

DAO meets the Estonian e-residency program: a stance from Synergy's blockchain-based open-source toolkit

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DOI: 10.3217/978-3-85125-932-2-11

1 Introduction

Perez (2003, 2010) argues that we are in a long impasse period in the Information and Communication Technology (ICT) Age. The current techno-economic paradigm⁸ has been implemented through financial speculation on the potential benefits of not fully understood digital technologies, using institutions and organisational models from the previous technological revolution⁹ (the Age of Oil, the Automobile and Mass Production) (Perez, 2003).

Digital platforms are coopted by multinational corporations, mining data from their users using a massive intensive farming business model. Distributed ledger technology (DLT)¹⁰ applications like blockchain are used as investors' bait for quick fundraising in Initial Coin Offerings (ICOs)¹¹ while providing little use. Similarly, other non-private actors like communities and governments aim to apply the promises of the ICT Age to other purposes. Platform Cooperativism¹² (platform co-ops) offers alternative organisational models for digital workers using the power of distributed networks. There are also government-backed initiatives: the Estonian government launched the e-Residency program supplying government-backed digital identity that provides access to non-nationals and non-residents to Estonia's digital services.

All the initiatives mentioned above are working in new arenas handicapped by the legacy of deeply embedded political-economy ideas about markets, business models, cooperation, and progress. As a result, each initiative breeds certain endemic dysfunctionalities. Digital proprietary platforms exploit their users as data-producing

⁸ <https://sociality.coop/>

⁹ <https://synergy-kit.io/>

¹⁰ <https://www.ngi.eu/ngi-projects/ledger/>

¹¹ The network effect is a phenomenon whereby increased numbers of people or participants improve the value of a good or service. <https://www.investopedia.com/terms/n/network-effect.asp>

¹² For the definition of reputation systems and their evolution into token-based systems see <https://future.com/reputation-based-systems/>

digital livestock. Blockchains beget financial bubbles with enormous energy costs. Platform cooperatives are under-financed and isolated. The Estonian e-Residency program is nowhere near widespread adoption.

However, the findings from digital platforms and DLT (private), co-ops (grassroots) and the e-Residency program (public) are providing building blocks for a functional and sustainable networked digital ecosystem. Anyone with a terminal and an Internet connection can participate in a digital cooperative system, perhaps making a livelihood out of her/his skill and dedication while having access to a network of new contacts and opportunities for expanded collaborations.

Synergy is a blockchain-based toolkit developed by Sociality Digital Cooperative. Using the case study of *Synergy*, we will show how a digital cooperative can provide the backbone for a form of a fair global platform co-op giving valuable insights for modelling the post-capitalist grassroots global organisations to come. The authors argue that a co-op fostering a self-developed custom-made blockchain can become a fair global platform co-op in two steps: i) by implementing a Distributed Autonomous Organization (DAO) in the co-op and ii) by linking a DAO-enhanced platform co-op to government-backed digital services.

In this paper, we will explore how co-ops can constitute the base for deploying post-capitalist cooperative networks well adapted to thrive in the ICT Age:

1. We will present a theoretical framework with the main technological and organisational innovations supporting the enhancement of co-ops.
2. We will present the case of a co-op already presenting some of the described traits.
3. We will discuss the new proposed model of co-ops through the case study and the theoretical framework.
4. We will present some tentative conclusions.

2 Estonian e-Residency Program

Estonia is a small European country situated on the east side of the Baltic sea with a population of only 1.3 million inhabitants. After resuming independence in 1991, the Estonian government opted to develop a digital state (e-state) to catch up technologically with more advanced neighbouring countries. As one of the latest additions to the Estonian digital ecosystem, the Estonian e-Residency program, launched in 2014, supplies a government-backed digital identity providing access to Estonia's digital services (Korjus et al., 2017). The program aimed to increase the country's attractiveness as a business environment. However, from the targeted ten million e-residents by 2025, eight years ago, there were fewer than 100,000 e-residents at the beginning of 2022. The authors of this paper argue that the political-economy ideas underpinning the e-Residency program are chiefly built upon unquestioned economic principles resonating with the neoliberal phase of the capitalist expansion of financial markets. However, the e-Residency program provides valuable digital

services that could be used under a different political-economy framework. Current benefits for e-residents include:

- Establish and administer a company
- Conduct all their banking
- Declare taxes
- Digitally sign contracts and other documents
- Access international payment service providers (Kotka et al., 2016).

