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D-CENT: Freecoin Toolchain Design and application to Pilots

Abstract

D-CENT (Decentralized Citizens Engagement Technologies - EU/FP7 - GA 610349 - www.dcentproject.eu) aims at developing large-scale collective platforms to support citizen empowerment. As shown by the preliminary considerations from the first round of interviews with alternative and complementary system managers in Spain, Finland and Iceland (D1.2 and D3.4), decentralised and privacy aware digital infrastructures are needed to allow institutions to integrate social feedback from the citizens, leveraging the potential of the extended society and social experts to improve democracy and many aspects of our society.

In turn, the experimentation on the Digital Social Currency Pilots in D-CENT can be conceived as an **open-source approach to decentralized complementary currency design**, which becomes ever more relevant where pilot communities are already actively designing tools for collective engagement and decision making on monetary economic matters affecting their communities.

The focus in the paper will be on the technical and design elements that shape Digital Social Currency as a way to legitimise the bottom-up process by means of auditable cryptographic blockchain technologies, respectively: decentralized storage, ubiquitous wallets and ad-hoc social remuneration systems. Our focus is on complementary currency design in the hope that the distributed allocation of credit created among engaged members supports a reputation management in terms of tolerance of risk. This technical design will be the referenceframework for the Freecoin Toolchain (http://freecoin.ch) implementation and experimentation across the different pilots here described (D5.5).

At Dyne Foundation (http://dyne.org)e, we also proposed a first set of indicators to assess the success of the DCENT currency pilots, and their social impact. We define "social impact" here as the social and cultural consequences for pilots populations of the introduction of Freecoin.).Finally, the common characteristic of the different pilots and use-case here described is theneed to strengthen the democratic debate necessary to consolidate and preserve the management of economic transactions, especially those with a social orientation, inside the local monetary circuit.

1. Introduction[1]

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[1] By Prof. Dr. Bernard Lietaer

All our Modern social organizations have either been created during the industrial age, or have been optimized for that environment. That is the case for production, distribution, housing, transport, education, healthcare, governance and political decision making, etc., The industrial age was also a golden age for "experts", people who know what has worked in the past thanks to specialized training in very specific fields. Almost all organizations took the form of pyramids, in which information would flow from the field through experts to the top where the most important decisions would be made. Good organizations were those that managed the necessary information flows in such a structure, and were effective in having the decisions made at the top implemented down the pyramid back into the field.

However, the industrial age has died with the 20th century. China becoming the "world's factory" was certainly not at the origin of this process, but has accelerated its implications, and is ensuring that the changes are irreversible.

It has thereby become a cliché that we have entered the information age. Interestingly, the way information technology itself has evolved has also shifted from what used to be expected. For instance, in Stanley Kubric's classic "2001: A Space Odyssey" (1968), computers were supposed to become giant centralized machines that control everything. Of course, what happened instead is the Internet: a network of millions of machines interacting in a distributed architecture. Mobile phone technology is guaranteeing that this networked approach is decentralizing further all the way to the individual citizen, and for the first time is taking place simultaneously on a global scale. This explains why mobile phone technology makes it possible for what used to be called "developing countries" to make a quantum jump in communications, to the point that it starts erasing the distinction with "developed" ones. Decentralized mobile payment systems are now more advanced in Kenya or Indonesia than in the US or Western Europe. Precisely because the information age is making our major social systems obsolete, all countries should be considering themselves as "developing". Some still happen to be in denial of that fact...

The shift from the industrial to the information age requires structural change by definition. In turn, structural change requires structural innovation, which is typically not the terrain of "experts"whohavebeentrainedtounderstandwhatworkedinthepast. Thereisriskthatthe old pyramidal decision structures and the established experts become obstacles to the necessary change.

One of the reasons for failures is that the traditional structures are simply too slow to be able to adapt to the speed of change in the field. By the time that the relevant information has been distilled upwards in the pyramid, and the implementation of the decision has percolated back down to the field, the reality may have changed enough to make even a correct decision obsolete.

It is only in such a broader context that the relevance and importance of a project like D- CENT becomes visible. It starts with the premise that democratic governance will have to adapt in the 21st century by smart use of the information technologies that have become available. It welcomes that civil society in general, and activist communities in particular, can become an important source of social innovations. What are the tools now available for a community to make decisions, and to organize and coordinate its actions? For they have the potential to implement the decisions made by the communities and for the communities in a shorter loop than the legacy governance systems. The currency designs that are described in
this section aim at providing tools that fit those requirements.

1.1 Digital social currency experiments to foster direct democracy across Europe

The research and development approach proposed follows up on the definition of Freecoin: back in 2011 researchers at Dyne.org had announced their intention to "fork" Bitcoin and develop "Freecoin" with the aim to realize a software toolkit to build and deploy custom cryptographic

blockchains. Having foreseen the success and importance of the Bitcoin project and its underlying cryptographic blockchain technology, the Freecoin initiative doesn't aim to be a currency in itself, but to be a base for field experimentation and Lean currency design practices based on such technologies. Freecoin is not a currency, but a suite to create P2P currencies, in order to scale bottom up cooperation for the social good Freecoin is thought of as a toolchain: a backend suite of interoperable tools to run free and open source, ad-hoc blockchain systems. The ultimate ambition of the Freecoin Toolchain is, even beyond the span of the D-CENT project, to reach GNU software quality standards to create and operate blockchain systems. In our previous research work (D3.4), we sketched out different kinds of local monetary circuitsand those systems that complement the conventional banking system by implementing currencies that perform countercyclical and social purposes.

This concerns the notion of "social sustainability": without participation and real democracy, local monetary circuits run the risk to remain too little, too dependent on the local political cycles, too far from the real demand that may be expressed by the local economic system.In fact, all currency systems should ideally be managed as a commons. Indeed, if any currency loses the trust of its users, it simply stops being accepted as money. This is the case even for official money, as is demonstrated whenever there is a currency crisis. Contrary to the overly simplified idea of the "tragedy of the commons", communities all over the world have developed and used effective rules that make management of a commons successful. This has been well documented by Elinor Ostrom, in a life-long work for which she received a Nobel in Economics. (Ostrom, 1990, 1994, 2003).

The rules to issue the currency depend on the decision-making processes (i.e. direct democracy) that characterize different pilots.In order to start Digital Social Currency design from desirable theoretical pinpoints, the suggestion in the concluding remarks of D3.4 was to endorse the insights from Lietaer et al (2001; 2010 and 2012), i.e. to design structurally sustainable money systems via the creation ofa digital ecosystem of complementary currencies to use in parallel with conventional ones (a "Monetary Ecology"). Indeed, alongside orthodox monetary economics, a polidoxy (Arnspenger, 2008) in the monetary field would mean the legitimacy of currency diversity that becomes the new norm for systemic resilience purposes.

Starting from these premises, the proposal is to design decentralised tools to manage trust relations among participants of multi-currency systems (Eurocat and Euro; Social Credits and Icelandic Kronas, etc.) by means derived from an interoperable backend software component that facilitates the usage and integration of cryptographic blockchain technologies for achieving social sustainability. In this way it is possible to have not only a structurally sustainable money system, but also a structurally integral one. In brief, sustainability is not enough; we also need built-in integrity for a 'stable' system to endure (Schumacher, 1989 and Illiceto, 2008), while preserving the path dependence that characterizes the different pilots.

