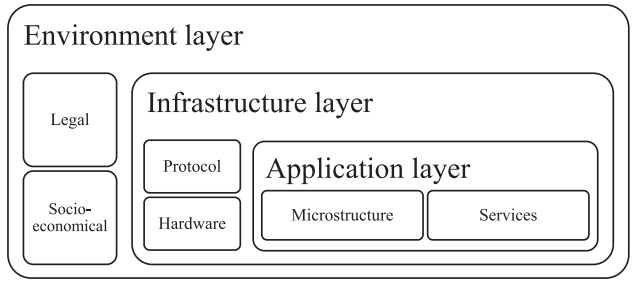

Fig. 4. The blockchain market engineering framework.
Source: Notheisen et al. (2017)

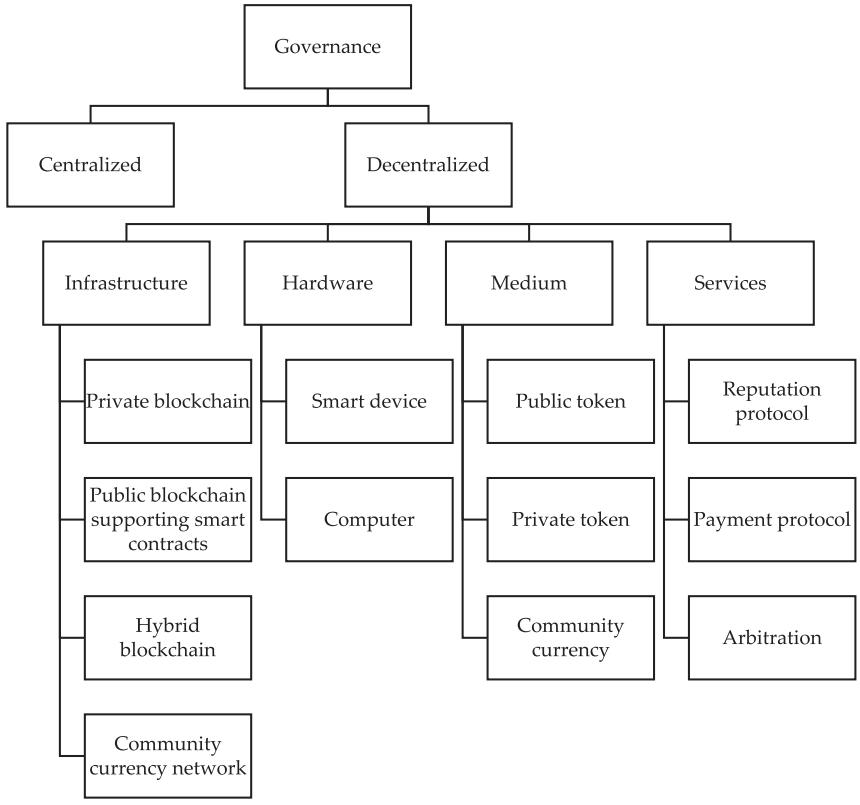

Fig. 5. Design choices for a decentralized, smart contract-based platform.
Source: authors

In comparison to other alternatives, the biggest advantage of a widely adopted public blockchain is the stability and security of the network. The most well-known public blockchain supporting smart contracts is Ethereum, which has been operating since 2015. Ethereum's smart contract platform offers a high degree of standardization and support, with clearly defined guidelines for developers (DevTeam 2020). Besides security and data protection issues, the drawbacks of public blockchains like Ethereum lie in the complex consensus mechanisms needed to guarantee a stable and secure network and in consequence in the slow speed of transactions (Menne 2018). The Ethereum blockchain can process 1.3 million transactions per day, while the number of online Visa card payments can reach more than 150 million transactions per day (BCCRWP 2019). The most popular alternative to Ethereum is Hyperledger Fabric, an open-source blockchain infrastructure developed by the Linux Foundation and IBM. Compared to Ethereum in terms of manageability and standardization, Hyperledger Fabric has a much more flexible infrastructure. One can create Hyperledger smart contracts in JavaScript language using the Hyperledger Composer tool by simply installing the appropriate modules. Hyperledger Fabric is a permissioned blockchain infrastructure that facilitates the execution of