The aim of the e-Residency program has changed over the years. It began with a startup-like philosophy that, according to e-Residency program director Kaspar Korjus "will have to be supplanted by a more stable framework as the programme matures" (Korjus 2018). One of the e-Residency program founders stated in 2019 that the initial idea turned into offering "the Estonian business environment to the entire world" to increase Estonian revenues from business abroad. Moreover, the program evolved into a "national initiative in Estonia based on cooperation between the public and private sector" (Korjus 2018, 2). In other words, the aim shifted into using Estonian digital public services to attract foreign companies to establish themselves in the European Union, using Estonia as a proxy country where they operate international businesses with reduced costs and minor bureaucracy burdens.

Gathering revenue and providing an ecosystem of digital services, both public and private, for foreign companies has overlooked other possible e-residency target groups, like co-ops, foundations, and other non-profit enterprises. However, another category is mentioned in the e-Residency 2.0: the digital nomads, people earning a living by working online without a fixed business location.

Uses of blockchain technology in the e-Residency program have been explored, as in the case of the "public notary service to Estonian e-residents based on blockchain technology" (Sullivan and Burger 2017). Regarding blockchain and e-residency, decentralized, cryptographically signed proof of existence for identities and the potential for individuals to control access to their identity information" are significant benefits to blockchain that, like e-residency itself, herald the near future in identity management and authentication. Still, its application is untested, and the ensuing implications are not fully known" (Sullivan and Burger 2017). Ultimately, e-residency may be (accidentally?) a tool for global digital citizenship (Tammppuu and Masso 2019). Moreover, in the case of Estonia Identity Documents (ID) services, the state is seen as a market actor providing services to 'global citizens' in a global digital market and as a membership organization extending beyond its physical frontiers by providing access to its digital service ecosystem to citizens of other states (Tampuu et al., 2022).

3 Distributed Autonomous Organization (DAO)

The decentralised infrastructure underlying Bitcoin has become increasingly relevant in multiple fields since the publication of the Bitcoin whitepaper (Nakamoto, 2008). In the following section, we provide an overview of Blockchain technology and some of

the changes and new organisational models that it has brought about. We also add a sub-chapter dealing with government projects using Blockchain.

3.1 Blockchain & Blockchain-based Systems

Blockchain is a distributed ledger technology that enables immutable and decentralised data storage and computation without a third trusted party (Underwood, 2016; Wright & De Filippi, 2015; Rozas *et al.*, 2021). Blockchain enables the decentralised implementation of infrastructure-level properties and allows the storage of code fragments known as smart contracts (Rozas *et al.*, 2021; Semenzin *et al.*, 2022).

A set of smart contracts deployed on a public blockchain constitutes a Decentralized Autonomous Organization (DAO). The information encoded in these smart contracts defines the governance structure of the DAO blockchain-based system. Since smart contracts allow parties to verify whether a condition has been met, they mediate the interaction between the parties. Thus, they enable members of the organization to coordinate and self-govern decentrally, horizontally, transparently and securely (Wright & De Filippi, 2015; Hassan & De Filippi, 2021).

Decentralisation in DAOs concerns both the infrastructure on which they rely and governance. Autonomy is based on the property of smart contracts to be executed without human intervention and grants DAOs independence from their developers while guaranteeing continuity as long as at least one of the conditions required by the set of smart contracts is fulfilled (Faqir-Rhazoui *et al.*, 2021).

Autonomous automation (Rozas *et al.*, 2021; Semenzin *et al.*, 2022) provides new possibilities, such as encoding redistributive algorithms into smart contracts. When a smart contract is executed, these algorithms redistribute profits or tasks between the involved parties. Tasks and remuneration can thus be transparently and automatically assigned on the basis of standardised criteria or objective scales.

3.2 Blockchain-based government projects

Blockchain imaginaries can be classified into crypto-anarchist and crypto-institutionalist imaginaries (Husain, 2020; Semenzin *et al.*, 2022). The former advocates blockchain's potential to subvert government institutions, while the latter advocates its potential to strengthen those institutions through government-led blockchain projects (Semenzin *et al.*, 2022).

Under the latter imaginary, it has been argued that features of blockchain such as decentralisation, data quality and data integrity, transparency and immutability could play a central role in the fight against fraud and corruption in the public sector (Batubara *et al.*, 2018; Ølnes *et al.*, 2017) while decreasing costs (Alexopoulos *et al.*, 2019) and maximizing performance (Diallo *et al.*, 2018). However, the potential of blockchain in the government field is just beginning to be explored.