In turn, the Freecoin Toolchain should respect the normative dimension of the monetary circuit. **Money is a social relation more than it is a pure technical instrument** ▬▬▬▬▬▬. As such, it reflects social relations which function as providers of rules for games played by social and economic agents. The technologies and algorithms we will propose must be conceived as technical tools influenced by social variables and aimed to solve problems of social and economic coordination. Social purpose complementary currencies are monetary solutions for effectively reframing the structure of the communities and social economies participating to D-CENT pilotexperiments.Hence, in the following, we propose design elements for a toolkit - the Freecoin Toolchain - to build blockchains for the social good aimed to improve decentralized trust management dynamics manifesting in the D-CENT digital social currencies pilot communities.

2. Why Bitcoin?

2.1 Cryptographic blockchain technologies in Bitcoin

Cryptographic blockchain technologies (blockchain), made famous by the Bitcoin project, are emerging as an interdisciplinary area of software development for decentralized data commons, value exchange and management of trust.According to the primary author of the Bitcoin Core implementation, Satoshi Nakamoto: "Bitcoin is a decentralized electronic cash system that uses peer -to-peer networking, digital signatures and cryptographic proof so as to enable users to conduct irreversible transactions without relying on trust. Nodes broadcast transactions to the network, which records them in a public history, called the blockchain, after validating them with a proof-of-work system. Users make transactions with bitcoins, an alternative, digital currency that the network issues according to predetermined rules. Bitcoins do not have the backing of and do not represent any government-issued currency" (Nakamoto, 2008).

In other words, a blockchain is a timestamped ledger shared by all nodes participating in a system based on the Bitcoin protocol. The blockchain allows for a new architecture in payment system design: every device participating to the network - and the people using them - share the same transaction history by abiding to the 'longest chain rule': the blockchain is a tree-like structure that consists of all valid blocks whose entire ancestry is known, up to the genesis block. This common understanding creates a shared agreement within the whole Bitcoin community about the reliability of using the decentralized currency. Since there is no central point of single failure, and since it is available to everybody, a blockchain is structurally more resilient and transparent than the conventional monetary system, which has proven prone to collapse and very difficult to effectively audit by statute.

Starting from the first, or genesis block, a chain of bitcoin transactions ignites a process of validation *via* **a distributed consensus algorithm** run by all those who participate into the activity of issuance of new currency, or miners. A chain of bitcoin transactions may be represented as follows:

Figure 1: representation of a chain of bitcoin transactions.

More than 5 years after its inception, Bitcoin Core is still the reference implementation of the Bitcoin protocol, its code is distributed under the free and open source software MIT license and maintained by a rather compact group of developers handling a significant load of daily contributions.

By now is clear that the general direction of blockchain technologies is that of making information systems more distributed and resilient: a general improvement that not only implieshaving a distributed database, but also a timestamping mechanism for data operations and an authentication system that is decentralized and provides incentives for involved peers. Nevertheless these improvements come at a cost which is higher in these early phases, that of usability and malleability:

1) **Usability**: most blockchain based systems willing to bridge over the usability gap are giving up on decentralization and derived advantages to deliver a managed web environment for the users.

Such solutions become less interesting as they come closer to what is already provided by more

Source: ECB.
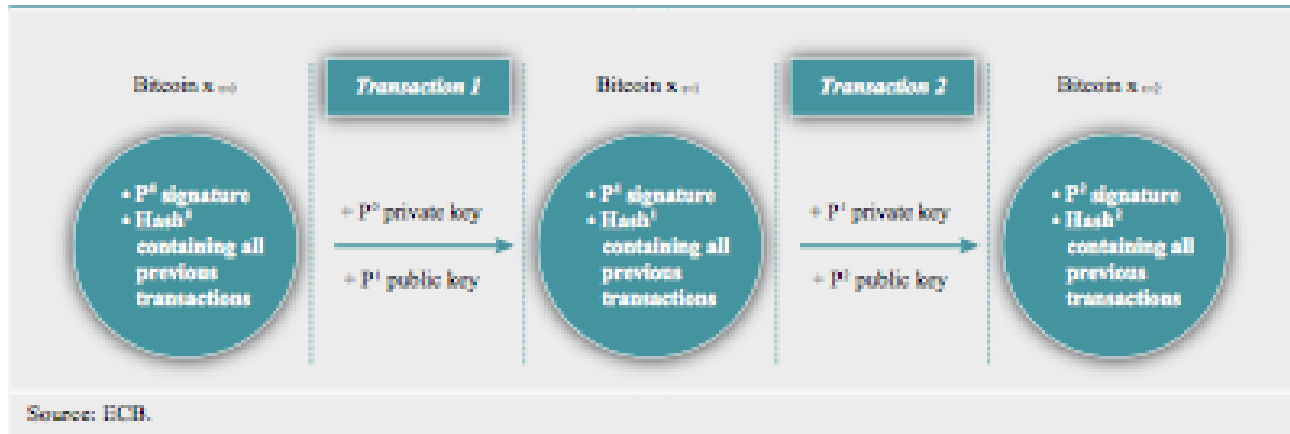
mature technologies as cloud distributed databases.

2) **Malleability**: adapting blockchain technology to specific needs turns out to be an extremely complex and dangerous operation which risks to introduce flaws that may also appear later in time when the deployment of the implementation has already grown in importance.

Meanwhile, as of today, there isn't a clear path marked for blockchain technologies to become less complex and more malleable: the complexity of implementations is growing directly proportional to the possibilities of adaptation in various contexts. We identify this as one of the biggest flaws in the current development of blockchain technologies, which we can only consider to be still far from adulthood. The still growing complexity of blockchain technologies undermines their long-term usage in mission-critical situations, making it difficult to deploy them for socially sound applications that can then be only understood and governed by a small elite of highly specialized engineers.

For these reasons we believe that the major weaknesses in blockchain technologies are not to be identified in the domain of cryptographic analysis and technical implementations, where steady progress is being made on top of a technically innovative design that offers qualitativeadvantages over what has preceded it. The major weaknesses lie into the possibility to appropriate and audit such technologies by a larger portion of the population affected by their use. As a solution to this, progressing on blockchain development for the social good, we propose to further deconstruct and simplify blockchain technologies, esp. by further research possibilities allowed by the adoption of multi-signature environments.

2.2 Features of the blockchain

2.2.1 Proof of Work

The proof of work (POW) is the algorithm that needs to be solved in order to obtain a block as reward: it is what "Bitcoin miners" try to solve and what becomes progressively harder to solve at every new block rewarded. In Bitcoin mining is the act of creating bitcoins by running the proof of work algorithm, which produces network neutral proofs of the fact the algorithmic "work" has been done. The metaphor is that of finding this "algorithmical mineral" and minting it into usable tokens,

which is adequate considering cryptographic currencies are digital assets, rather than coins in the most literal sense. The process of mining is remunerative for thosewho challenge it by running the mining software on their computers which transforms electricity into Bitcoins. By mining, computers look for numbers that are not yet discovered and, once they found them, these numbers can be relayed as coins within the network.

Miners generate a wealth they can put it in circulation at their own discretion. As absurd this may sound, the value of digital assets produced this way is purely relational and it is important to understand that the POW algorithm is really the seal of neutrality for such a system that will reward the same way any participant to the network.