smart contracts, but does not have its own token system (DevTeam 2020). Private blockchains like Hyperledger Fabric provide a higher transaction speed; up to 100 transactions per second can be achieved. Every participant needs to be approved and their privacy is guaranteed (IBM 2018). The third option is to create a hybrid blockchain that combines the stability of public blockchains with the transaction speed and data security of private blockchains. The first hybrid blockchain was XinFin, which is based on the Ethereum public blockchain and the Quorum private blockchain. Instead of the expensive and energy-intensive Proof-of-Work consensus mechanism, it uses a Proof-of-Stake algorithm, in which people are randomly selected to create the blocks. It allows up to 2,000 transactions per second and transaction data are stored on Quorum's private blockchain (Freuden 2018). The fourth option is not based on a cryptocurrency but on a virtual community currency created as a multilateral obligation in automatized user transactions. For the automation of processes, Hyperledger's smart contract could provide an adequate basis. The virtual community currency becomes a digital display of value that is not issued by a central bank or government and is not necessarily linked to legal tender, but is accepted as payment by the members of the platform (ECB 2016: 4).

Based on the presented options, the platform can offer its own token, use an existing cryptocurrency or its own virtual community currency. The use of an own token provides a way to finance the operation by means of an Initial Coin Offering (ICO) (Menne 2018). "Initial Coin Offering is an investment method by which a blockchain-based business can raise the amount of funding needed in order to launch the platform. Cryptocurrencies or tokens function as 'fuel' for the platform and a security mechanism within the system" (Coinmixed 2018). The platform's own community currency, similarly to LETS[1] and timebanks, is represented in the users' credit lines, which must be accounted for in the long run. The community currency does not serve as "fuel" for the platform, its only purpose is to ensure the measurability and traceability of transactions. When using a public cryptocurrency or an own token, the platforms participants must first purchase the cryptocurrency in order to use the services. Lack of technical knowledge in this case can become a barrier to entry. Paying by fiat currency may be a possibility, however it would enhance profit-orientation, which is contrary to the principle of genuine sharing (Menne 2018). In terms of the form of issuance, the community currency is generated during user transactions, therefore users do not need to deposit cryptocurrency or provide credit card/bank account information. Users only have to download an application to their device (mobile phone or computer) and register on the platform. The community currency outlined is closely linked to community of a sharing economy business. The platform's "community can be defined by geographical boundaries or specific common interests" (Diniz et al. 2018: 1). It can be a geographically fragmented, worldwide community e.g. in the case of services like data sharing, or computer capacity sharing. However, in the case of a resource-sharing platform, the community currency – because of its features – can only be used in a community of a geographically restricted area.

[1]The acronym LETS usually stands for Local Exchange Trading System. According to Zagata (2004: 480, "the core of the system is the creation of a local economy that is based on the use of own – made by people – money, which serves for exchanging goods and services among the community members. When the transaction is realized, the supplier gains on his/her account a credit based on the value of the exchanged commodity, and the demander is charged a reciprocal value. Proponents of those schemes argue that the money is created by exchanging".

An important element of the application layer is the digital trust infrastructure which consists of trustbuilding elements. One of the trust building elements is the user reputation system. The reputation system acts as a filtering mechanisms that shows reliability and generates trust (Szűts and Yoo 2015). However, in the case of centralized platforms, reputation data can be modified or deleted by the platform's operators, as it has already been the case for Airbnb (Schaal 2012). Using an automatized reputation protocol, that keeps track of the reputation score – like in the case of Beenest (Bee 2018) – and is able to continuously update, prevents the platform operators from subsequently modifying the ratings. In the case of the community currency, reputation score could be given based on the credit lines of the user.

Every system of payment that requires trust needs a third party to mitigate misbehaviour. The Bee Token e.g. operates a decentralized arbitration system in which randomly selected members of the community decide the dispute (Bee 2018). The advantage of the system is that it is more independent than centralized arbitration, but the selected dispute settlers are not controlled and take only limited responsibility for their decisions (Menne 2018). In the case of a community currency-based platform, an arbitration system is required mainly to enforce the settlement of "credit lines". Arbitrators could temporarily exclude participants and reintegrate them in case of correction.