DAOs have been proposed as candidates to improve the contracting service of an e-government system. DAO-enhanced e-government systems or government-DAOs (eGov-DAOs) rely on a public blockchain and allow real-time monitoring, providing transparency, accountability, immutability and improving the national resource management of the service while solving security problems (Diallo *et al.*, 2018).

Proposals incorporating blockchain into e-government systems have not been limited to institution-citizen interactions but also encompassed government-to-government (G2G) services. Geneiatakis *et al.* (2020) proposed and experimentally evaluated the performance of a System for Exchange of Excise Data (SEED) implementation on the blockchain. SEED is part of the Excise Movement and Control System (EMCS), which controls the movement of excisable goods across EU Member States' borders.

Despite the abundance of theoretical proposals, concrete applications are scarce. The following are some examples of ongoing initiatives. The Chinese district of Chancheng, through "The Comprehensive Experimental Area of Big Data in Guangdong Province" project, applies blockchain to digital identity, credit, and information disclosure avoidance (Hou, 2017). Similarly, the e-Estonia e-government system uses permissioned/closed blockchain to strengthen traditional centralised institutions (Semenzin *et al.*, 2022). Finally, the German Federal Office for Migration and Refugees (BAMF) has launched a project to promote collaboration between governmental agencies through blockchain. Its main goal is to improve the efficiency of information resources on migration and asylum procedures (Kassen, 2022).

4 Platform Cooperativism

The emergence of platform cooperativism is a result of the massive deterioration of labour conditions associated with platform capitalism (Mazzucato, 2018; Scholz, 2016). Platform co-ops derive from applying the co-op concept to the digital environment (Scholz, 2016; Pazaitis *et al.*, 2017). They provide an alternative organisational model for digital workers based on the main idea of shared ownership and democratic governance.

Although there is no consolidated and unanimously accepted taxonomy of platform co-ops, Borkin (2019) suggests the following:

1. Multi-stakeholder/community platforms: combine two or more categories of member-owners (usually users, producers and developers).
2. Producer-led platforms: composed of stand-alone producers as member-owners selling their products and services and addressing the governance of the platform.
3. Consortia/worker platforms: the member-owners are the workers/employees. They not only work but also govern the platform.
4. Data consortia platforms: built to manage its members' data for mutual benefit.

Despite differences, they all embrace common founding principles (Scholz & Schneider, 2016): a) anti-discriminatory open membership; b) democratic member control; b) equitable member economic participation; d) autonomy and independence; e) education, training, and information; f) cooperation among cooperatives; g) concern for the community.

Combining activism and work (Pazaitis *et al.*, 2017), platform co-ops aim to provide technological, cultural, political and social changes (Scholz, 2016). Beyond profit generation, these changes and the generation of a fair alternative to platform capitalism are their main goals (Sandoval, 2020).

5 Synergy

Sociality Digital Cooperative is a producer-led digital co-op based in Athens¹³. Its main objective is to provide a solid online presence, digital tools and infrastructure to its clients. Imbued with open source values and work ethic, Sociality encourages the use of open source and places special emphasis on the fair treatment of data.

Synergy Toolkit is a financial open-source toolkit for cooperatives developed by Sociality and based on a distributed ledger¹⁴. It was funded by the NGI Ledger program¹⁵, an initiative of the European Commission. *Synergy* provides loyalty and micro-credit services to cooperatives (and other small and medium-sized enterprise (SME) sectors and businesses) using blockchain technology. The objective is to help communities overcome challenges such as lack of liquidity, investment capacity, and client acquisition.

The system was co-designed by the co-op community in Athens during meetings and workshops. It operates using the Quorum open-source blockchain platform. Moreover, the system has its own digital wallet and implements privacy-by-design elements to ensure data privacy for the user. The final goal was to make the toolkit easily replicable, maintainable, and modular so communities can recreate it in different cities and govern it in a community-based approach. When interacting with *Synergy*, a user interacts with the following *Synergy Public Components*:

13 A techno-economic paradigm is a best practice model for the most effective use of the new technologies within and beyond the new industries emerging from a technological revolution. (Perez, 2010)

14 What distinguishes a Technological Revolution are two basic features: a) the strong interconnectedness and interdependence of the participating systems in their technologies and markets; b) the capacity to transform profoundly the rest of the economy (and eventually society). (Perez, 2010)