2.2.2 Authentication

Another core feature of cryptographic blockchains is that of authenticating data inscribed inside them, be them transactions of blocks or, in more advanced scenarios, any other sort of metadata inscribed or linked into such transactions.

The authentication (through distributed validation) works by the principles of triple-signed accounting already well described by Ian Grigg's article "Triple Entry Accounting", basically consisting in a peer to peer based network of witnesses that are offered incentives to sign the existence of contracts at a certain point in the blockchain, which also means at a certain point in time. Timestamping is in fact an important part of this feature that really makes it useful for the sort of contracts and notarile acts that are nowadays still authenticated by a centralized network of authorized subjects.

It is also important to note that within the digital domain the characteristic of unicity can only exist so far in a blockchain system: still everything that is digital can be copied, yet by virtue of signed contracts a digital asset can be publicly transacted and every participant to the blockchain can verify that and even sign it as a witness. The blockchain will timestamp and store the whole history of transactions for each asset. This feature of authentication becomes very close to the etymology of the word itself: composed by αὐτὸς and ἐντὸς the noun refers to the assessment of truth, reality and unicity within a system. It is not a coincidence that notarile acts are said to be "authenticated". Authentication is an important feature of blockchain technologies that stays unvaried across all forks and re-implementations. Here we dare to say that the core innovation of blockchain is really that of giving a group of participants the potential to assess what is true for its peers and to track and store the genealogy of such a truth.

2.2.2 Decentralization

The third salient feature of blockchain systems is that of decentralizing the storage of all the data contained in it, by distributing it among the whole set of participating peers. In Bitcoin Core anyone who has the software running, even those who are not mining, will have a "wallet" and the full copy of the blockchain, storing the full history of the network. Such private nodes do not depend from any cloud or centralized service of sorts: the only thing they need to function are other peers of the same kind. Every peer stores the complete blockchain.

Due to the increasing size of the blockchain, this way to function is being changed in many Bitcoin re-implementations at the risk of losing an important feature: a very resilient way to store the history of contracts taking place inside the blockchain - and possibly also more attached data.

Obviously this is a feature that is very important for the D-CENT project and we are looking forward to keep it around in any implementation we use. The aforementioned **ubiquitous wallet**

feature we intend to deploy in pilots is heavily relying on such decentralization traits: so called brain wallets or paper wallets are basically storing all their contents on the blockchain and providing access to them from anywhere with the only requirement of a secret (be it a passphrase or qrcode). We believe this goes even beyond the concept of mobile clients in opening up new opportunities for public shared interfaces and technology independent access to participation.

2.3 Alternative chains and Alt-coins for the social good

Alternative chains are those blockchain innovations inspired by Bitcoin that implement the consensus algorithm and distributed ledger as a platform for contracts, name registration, distributed storage, crowd-funding, aggregate consensus, voting, crypto-equity, etc. Their primary outcome is not a currency system, although they may also present a currency in use among community members. By contrast, *Alt-coins* are crypto-currencies modelled around and do descend from Bitcoin. In this section, we proceed with a brief presentation of alternative chains and crypto-currencies that are explicitly focused on the implementation of the Bitcoin protocol for the social good. This exercise will help shaping design pattern and systemic features of the Freecoin Toolchain.

2.3.1 Freicoin (Negative Interest Counter-cyclical Alt-coin)

"FreiCoin[4] is a decentralized, distributed, peer-to-peer electronic currency designed to address the grievances of the working class and re-align financial interests of the wealthy elite with the

stability and well-being of the economy as a whole. Whereas inflationary currencies like the U.S. Dollar or Euro are controlled by central bankers under rules that intentionally or not benefit the establishment, FreiCoin is completely decentralized and self-regulating, with a demurrage fee that ensure its circulation and bearers of the currency pay this fee automatically to thosecommunity members who contribute work to secure the currency.FreiCoin is an implementation of the accounting concept of a proof-of-work block chain used by Satoshi Nakamoto in the creation of Bitcoin. It includes a downloadable client for Mac OS X, Windows, and Linux, and an electronic network for transferring funds denominated in Freicoin world-wide. You can download, review and improve the code of this free software project on Github.

FreiCoin is based on the opposite of bitcoin's deflationary embeddedness as it represents Silvio Gesell's *Freigeld* version of a blockchain based on Bitcoin. FreiCoin presents a *demurrage,* i.e. a parking fee of 4.5% Annual Percentage Rate for coins stored in a user's wallet. As for every demurraged currency, FreiCoin is meant to boost spending by discouraging hoarding, a crypto-stamp-script.

2.3.2 Faircoin (Fairly Distributed Crypto-currency)

FairCoin[5] is endorsed by Fair Coop, the Earth cooperative with the aim to develop a global fair economy. FairCoin is the first fairly distributed crypto currency. 99.99% Proof-Of-Stake, FairCoin rewards savers. All the coins were pre-mined and fairly distributed to thousands of people from all over the world. Backed by a strong, diverse and committed community. Promotes prosperity and financial freedom with real value. Working to become the coin of fair trade. Faircoin is the first project where the coins are not bought but rather distributed equally between everyone who wants them regardless of their current financial status, and promotes equality.

FairCoin is a crypto currency like Bitcoin. It is a descendant of Peercoin, meaning the block generation is done by PoW/PoS hybrid.

FairCoin is an important example of pre-mining a crypto-currency explicitly for fair distribution of itself as a social good. FairCoin is a decentralized virtual currency, distributed through a vast airdrop process during the 6th and 8th of March, 2014. An approximate 49,750 addresses were logged for the giveaway, each able to claim 1000 FAIR per hour. Automated airdrop claiming methods had no effect, as each IP address could register once per hour and 2 different captchas had to be solved. These security precautions were hidden till the day of distribution. FairCoin's vast distribution method allowed a good portion of the crypto- currency community to claim a little bit of the 50,000,000 FairCoins each.

2.3.3 Pegged Sidechains (complementary blockchains)

Sidechains are a qualitatively different approach to alt-coins: instead of forking the code-base of Bitcoin or rewriting it from scratch, creating new blockchains, they keep using existing blockchains and shape digital assets that can interact with them. An early example of one-way

sidechain was previously mentioned: Counterparty. The Pegged Sidechain whitepaper (Back et al., 2014) conceptualizes an evolution of this concept: a "two-way" sidechain that does not require the "proof of destruction" of assets from an existing blockchain to base its own chain of trust. We see this as the most advanced frontier for development and experimentation of systems that permit the existence of digital assets in a reliable and efficient manner. Quoting the whitepaper:

We propose a new technology, pegged sidechains, which enables bitcoins and other ledger assets to be transferred between multiple blockchains. This gives users access to new and innovative cryptocurrency systems using the assets they already own. Byreusing Bitcoin's currency, these systems can more easily interoperate with each other and with Bitcoin, avoiding the liquidity shortages and market fluctuations associated with new currencies. Since sidechains are separate systems, technical and economic innovation is not hindered. Despite bidirectional transferability between Bitcoin and pegged sidechains, they are isolated: in the case of a cryptographic break (or malicious design) in a sidechain, the damage is entirely confined to the sidechain itself.