The lack of legislation and data and consumer protection issues also pose design challenges. Platforms based on cryptocurrencies need to ensure price stability due to the exchange rate volatility of the cryptocurrency (Menne 2018). An important issue is that when developing the platform, care needs to be taken to ensure that personal data could not be obtained or used by unauthorized persons. In the case of a decentralized platform, where community members exercise governance rules, members can choose which personal data they share, but it is important that all users go through identity verification. In the case of Beenest, users have to first sign up and go through a basic KYC (know your customer) process to ensure that they are real and authenticated. Based on the validity of the data given, their reputation score gets updated (Bee 2018). A similar solution could be applied in the case of a community currency-based platform.

3.4. Conditions for the successful operation and the main features of the model

In this section, we briefly review the conditions for successful implementation and the main features and possible implications of the model. We acknowledge that at the present stage we cannot answer all of the related technical questions and cannot fully discuss the potential economic and social implications generated by the presented model. The potential impacts and related questions are probably richer than those discussed in this paper are, for this reason, further research needs to be done. While our concept is a generalised version of a sharing economy platform using a virtual community currency and smart contracts without distributed ledger technology, we define some conditions needed for the successful implementation and operation of the model.

Based on the definitions used, we suggest a two-sided market focussing on peer-to-peer relations. As such, we exclude business-to-peer platforms from this model. This condition suggests that members use the platform to genuinely share their excess capacity and are not driven by profit motives to purchase new goods in order to facilitate access. The key activity of the platform is mediating the sharing between peers with additional services, such as a user rating system providing a reliable and easy to use interface.

The platform may rely on existing third-party applications to mediate sharing or may use a technology developed in-house or by a third party. The platform may leverage an application or a website for the mediating of transactions. For the operation of the platform we see sponsors, funding bodies as a source of revenue and consider the time and effort of volunteers as a non-monetary source (Curtis – Mont 2020). The transactions based on Tauscher and Laudien (2018) are hybrid interactions, as the platform matches the users online, but during the sharing of goods or services they interact offline, in person.

A system based on multilateral agreements between users poses several challenges. The scale of the platform is an important question as its successful operation is based on the trust between its participants and as the number of users grows, the average level of trust between the participants declines. This, in consequence, lowers the willingness to accept the credits represented in the virtual community currency (Schraven 2001). Besides the trust enhancing mechanisms offered by the platform such as a user rating system and arbitration, imposing a governance model is also an important step to providing long-term stability. Based on Munoz and Cohen (2018) we suggest cooperative governance as an approach to decision making. The authors differentiate three types of governance models, and cooperative governance means the highest level of involvement of users in the leading and decision making processes of the platform. Through cooperative governance, they can define and impose rules e.g. to reduce free riding by restricting the upper limit of debit of the users' account (Kichiji – Nishibe 2012). Through cooperative governance the pricing mechanisms can also be determined. We suggest differential pricing, which means it may change based on the user's characteristics, location and ratings etc., but it can also be a subject to negotiation between peers.

The concept suggests that this kind of platform can only be used in a community of a geographically restricted area. The definition of the space for this kind of sharing economy community is a relevant but tough question. Should we consider the scale of a municipality? Of a conurbation? The scale of a region? The rationale behind this kind of platform suggests that the relevant territory should be one in which all kinds of goods and services needed within the territory are available for sharing. It should happen in a relatively close proximity as it requires a low volume of energy for the transport. In our opinion it calls for the individual analysis of a given territory before implementation.

3.5. Socio-economic implications of the model

Being aware that our general concept leads to simplifications, we briefly discuss our hypotheses on promises of the presented sharing economy model, touching upon possible drawbacks too:

- The main argument in favour of the sharing economy is that it reduces consumption, promotes cheaper and the easiest access to goods and services. Nevertheless in many cases it leads to a "rebound effect" (Jevons 1865) through the creation of the so-called "on demand" economy. Companies operating under the umbrella of the sharing economy bought new goods in order to facilitate sharing and users created new capacity by accessing goods and services that would not have been used or made in the first place (Andreoni 2020). The present model is based on non-monetary transactions between peers and excludes such kind of business-to-peer models. It promotes genuine practices of sharing built on reciprocity. Schor and Attwood-Charles (2017) argue that sharing economy practices may amplify the disparities in our society, as lower income groups usually have a limited amount of goods to share and those are typically

excluded from the sharing community. We argue that everyone has something useful to offer to the community, may it be their time, their labour or their skills.