15 Distributed ledger technology (DLT) has established itself as an umbrella term to designate multi-party systems that operate in an environment with no central operator or authority, despite parties who may be unreliable or malicious ('adversarial environment'). Blockchain technology is often considered a specific subset of the broader DLT universe that uses a particular data structure consisting of a chain of hash-linked blocks of data. (Rauchs *et al.*, 2018)

- Wallet. A digital wallet for supporters and merchants, available on the web and mobile.
- Blockchain. A quorum blockchain infrastructure.
- Public Website. A public website to engage supporters.
- Cardboard Card. Integration with Quick Response (QR) codes for non-digital users.

Synergy's goal is to support the co-op community and create an interconnected platform tailored to their collective needs. The tool's purpose is to empower the collectives both structurally and financially. Thus it was crucial for *Synergy* to focus on the community itself and the relationship dynamics inside it through a co-design process.

In order to effectively design the procedure, it was deemed necessary to assess the relationships inside the co-op community of Athens in terms of a network. That was achieved by holding meetups and researching collective operations with the intention to form an open-to-contribution and debate co-design process about the needed change and describing the technical solution and its feasibility.

After the meetups and the co-design sessions came the planning of the implementation of the proposed change consisting of the following parts: propagate, test, document and release change.

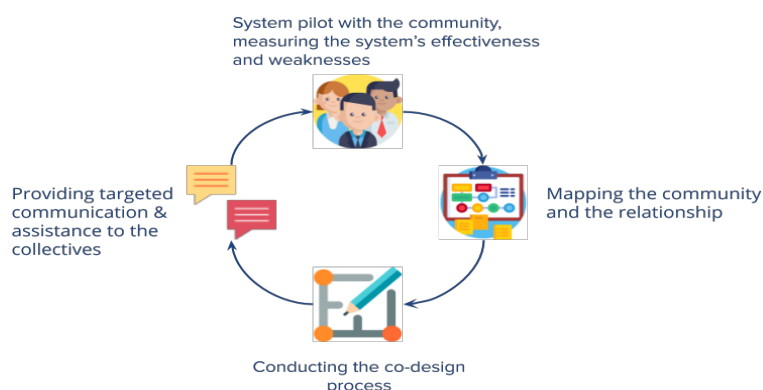


Fig. 1. Methodology Cycle¹⁶

The following actions were deemed necessary in terms of methodology:

- Mapping the community and the relationship of its members, through meetups, focus and research groups, operation analysis and more.
- Conducting the co-design describing the proposed solution and the implementation plan.

16 An initial coin offering (ICO) is the cryptocurrency industry's equivalent to an initial public offering (IPO). A company seeking to raise money to create a new coin, app, or service can launch an ICO as a way to raise funds. Interested investors can buy into an initial coin offering to receive a new cryptocurrency token issued by the company. This token may have some utility related to the product or service that the company is offering, or it may just represent a stake in the company or project. <https://www.investopedia.com/terms/i/initial-coin-offering-ico.asp>

- Separate the features of *Synergy* into independent and interchangeable modules.
- Providing targeted communication & assistance to the collectives and the parties involved - in the form of materials and training.
- Creating a system pilot with participants from the community, measuring the system's effectiveness and weaknesses and redesigning its functions accordingly.

5.1 The Synergy Solution

5.1.1 Synergy Services and Contributions

The general goal of *Synergy Services and Contributions* (SSC) is to improve efficiency levels. In order to be able to contribute to the growth of co-ops, *Synergy* mapped and addressed critical obstacles in *Synergy Toolkit's* services.

Table 1. Synergy Services and Contributions to Growth Barriers

Growth Barrier	Synergy Service	Synergy Contribution
Accessing appropriate finance	Microfunding	Tokenization or future/network products/services as means of funding
Regulations / Administrative Burdens	Community Building	Involvement and empowerment of structures and collective bodies such as the SSE Union in Athens
Lack of awareness	Community Loyalty	Raising awareness through a marketing campaign and platform for the general public.
Lack of a tradition of cooperation	Community Building & Loyalty	Creation of a Common Service Pool and documentation on business support

Beyond mere means of transactions, *Synergy Toolkit* aims to create a circular, self-sustaining, and added-value community that will promote economic growth through cooperation and eventually commoning.

Additionally, the toolkit represents the community and depicts its ethical and affective values. Taking that into account, we focus on the Social and Solidarity Economy (SSE) as a community but also on the audience/customers that they interact with and partially share some of the values the collectives embody.