The advantage of this approach is avoiding the techno-political negotiation on changes to be operated on existing blockchain protocols, as well the maintainance and propagation of updates across forked codebases. Rather than forking Bitcoin, the pegged sidechain approach will offer a way to relate new technologies to existing blockchains, inherit their strength and at the same time preserve a certain freedom in developing new architectural approaches.

3. R&D Elements for the design of D-CENT Freecoin Toolchain

3.1 Freecoin Domains of Innovation

D4.4 is an experiment in digital social currency design. We locate innovation in two intertwined domains both contributing to the advancement of the state-of-the-art in decentralized

governance through distributed computing. (1) Complementary currency governance systems (2) Digital distributed trust & authentication management systems

1*) Complementary currency governance systems:* in this domain the Freecoin Toolchain innovates by offering a **decentralized participatory social governance structure** for complementary currency systems. Essentially, the opposite of high frequency trading ruled by robo-journalism instructing algorithms, which in turn trade stocks with none or minimal human intervention. (Durbin, 2010) With a minimalistic reinterpretation of the blockchain technology, the Freecoin Toolchain is a toolkit for community members to easily access and decide on the systemic features of the currency system they use. In general, such social interactions aiming at social sustainability will inform the notion of Social proof-of-work (or proofs) within a community, i.e. the proof that a community has decided on the rules of their own currency system, esp. the possibility to condition the trend of the money supply curve in real time by actions users perform in the real world, according to decisions made within a self-governance setting (see section 3.2, below). Hence, with a system for collective deliberation on the decisions to take for the creation of digital complementary currency, users will engage in collective monetary policymaking in real time by conditioning the currency-creation mechanism(s) under agreed upon dynamics of collective deliberation: for instance, through

either quarterly or monthly deliberation rounds (Spain), during special events like participatory budgeting (Iceland) or daily, if the system allows for social remuneration operations (Finland and Milan).

2*) **Distributed trust management systems**: in this domain the main innovation that the Freecoin Toolchain offers is a system for **decentralized risk self-management**. In the context of trust management research, D-CENT Digital Social Currency pilots are experiments in reputation management. Reputation is the basis for decision-making in trust related contexts. And trust can be seen as tolerance of risk. (Wierzbicki, 2010) Putting together trust and the blockchain, the Freecoin Toolchain allows for the design and prototyping of systems aimed at managing social currency in a community, i.e. reputation in a decentralized fashion: for example by using micro-endorsements as collateral/backing of the underlying complementary currency (Spain), risk is spread evenly among participants; or by participatory rewarding best political contributions (already happening with participatory budgeting in Iceland) and use those creditsas loyalty scheme vouchers in the related municipal area, whereby rewards for good proposals for the common good lower the risk to promote proposals that go against the common interest of the citizenry; or still by publicly recording and rewarding one's contributions to a community supported cooperative in Helsinki, thus testing the behaviours and habits of members belonging to communities that self-process themselves as fair and honest (see Appendix 1, below). In all three pilots, trust management is related to collective risk and Freecoin tools will underpin experiment around decentralised and bottom-up trust management.

3.2 Replacing Bitcoin algorithmic proof of work with a Social Proof of Work

Now let us emphasise an important outcome of the techno-political analysis carried out in this paper, building on both the analysis of use-cases in D3.4 and the work of Christian Marazzi[8] it seems to be a limitation for the POW to be a mechanic process, a condition verifiable across all existing blockchain implementations. On the contrary, the main driver for a desirable anthropo-genetic economic model, i.e enhancing human economic development. In effect, in terms of

currency creation dynamics, the consensus algorithm that conditions the issuance of new coins is technology driven and mechanistic. This central function of the algorithm that authenticates currency creation is extremely important in view of structurally neutralising counterfeiting. However, this may also be seen as a departure from an active and critical engagement among humans and machines, whereby the creation of money in the system is motivated by social interactions for the common good, rather than by exclusively hashing cycles. Therefore, the task of the research in D4.4 seems to configure as a quest to redefine Bitcoin's 'proof of work' and the reward of a blockchain system, in order to devolve the power into the hands of people through a democratic decisional processes.

We experiment within a scenario whereby human decisions deeply influence the behaviour of algorithms and not the opposite. The literature review on the blockchain technology, its bio-political critique and promising implementations for the social good, make emerge a new way to look at the relation between the participatory democratic process and the blockchain technology in the context of the governance of complementary currency systems. Within the scope of the D-CENT project, the Digital Social Currency pilots will experiment and test a new notion of proof-of-work: **the Social Proof-of-Work**, which is the proof that a member in the system is endowed with coins as a reward to an action in the real world while abiding to community rules and enhancing collective values.

As it is the case with the design of traditional complementary currency systems, also in the case of crypto-currencies and blockchains programmed with Freecoin, **Social POW will be tailor- made and agreed upon by the community of users of the crypto-currency**. For instance, in Spain POW will be in the form of a **Proof-of-Business** as concrete economic transactions in a B2B context. In Iceland, the POW will be a **Proof-of-Political-Participation** as online engagement to reward users on Your Priorities platform, while in Finland it will be**the proof that somebody performed cooperative work** and had honestly remuneratedthemselves for that.

In brief, the acts of endorsement, giving reward and social remuneration are three ways to conceive the SOCIAL POW by harnessing the signature capabilities of members in order to condition the supply, circulation or remuneration of money. The design challenge for the Social POW is to replace the strictly deterministic and algorithmic trend of crypto-currency supply (Gold Standard-like) with a more flexible and interactive process of currency creation. Communities act in the real socio-economy, thus the Social Proof-of-Work should reflect communities' democratic agreements and collective needs, and the algorithm should adjust the money supply according to such inputs.

The outcome of this shift in design is twofold: (1) people engage in transactions that have real world desirable impact that they produce and collectively construct; (2) it is possible to go towards self-managed decentralised currency systems (with desirable consequences for credit risk management practices). In this way, new participants can enjoy an egalitarian economic environment by avoiding the undesirable condition of structural advantage by early adopters of a currency. At the same time this would allow to have complete democratic oversight on transaction history and collective deliberation on social currency systems' rules of engagement and reward.

3.3 D-CENT Digital Social Currency pilots as experiments in distributed trust management systems

Apart from purely technical issues concerning the blockchain, the design of the D-CENT Digital Social Currency draws also from the most recent findings in Trust Management Research. Trust management dynamics are in fact an element which is common to both the Direct Democracy and the Social Currency domains of the D-CENT Platform. In the collective decision making processes within D-CENT pilot communities that already present a high degree of trust built in

the analog world, there is the possibility to exploit such confidence among community members in order to build with the blockchain technology new political and economic incentive mechanisms that foster the social good. In turn, Trust Management Research offers those elements that will then go to frame more in detail the notion of Social Proof of Work, i.e. the proposal to shift the process of authentication and circulation of crypto-currency from an exclusive focus on impersonal mathematical proofing on machines to one where currency creation - albeit supported by machines - is authenticated by users through self-management as the main organizational propeller.