- The presented model may also increase collaboration and in some cases social bonding. In the case of traditional sharing economy platforms, the creation of social relations decreases over scale and time (Andreoni 2020). According to Barnes and Mattsson (2017), as the community grows, interpersonal connections become more casual and economic motivations prevail. The participation in our model is not primarily due to economic motivations such as income generation, and it places more emphasis on collaboration and partnership between users.
- The sharing economy is also said to promote reuse and responsibility, but there is evidence (Acquier 2017; Wilhelms et al. 2017) that the temporary usage of goods may lead to a lack of caring and to a higher deterioration rate of products than in case of a private ownership. The outlined model may encourage long-term collaboration, which is based on the trust that the resource provider and the resource user both take care of the shared product.

4. EVALUATION AND DISCUSSION

The evaluation of the model can be done by comparing it to another solution or in making comparisons in absolute terms, i.e. using the prototype vs. not using the prototype (Friis – Glaser 2018). As we focused on the technical aspects of building a decentralized model using a virtual community currency, we evaluate, based on Friis and Glaser (2018), the related features of the model in comparison to existing solutions, based on the defined design objectives, which were a decentralized, transparent and freely accessible, smart contract-based sharing economy model (Table 2).

Table 2. Evaluation of the technical aspects of the outlined model compared to existing solutions

	Sharing economy platforms based on public cryptocurrency	Sharing economy platforms based on traditional online payment systems	Sharing economy business using virtual community currencies
Decentralized	Yes	No	Yes
Permissionless	Yes	No	Yes
Freely accessible	No	No	Yes
User issued money	No	No	Yes
Transaction speed	low	high	high
Transaction cost	low	high	no transaction cost
Automatized processes	Yes	No	Yes

Source: authors, based on Friis and Glaser (2018).

Compared to solutions based on cryptocurrency and to platforms based on the traditional online payment systems, we identify two crucial advantages:

1. ease of adoption and joining the network,
2. no transaction cost and high transaction speed.

We assume the prototype fulfils the design objectives and consider the ease of use the biggest advantage of the system, as users only have to download an application and register on the platform. Users do not have to register on an exchange platform to buy cryptocurrencies, nor do they need to have bank accounts, or fiat money. Besides the direct contact between participants, there is no transaction fee charged either. Smart contracts provide automatized processes and users do not have to deal with the complexity of the underlying technology.

According to Lietaer (1997) the ideal type of community currency 1) operates in an efficient and secure payment system, (2) in a self-regulatory network, (3) it supports the creation and strengthening of communities, (4) it can be converted into local expenses, (5) is a non-national currency. Community currencies created through smart contracts have features that can come near to the ideal type. A limitation of the model is that in the case of a resource-sharing platform, the community currency can only be used in a community of a geographically restricted area. Because of its features, it cannot be converted into local expenses and cannot be used as an alternative source of income.

5. CONCLUSION

This research examined the potential of a virtual community currency created through smart contracts in the context of the sharing economy. First, we reviewed the conceptual issues of the sharing economy, followed by the background of blockchain technology and smart contracts. This was followed by an analysis of the strengths and shortcomings of current payment systems based on blockchain technology in the sharing economy model. The literature review showed that although the use of cryptocurrencies facilitates low transaction fees and microtransactions, the technical knowledge needed to use a cryptocurrency could be a barrier to entry. Most of the cryptocurrencies compared to a traditional online payment system have a lower transaction speed. A large share of the currently operating sharing economy platforms are centralized and profit-oriented. Another problem is the concentration of data and control, which raises privacy concerns.

After the problem identification, we outlined a decentralized, transparent and freely accessible, smart contract-based sharing economy model. The biggest advantage of the system is the ease of use, as users do not have to register on an exchange platform to buy cryptocurrencies, nor do they need to have bank accounts, or fiat money, as the community currency is created through transactions between participants and is represented as a "credit line." There is no need for an intermediary and payments do not incur any kind of transactional fee. Smart contracts provide automatized processes and users do not have to deal with the complexity of the underlying technology.

We also wish to acknowledge the limitations of our work. We acknowledge that our concept needs to be supported by further research focussing on the design and the possible implications of the model. A clear overview of the socio-economic impacts can further support the design of

an effective platform. The negative impacts and limitations, highlighting the tensions of scale and the problems of regulation need to be studied. Further research needs to be done on the acceptance, usage and usefulness based on qualitative and quantitative metrics. The impact of virtual community currency on the way of sharing services or property is another important research theme. That said, our proposal may contribute to the development of a model designed to promote practices of genuine sharing.

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