5.1.2 Community Loyalty Program

A community loyalty program involves businesses in a specific sector pooling their resources together to promote themselves and reward their customers. The desired goals of a community loyalty program are to lower service costs and reduce price sensitivity while generating higher purchasing levels, and positive word-of-mouth.

5.1.3 Microfunding

The micro-funding concept provides solutions regarding both investment capital and liquidity injections. A future microcredit scheme could be developed where the consumers purchase tokens representing products in order to provide the cooperatives with the capital they need in order to make investments. It entails two aspects: exchange of capital with tokenization of future services/products; donations and crowdfunding from supporters.

5.1.4 Community Transactions

In order to enhance the collective governance and the community building between co-ops themselves and co-ops and supporters, the following items were included in *Synergy's* initial minimum viable product (MVP). Initially, the co-ops were given the ability to post their news, events, or support requests so that they could attract and inform supporters about their activities. The ability to post feature was developed to allow co-ops to showcase their social impact and activities.

Moreover, the MVP included a draft community area where co-ops could post news, events and requests that would be visible to other co-ops only. The draft community area would provide the basis for developing the third major service of *Synergy* regarding community transactions. During the co-design phase and the workshop, the draft community area raises a debate regarding the possibility of using it as an internal lending mechanism.

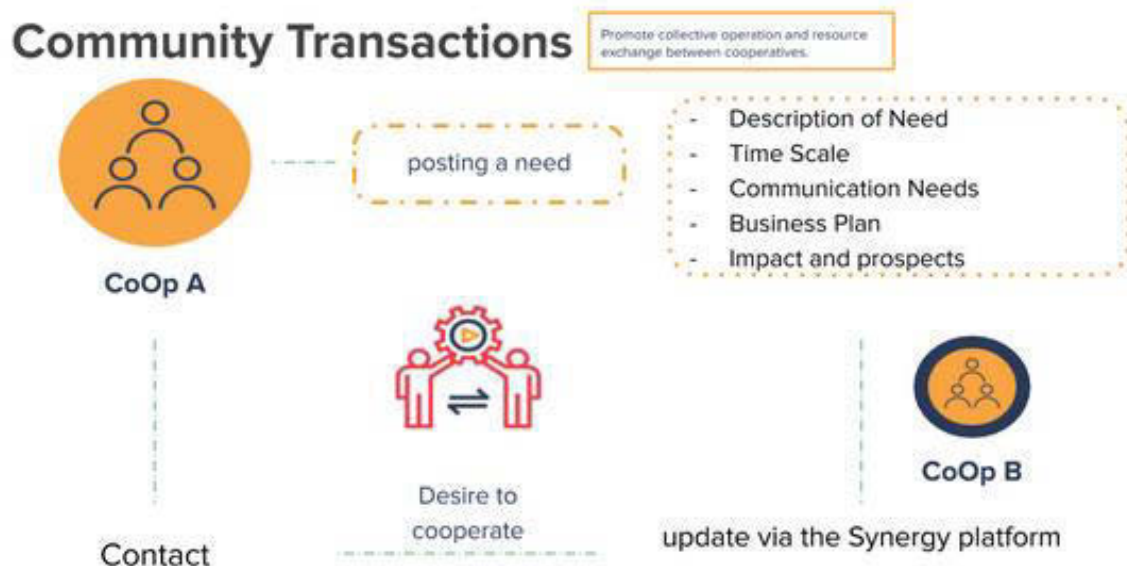


Fig. 2. Community Transactions

Such a discussion highlighted the need for a forum for internal communication to develop solidarity between co-operatives and as a practical experiment on whether it would be feasible to set up an internal lending fund where members of co-ops could develop internal rules and methods to decide on fund allocation and prioritization of

needs and requests inside the co-ops. The co-design phase concluded that borrowing could in addition to money refer to services or know-how.

5.2 Services and Features

Synergy Toolkit is at the same time the backbone and the tools used to generate more communities and applications. Sociality has developed a pilot MVP called Synergatika.gr with specific features for each of the main services, providing a custom-made product that responds to the situation of the Athens cooperative community, as recalled during the co-creation sessions with the local community.

In the following Table, there is a condensed version of all available features of the services that can be provided to new communities.