Humans use trust when making decisions under uncertainty. As a working definition of trust within the context of the Digital Social Currency pilots, "trust in some way represents an actor's (trustor) expectations about another actor or object/institution/organization (trustee), that one believes is willing to depend on another party" (Schoorman et al., 2007). Trust is a relational notion. From an institutional point of view, one can see that the institution createsthe actor as much as the actor creates the institution (Kroeger 2013). Moreover, for institutionalized trust to persist it needs to be continuously 'brought to life' through interaction (Berger and Luckmann, 1967). In the context of the social currency pilots, the social relation of trust is to then be translated in the social relation of money as a common good. In other words, within D-CENT, money is an agreement within a community to use coins circulating on a blockchain as a means of payment self-managed as a common good.

The evidence that this issue isn't a trivial one is the massive loss of trust in the conventional money post Lehman-collapse in the financial services industry.. Indeed, collective trust in banks experienced a major decline after the Global Financial Crisis, and this is true on a global basis with the exception of China where data have been questioned (Hurley et al., 2014):

Figure 5: percentage variation (between 2008 and 2013) of people who trust banks to do what is right.

Even before the Global Financial Crisis, some had noted that the idea of institutionalizing trust may hold the promise of making trust more stable and enduring (Dasgupta 1988). Accordingly, Freecoin Toolchain design is based on this orientation toward trust as an institution innovatively deployed on a Collective Awareness Platform such as D-CENT and backed by *trustless* blockchains, or distributed ledgers.

Trust building can be acknowledged as the expression of a 'symbolic action': actors engage in actions that are apt to signal their trust and/or trustworthiness to each other (Kroeger 2013). In turn, symbolic exchange is clearly a manifestation of 'active trust' (Kroeger 2013). What is more remarkable for the design of the three Digital Social Currency pilots in D-CENT is that inunstructured settings the introduction of symbolic statements can order perception so that the symbolic presentations is perceived as real (Cuzzort and King, 1989). The Freecoin Toolchain offers indeed tools for the digital management of virtual trust relations that have real world impact.
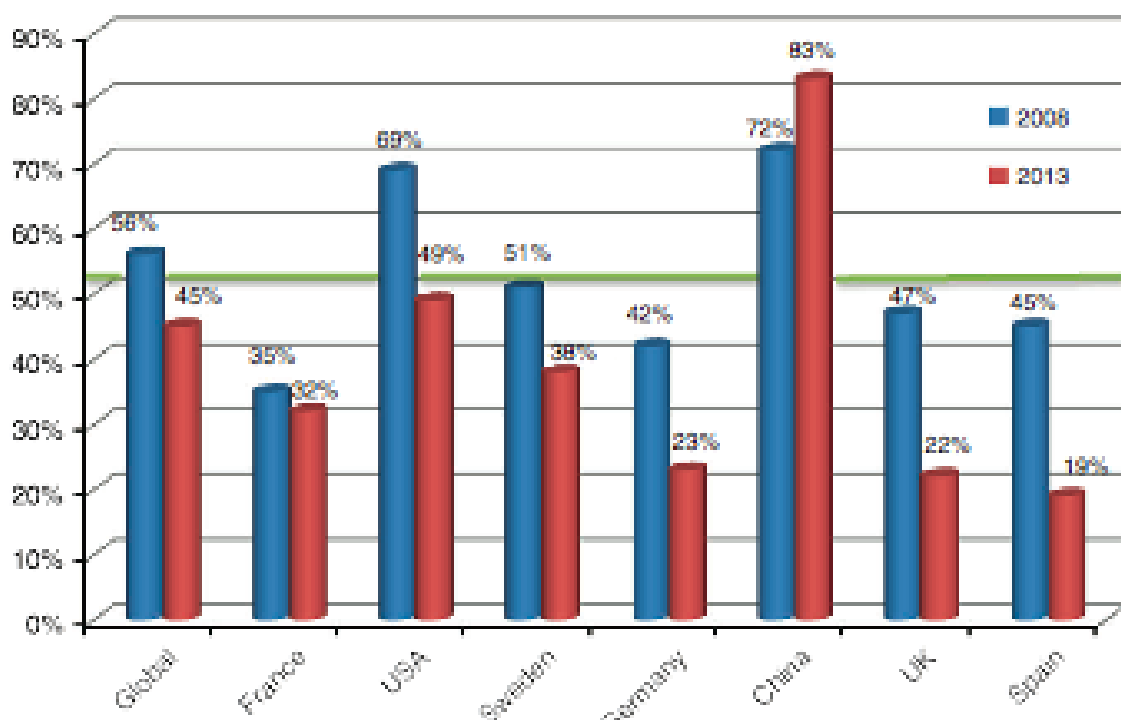
In this way,

Source: Edelman (2013)

users will be endowed with the power to create, assign or simply track digital social currency while using it to exchange value and, therefore, to monitor trust flowing within a community in real time with tools like a decentralized digital payment system, a crypto-wallet and a blockchain explorer, respectively. As the process will take off from prototyping toward the production of a stable Minimum Viable Product, Freecoin interoperable blockchain tools will become an experimental instrument to transparently orient collective perception and awareness toward the circulation of value in a dis-intermediated environment under users' control of their own symbolic statements around trust, i.e. reputation management for creditrisk management purposes.

The practice of developing, implementing as Minimum Viable Product and finally using the Freecoin Toolchain in a collective open setting is a way to represent - digitally - the institutionalization of trust, which is a process of 'socialization' (Berger and Luckmann 1967) that from habituation, routinization and typification leads to institutional 'structure', whereby the typifications of trust behavior function as 'trust templates'. (Kroeger 2013) Although it will emerge more clearly with the scenario building for each pilot context of the Digital Social Currency, it is worth noticing here that the institutionalized trust templates provide (1) symbolic cores and (2) a 'writing guide' for symbolic action that suggests how to structure more specific personalized

meanings around those cores (Kroeger 2013). In the context of digital social currency systems, the institutionalization of trust is therefore regarded as the process of 'socialization' of trust templates, i.e. the transmission of institutionalized trust patterns between individual actors, in this case related to the social economy in terms of credit risk management institutionalization itself is only complete when the objectified patterns are passed on to third actors and further replicated reliably with the mediation of digital devices.

The process of institutionalization via socialization of trust begins with a new actor entering the scene. Members of the network introduce the newcomer to the typifications they have already created to form the trust relationship, i.e. the Social Proof-of-Work. We envision the Freecoin Toolchain as a set of tools to facilitate the creation of horizontal circuits of value that digitalize trust relationships in a social networking context in order to link unused resources and unmetneeds among like-minded peers in terms of endorsement (Spain), reward for political participation (Iceland) and remuneration for work contributions (Finland). According to Kroeger (2013), in this process, the patterns are typically communicated as fact ('this is how things are done'). That is, the new actor encounters the roles and routines for trusting as a pre- existent 'facticity outside of himself' (*Ibid.*)'. At the same time, the fact that the original creators of the patterns witness this process produces a 'mirror effect' through which institutional reality 'thickens' and 'hardens' for them too. (Berger and Luckmann 1967). Throughout this iterative dynamic of trust transmission, the process of objectification is then complete. In this view, Digital Social Currency design for D-CENT pilot communities is an experiment in the institutionalization of trust patterns already present in those communities, but lacking the digital infrastructure to make institutionalization viable.