Table 2. Synergy CoDesign Cards

Service	Feature	Description
Loyalty	Redeem Points	As long as the member is shopping, he/she earns points that he/she can spend
Loyalty	Points-based Discount	As long as the member is shopping, he/she earns points and he/she receives a discount
Loyalty	Points for Gifts	As long as the member is shopping, he/she collects points and he/she receives gifts
Loyalty	Discount	Members are discounted from the start as they show their card
Loyalty	Gamification	Members get points based on their behavior. Those who gather more earn specific benefits
Loyalty	Reference	When bringing in a new member earns points
Loyalty	Offers	Members are privileged for specific offers
Microfunding	Donations	Supporters give money as donations
Microfunding	Crowdfunding with gifts	Supporters give money for something and get back specific gifts
Microfunding	Subscribers	Supporters give specific money every month and get gifts back
Microfunding	Lending with Points	Supporters give money for something and get the equivalent in points they can spend in the store
Microfunding	Microfinance with Money	Supporters give money and get money in future time
Microfunding	Liquidity Fund	Microfunding contributions go into a common

		liquidity fund
Community Transactions	Internal Lending	Cooperatives lend to each other
Community Transactions	Negative Balance	Cooperatives have the potential for a negative balance in a domestic currency
Community Transactions	Smart Contracts	Cooperatives make ad hoc agreements with each other on products or services
Community Transactions	Liquidity Fund	A common liquidity fund is created from the cooperatives to help each other.

5.3 Value Chain & Benefits

A value chain “describes the full range of activities that are required to bring a product or service from conception, through the intermediary phases of production (...), delivery to final consumers, and final disposal after use” (Kaplinsky, 2000). Small businesses usually face problems when participating in a value chain. Scarce resources and capacity result in difficulties for small enterprises to become suppliers to larger audiences, compete in value chains and enter higher value markets. While large firms can often use their bargaining power in their supply chain, small enterprises need to follow the decisions taken by others. In this context, they end up with no other choice than to accept prices or product requirements that are given by a buyer.

A generic value chain has many levels of involvement and several trade connections where intermediary traders play a crucial role, often having concrete market information and more financial resources than small producers. A trader can relate to each of the small producers individually and can potentially use his bargaining position to exercise pressure on small producers (for lower prices etc).

This asymmetric bargaining power in a chain lowers small producer revenues and, thus, limits their opportunities for improved livelihoods. Producers often do not have proper information on market conditions and processes and therefore run the risk of being treated unfairly.

An organization can be linked to a value chain both vertically (buyer-seller relationships) and horizontally (internal operation and coordination, linkages to services providers and to policymakers). *Synergy* aims to become the center of a new and integrated value chain for the cooperatives where it will be possible to address the problems of the traditional value chain.

Synergy offers the following benefits to the cooperatives and their clients:

- A. It is creating a community and a marketplace where it is possible to raise awareness and interaction between the interested parties.

- B. It is possible to gain access to services that can be crucial for the business development of their activities.

Synergy's MVP (Synergatika.gr) is testing a new and more integrated value chain for cooperatives where vertical and horizontal relationships are facilitated. Cooperative communities will be able to: facilitate and leverage market linkages, improve their collective bargaining power and gain market information and intelligence.