The main tenet that underpins this inference is that intelligent digital tools for collective social networking can help trust become long term: socialization allows the institutionalized trustpatterns to become a collective characteristic of the organizational team or subgroup. More precisely, trust can be long term, *because* it is collective in nature. (Kroeger 2013) Cross- generational transmission of trust templates allows them to become long term in nature - in particular, more long term than trust, which is a property merely of a dyadic relationship. And this applies also to the codebases for trust management and complementary currency systems that communities will adopt on the D-CENT platform.

In this sense, the main challenge for the design of the Freecoin Toolchain is then to objectify trust - without reifying it and, therefore, the dyad trustor/trustee - and transmit it across generations of organizational actors by means of software codebases for distributed trust management systems. In brief, D4.4 looks at ways to frame the socialization of trust by exploiting the architectural features of the structurally transparent blockchain technology and human engagement in pilot communities.

As findings from trust research in offline settings encouragingly show, the core of an (inter-)organizational trust relationship can therefore be maintained even beyond the point at which the original creators of the trust relation have moved on and left the organization. Counter to the assumption, implicit in much research and practice, that trust disappears when a participant leaves the relationship, this perspective posits that trust (that is ways of signaling, building, using trust) can become an attribute not just of individuals, but of groups, teams and organizations (Kroeger 2012). Since both trust - or a 'promise to pay'/IOU - and codebases are virtual, running trust management on a blockchain is remarkably worth a try.

The notion of Trust Management has been introduced in academic debate by Blaze (2005). In relation to IT and when the users of the system are human, Trust Management is an area of information technology that aims to improve the operation of open, distributed systems by predicting or influencing the behavior of their users. When applied to human users, Trust Management methods attempt to leverage the human capacity for trust or distrust. (Wierzbicki, 2010) Trust management can be seen as a symbol-based automation of social decisions related to

trust, where social agents instruct their technical representations how to act while meeting technical representations of other agents. In the context of the D-CENT project, pilot communities are the very settlers of the rules governing the trust management system that they self-manage.

Further automation of this process can lead to automated trust negotiations (e.g. see Winslett,2003) where technical devices negotiate trust by selectively disclosing credentials, according to rules defined by social agents that they represent. (Wikipedia) As Smart Contracts are already indicating, in the future trust management may become yet another standard service of information security, such as authentication, authorization, privacy or integrity (Wierzbicki, 2010). Most Trust Management systems use simple computational representations of trust. Internet auctions, for example, use a three-valued discrete scale of "negative", "neutral" and "positive" (with the exception of the recent system used by e-Bay, namely the Detailed Seller Rating system).

The Freecoin Toolchain aims to advance the state-of-the-art in the design of Trust Management Systems, in which trust is collectively self-managed by virtue of ad hoc implementations of the blockchain technology.Distributed trust can be measured for example, by Trust Units informing the money supply of a regional complementary currency (Spain), political-reputation rewards tokens (Iceland) and the social remuneration scheme from a common pool of complementary currency owned in a decentralized framework (Finland and Milan).

4.Freecoin Toochain Application to Pilots

As we presented in the design document above, the Freecoin Toolchain is the result of the features-building process conducted with LEAN-UX methodology in WP1 and WP3. The design of decentralized complementary currency and trust management systems for T4.4 has been directly informed by the needs of the communities piloting the Digital Social Currency on D- CENT. We analysed the qualitative data gathered during 2014 and below there are the various applications of the Freecoin Toolchain to the pilots' contexts. For each pilot in Iceland, Spain and Finland, a description of system, a scenario and a pilot-specific list of features are proposed.

Finally, a variation of the third pilot (Finland) is proposed for one of the use-cases identified in D3.4, namely the experience of art and entertainment workers at Macao, Milan.

- **Iceland:** 'decentralized complementary currency system for Your Priorities;
  - **Spain:** Decentralised application to be integrated to the Community Exchange System forEurocat;
  - **Finland and Italy:** Decentralized bottom-up social remuneration for Helsinki Urban-cooperative Farm and Macao cultural workers in Milan.

Pilot 1 (Iceland): Social Kronas - Political-Reputation Tokens for Your Priorities

The Icelandic pilot can be seen as experimentation in distributed reward mechanisms for political engagement, within the prioritization of best political proposals by citizens. Indeed, Your Priorities is a platform that already contains a reputation system that distributes 'social credits'. A member earns rewards called 'social credits' in the form of digital tokens by other members who vote for that proposal during Reykjavik Participatory Budgeting event. Since social credits are assigned to those that deliver the best political proposals in the participatory budgeting events, it became clear during our research that those credits could be spent in the local economy, turning them into Social Kronas recognised by the Reykjavik City Council.

The Freecoin Toolchain for Your Priorities: Description of System

The following blueprint is adapted from Lietaer and Kennedy (2012).

Region served: Reykjavik Metropolitan Area
Name of currency / Standard of Value: 'Social Kronas' (SKR) redeemable at 10: 1 ratiowith Icelandic Kronas (ISK), i.e. 10 SCR = 1 ISK
Management: Betri Reykjavik / Citizen Foundation / City Hall
Cost recovery: annual levy Betri Reykjavik / Citizen Foundation / City Hall

Main purpose: transforming political reputation into currency. It would be the first time where reward for bettering the social good can be spent for real value within a decentralized and transparent payment system.

Benefits: link desirable political participation to life models that enhance human engagement for the development of the common good. Within the context of participatory budgeting, pilot members engage in proposing initiatives for the betterment of the common and social good ofReykjavik and surrounding areas. Their very ideas can better their community and environment while also rewarding directly those that proposed the best ideas. This would make Rekyavik a city with increased level of political participation, improving the relationship and trust betweencitizens and elected representatives, thus increasing democracy.

Participants: Your Priorities members (12k individuals) within the pilot to be extended to the whole citizenry of Iceland.

Core mechanisms: Social Proof-of-work as Proof-of-Political-Participation for the social good connected to a 'Pot of Money'/Escrow Account. The pro-active and crowd-sourced decision-making process for the betterment of the social good that happens on Your Priorities can be linked to a special fund (or 'pot of money') provided by the City Hall (alongside the resources allocated for the participatory budgeting yearly rounds). The pot of money will be an escrow account that would clear social credits into Icelandic kronas to be spent within the circuit, for example to access the city transportation network, pools, cultural life, social services and the like. As for redeeming tokens, the Social Kronas escrow account would release value expressed in Icelandic kronas to the individuals that meet the conditions of the social proof of work for the Icelandic Digital Social Currency Pilot: the proof-of-political-participation. In practice, a user contributing with a highly rated proposal on the YP platform by other users, would have the possibility to redeem this reputation rates (social kronas) in exchange of a specific range of goods and services, those related to the set included into the circuit.

Governance: Betri Reykjavik / Your Priorities / Citizen Foundation / Town Hall: participatory governance and policymaking.

Freecoin Toolchain Features for Icelandic Digital Social Currency

Feature #1: transforming reputation for the betterment of the common good into money: Social credits will be coins in users wallets.

Feature #2: blockchain based complementary currency: ubiquitous wallets for a custom currency system based on Social POW

Feature #3: convertibility into ISK through City Hall Escrow Account

Figure 7: Icelandic pilot overview

Pilot 2 (Spain) Eurocat - a Micro-Endorsement System for the regional currency of Catalunya

The second application of the Digital Social Currency pilots is the Eurocat, a regional complementary currency for Catalunya. The Micro-Endorsement and Mutual Credit System proposed by Eurocat "is both a method of allocating credit and a method of guaranteeing against credit default" within the members of the regional currency system for Catalunya (Spain). Among the various experiences about Spanish communities examined in D-CENT D3.4, Eurocat emerged as an existing system for control of credit within a specific community, part of the CES network (Community Exchange System) and running on a centralized CMS application based on Drupal.

The Freecoin Toolchain for Eurocat: Description of System

The following systematization blueprint is adapted from Lietaer and Kennedy (2012):

Region served: Catalunya (Spain), several hundred of thousands SMEs and individuals.
Name of currency / Standard of Value: an eurocat (EUC) relates to a correspondent pair of endorsements (END). One END is one Unit of Trust (UT) given and received), i.e. one company can access EUC to the extent to which that company has been endorsed by - and is endorsing - other companies. UT (Unit of trust) is a unit of account that signal the potential to create a means of exchange denominated in EUC. When a company gives UT to another company, it is providing

endorsement to that company.. In turn, EUC is a complementary currency, i.e. a means of payment for measuring mutual credit between members and the standard of value.

Below, convertibility and 'functions of money' aspects of the Eurocat system:

To endorse is to give UT; to be endorsed is to receive 1 UT. For each UT given and received=1 pair of endorsements (END)

Micro-endorsement System: END : EUC = 1 : 1
(END: Unit of Account; EUC: Standard of Value)

Mutual   Credit   System: EUC   :   EUR   =   1   :   1
(EUC: Unit of Account/Means of Payment; EUR: Standard of Value/Store of Value)

Micro-endorsement and Mutual credit tiers together form the Eurocat complementary currency system.

Management: Eurocat Management Committee

Cost recovery: Eurocat membership/annual-fee/levy with a leading principle to operate, ie. on an "at-cost" basis (Bogle, 2009). As a result, Eurocat Management Committee will essentially earn a net income of zero. In practice, Euro donations. Local currency fee = 1% of total turnover.

Main purpose

Support the regional economy of Catalunya via social control of credit: Eurocat micro- endorsement and mutual credit system can be seen as a credit risk social-management system, i.e. Social Currency (END) in the form of reputation gained and assigned by members. To denote an endorsement in this context, it may be useful to borrow from transaction cost economics, the notion of 'relation-specific investments' (Noteboom 2013). If one player does not abide to the very commitment she puts in the system, then she may be banned, i.e. micro- endorsements can be withdrawn as it happens on online forums either by peers or moderators/sysadmins.

Benefits

Mobilise spare business capacity; makes money go further. Desirable counter-cyclical effect on regional economy by increasing the Local Multiplier Effect while ring-fencing euros inside Catalunya as a geographical and economic region. Essentially Eurocat's proposal is to engage in decentralized trust management (END) for the social control of credit (EUC). This possibility is a way to overcome the structural deficiency of the conventional money system that is currently incapable to exercise its very basic role of intermediary for credit access and circulation in the regional economy. As noticed in D3.4, in Catalunya, the absence of a steady recovery is being experienced as an impossibility to access liquidity, hence ushering in a sharp contraction of total SMEs sector turnover in the region.

Core mechanisms: social proof-of-work as Proof Of Business

Everyone gets the same amount in the Eurocat Payment system (EUC) as it has in Trust Capital (END): you have 25k in Trust Capital (ENDs), you get 25k EUC in your Eurocat account in the payment system.

The social proof-of-work within the Eurocat system, i.e. the parameter that benchmarks whether a company is either functional or dysfunctional for the system is called 'Proof Of Business' (Business POW): the proof that a company is respecting its Minimum Activity.

'Minimum activity is a systemic rule that refers to the number of exchange cycles that each member completes in one financial year. The Minimum activity is the minimum annual spending and minimum sales a company has to undertake in one year, and it will be a function of the Trust Capital and the Velocity expected for the type of credit the company has. For instance, for M1 accounts' Velocity expected is 2, so the minimum activity for the company will be 2xTC. i.e. a company with a trust capital of 50.000 EUC should sell and purchase for a minimum value of 100.000 EUC per year. non-functional members are the ones below 2TC purchases or sales

(whichever is lesser).

A decentralized list should detail the company name, balance and the date of the oldest transaction, and if they are in the grace period (see credit conditionality). Members whose Minimum activity is not achieved are potential problems. They either have EUC they don't spend, or have debt and don't redeem it, or have not made any transaction yet. They have to be reviewed and it is necessary to find out why they have such a low activity. If the low activity of a company is caused by a lack of engagement in the Eurocat system, there is the need of a feature that allows for withdrawal of the UT, i.e., endorsement (END) would be undone, i.e. Eurocats (EUC) would be withdrawn. This collides with the architectural features of the blockchain, thus the practical advantage to switch to more traditional and centralized clients like CES/Drupal. Within D-CENT, further engagement with Eurocat will be about testing useful features of the Freecoin Toolchain.

Governance Social Control of Credit for Distributed Monetary Policymaking: the community decides the level and the ways to spread risk - in view of securing a common interest, maintaining the social good, i.e. the integrity and reliability / resilience of the currency system itself: money as a commons. For instance, users can collectively set the agenda about the UPPER LIMIT / highest risk of the Minimum Activity parameter (or velocity target for each credit line) benchmarking the micro-endorsement system. By deliberating on the risk of allocation of credit within the rules of endorsement and the Proof-of-Business, collectively, member companies have credit risk self-management capabilities through an in-direct, measurable, transparent and concrete collective policymaking process. In fact, by fixing the level of trust in real time and in a transparent architecture, it is potentially more probable to supply the optimal quantity of currency at each point in the time series of the business cycle.

Freecoin   Toolchain   Features   for   Eurocat

Feature # 1: to facilitate the decision-making process (integration with e-democracy module)

Feature #2: decentralized storage: the database of the system is stored in a resilient fashion and can be recovered from the personal computer of custodian participants: stewardship of data commons.

EMC: Eurocat Management Committee
END: Eurocat Micro-Endorsement System
EUC: Eurocat Mutual Credit System
EUR: Euro System

**Decentralized Trust
Management System**

d-cent

Freecoin Toolchain

**Centralized Mutual-Credit
Management System**

Drupal™

CES

EMC

END

EUC

EUF

BANK

Figure 8: Eurocat pilot overview

Pilot 3 (Finland) Multapaakku - a Decentralised Currency for Community-Supported Agriculture

Community-supported agriculture (CSA; sometimes known as community-shared agriculture) is an alternative, locally based economic model of agriculture and food distribution.The experimentation in this pilot will be on a social remuneration scheme that will process contributions to the cooperative in real time by the very members of Helsinki Urban Co- operative Farm, who perform them. By having a public ledger for the registration of hours of contributions in the various areas of occupation (almost 20 streams) that volunteers can choose what to be busy in and by storing a backup copy of Helsinki Urban Co-operative Farm Escrow Wallet on each device connected to the network, cooperative members will self- record and self-remunerate their contributions. In the Finnish pilot, each member will have stored on her device a copy of the total amount of currency of the network, and every time she will self-remunerate herself, she - and all members - will see an adjustment on the EscrowWallet containing the tokens. In this case, governance is spread to every participant and risk is the highest as anybody can compromise the system, thus damaging all the others.

The Freecoin Toolchain for Helsinki Urban Co-operative Farm: Description of System

Region served: Helsinki Area 500 people, viz. 200 households (200 members). Each household has a share in the cooperative and there is a scheme for food delivery once a week in one of the 4 spots in the city that give the products during winter. Each of the 200 members does at least 10 hour of work per year of work for the cooperative.

Name of currency / Standard of Value:

10 Multapakku = 1 working hour = ~10 Euros **Management:** Helsinki Urban Co-operative Farm. **Cost recovery:** 450 Euros for both join and harvest fees.

Main purpose:

To ignite a fair and meritocratic process of economic growth of Helsinki Urban Co-operative Farm. The idea is to compensate more efficiently people's work by choosing the kind of activity one wants to join and be active into one of the 20 working groups in which the cooperative is framed around: fieldwork, events grouse, finance management, membership registry management, fundraising division Need to track who works for what and compensate thus a meritocratic and self-managed system (Social POW). The need is to be able to reward who is executing a task for the cooperative and remunerate them by tracking their contributions. Already using CES from Helsinki Timebanking used for paying those that work for weeding the fields. Difficulties and cost of running the marketplace itself.

Benefits: better management of the cooperative, solid business model that can both increase membership in Helsinki Urban Co-operative Farm and, if the test will be successful, it could be adopted in other similar contexts. In particular, the Social POW here is an experiment around a community that can monitor in real time both collective trust as contributions to the cooperative and

individual trust as honesty in that everybody will have an eye on the movements of the main Helsinki Urban Co-operative Farm Escrow Wallet.

Participants: Urban Co-operative Farm members. 200 households / 500 individuals. Another stakeholder would be Helsinki Public Library, which interested in urban agriculture and is also one of the pickup points of harvest produce coming from Helsinki **Urban Co-operative Farm.** Also house-sharing and collective purchase rings may be involved in the piloting of the codebase.

Core mechanisms: Social POW as Proof-of-Contribution: If a member abides to the cooperative subscription rules by performing 10 hours/year of cooperative work (on filed, administrative, commercial, etc.) and wants to contribute more to the social sustainability of Helsinki Urban Co-operative Farm, she can apply to have a Urban Co-operative Farm member wallet. In order to explore decentralized tracking processes of trust management dynamics within a community, contribution will be rewarded by members themselves: each time a member execute one or more hours of work, she will simply pay her wallet from the Helsinki Urban Co-operative Farm Escrow Wallet, a common wallet where all digital tokens are parked.

Governance: Urban Co-operative Farm board in general and especially the person in charge of membership address book to monitor the blockchain.

The Freecoin Toolchain for Helsinki Urban Co-operative Farm: Features Feature #1: P2P trust management. Meritocratic system for rewarding contributions to

the common good of Helsinki Urban Co-operative Farm.

Feature #2: 'Common Account' decentralized storage. Every member will have access to the common wallet containing the money supply for the self-reward of contributions by members themselves. This features will test the levels of trust and distrust among members of a currency system. If the system will not be abused unsustainably, then this pilot will have demonstrated that self-reward is an option to further explore in the study of economic relations.

Feature #3: blockchain based complementary currency: the coins and wallets are based on a customized blockchain system based on Social POW and ubiquitous wallet technology.

Freecoin Toolchain

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Conclusions: What is success for Freecoin and how to measure it?

In order to propose a set of metrics and indicators to assess community impact and community resilience as an outcome of the use and growth of Freecoin, we have to consider the differences between Freecoin tools and features range from use-cases.

Referring to the main features we individuated for our research to contribute to pilots, we may consider three different cases:

1) Distributed storage architecture

A clear indicator of success will be the effective deployment of at least 3 nodes for each formerly central database adopting this feature. Such nodes should be held by participants to the network, whose participation is incentivised, a well-communicated principle of stewardship for data commons. Scaling to more nodes is advisable and such a scaling should tend to be device-centric rather than mixed up on multi-tasking systems.

2) Blockchain based complementary currency

Measuring the success of a currency is relatively easy and mostly bound to its quantitative nature. We should also look at the political acceptance of the currency by top-down institutions, which binds the success for this aspect to the overall work done by D-CENT as a whole, in having perceived the application of such tools as a reliable source of information, aggregation and quantification for behaviours contributing to the common good.

3) P2P trust management

The success of this feature when applied to pilots is tightly coupled with the developments in e-democracy and the level of integration of the two main pilots in D-CENT, establishing aconnection that is as seamless as possible between the distribution and circulation of social credits and the political process of deliberation that take place in the assembly.

When looking to this features themes, it is important to remember that Freecoin is not a currency, but a suite to create P2P currencies, in order to scale bottom up cooperation for the social good. This happens by giving pilots a tailor-made Digital Social Currency as reputation management in terms of tolerance of risk to a distributed allocation of credit created among engaged members. Accordingly, the general rationale for success is the following: If the tools of the Freecoin suite will increase both sensibly and reliably such decentralized allocation of credit through the set of features

summarized above, Freecoin will be considered a successful codebase for decentralized trust management and complementary currency governance systems.

5.1 Indicators of success

In each pilot, we will monitor the usual measures for determining the performance of currency systems and their social impact. We propose to define "social impact" as follows: the social and cultural consequences for pilots' populations of the introduction of Freecoin. Social impacts, in this field, involve the ways in which people relate to one another by means of Freecoin tools, and the way they organize to meet their needs, and generally cope as members of community, as well as changes to the norms, values, and beliefs of individuals that guide and rationalize the political process of deliberation.

Indicator #1. Increased volume of currency in a local area

Given that the volume of conventional money in a local area is scarce, evidenced by the level of underutilized human and material resources in a given area, Freecoin tools should increase the *volume of transactions in a local area* to mobilize these resources. The *velocity of money in circulation* may increase. Higher velocity means the same quantity of money is used for a greater number of transactions and is related to the demand for money.

Indicator #2. Increased employment opportunities

Freecoin tools should give their participants a safe way of trying out their new employment choices, by improving the *local rate of employment*.

Indicator #3. Increased importance of traditionally undervalued activities

Community members themselves decide the value of childcare, artisan skills or community organizing, by establishing a connection between the distribution and circulation of social credits and the political process of deliberation about the community sector. The *rate of growth of community sector activities* endorsed by means of P2P trust management is a measure of the community impact of Freecoin tools.

Indicator #4. Increased strengthening of social relationships

Freecoin tools are intended to help the members of a society to reinforce and create social networks. In order to measure this feature we will use the *increase in the number of individual citizen that actively participate to decision making process by using D-CENT platform* and theincreasing engagement with local democracy, associations and organizations by means of Freecoin tools.

Indicator #5. Counter-cyclical economic tendency

Some complementary currency systems provide a beneficial countercycical impulse to the economy. During periods of recessions, the volume of transactions and the number of participants increases, while the opposite happens during boom periods. The most detailed study in this respect involves the Swiss WIR currency in several studies by Professor James Stodder Stodder 2000, 2009). The WIR is the oldest continuously complementary currency system in the world: it was started in 1934 and involves today some 70,000 Swiss businesses. This provides 80 years of high quality data. Stodder's studies prove that the WIR system plays a significant counterccyclical role in the Swiss economy, stabilizing particularly GNP and employment.

References