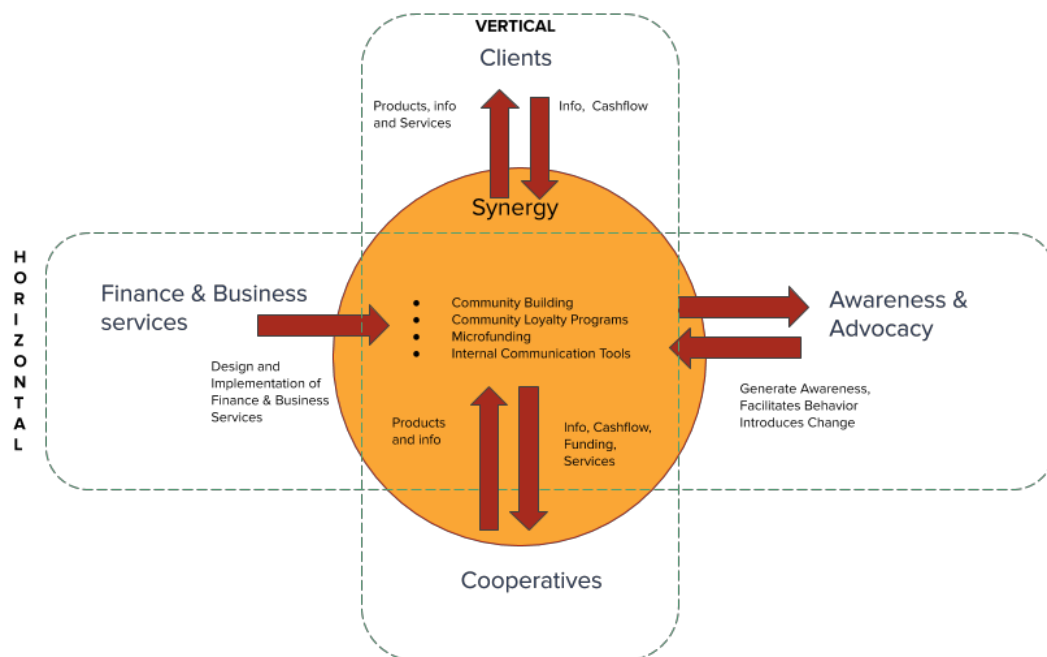


Fig. 3. Integrated Value Chain

The relationship between cooperatives and clients is channelled through the application marketplace. Additionally, the vertical relationship is being expanded adding to it the notion of micro-funding and community loyalty where the client/supporter becomes a more vital asset to the operation of the cooperative. The horizontal relationship between *Synergy* and the cooperatives reduces common costs and activities.

Namely, the design and implementation of communal finance and business services create economies of scale between the cooperatives and lowers externalities.

Finally, the platform provides the ground for collective advocacy and raising awareness for the community which later can create benefits for the community in general.

6 Discussion

Platform cooperativism has the potential to provide key organizational innovations for the reality that lies ahead: a post-Globalization era. The subjacent logic and ethos of the ICT Age greatly influence how the generation and allocation of resources, organizational and business models and even institutions operate, making them over-dependent on digital technologies and their underlying principles. Such "digital logic" permeates novel practices like peer production, open-source, asynchronous collaboration, modularization of tasks, or iterative version control processes. These practices present key factors for massively distributed innovation and collaboration and imitating computers and software in many ways. The simpler the rules of engagement, the more likely multiple agents will engage in sharing information between themselves. If the agents achieve enhanced communicative capacities, individual members of digital networks can generate so-called "network effects"¹⁷ by sheer numbers and density of cooperation. The rules, values and aims of platforms co-ops make them suitable candidates to articulate intensive and extensive digital information exchanges. As co-op members are collaborative equals (peers), they are well fit to interoperate in distributed networks. If platform co-op members would have the capacity to generate, pool, invest and exchange resources together, heeding equal and horizontal rules, co-prosperity should be an expected outcome of their collaboration. The tools and mechanisms needed for such platform co-op co-generated prosperity to happen are already available, although not in their mature phase yet.

Knowing that a DAO is the application of rules in software that self-executes itself and that for implementing a DAO, a blockchain is needed in the first place, we see that *Synergy* has the building blocks for implementing a DAO over platform co-ops. Implementing a DAO in platform co-ops to provide a clear set of rules to register and operate actions and activities from the platform co-ops and their members would provide a transparent and reliable source of trust between communities organized in co-ops. *Synergy Services and Contributions* is already incorporating the feedback from the local co-op in Athens about the barriers preventing their members from using a co-op-based blockchain to have access to finance or surpass local and national administrative burdens. *Synergy Services* built over the Quorum blockchain can be included in the rules for a DAO. The conditions to access financial instruments like microcredits can be executed automatically. When a co-op member's financial request fills the encoded conditions, or when the data of a co-op member is used for administrative procedures, the DAO would automatically accept the financial request and transfer the funds or send the data to the pertaining administrative body.

Synergy Toolkit constitutes the first approach of platform co-ops to the Blockchain environment. The set of three digital tools on the toolkit is the entry point for the Athens co-op into the realm of DAO. First, the wallet upgrades the members' financial capacity

¹⁷ Platform cooperativism is about democratic ownership models for the Internet. (Scholz, 2016)

to interact with digital tokens and cryptocurrencies, adding a new layer to their digital persona for accessing digital sources of financial support. Second, the blockchain provides the trusted backbone for all digital operations to be correctly registered, transparent, and secure. Third, the website provides a platform with publicly available information for co-op members, supporters and related parties and a digital forum for discussion, questions & answers (Q&A), and connecting with other co-op members. Any co-op member that can properly use these three digital tools provided by *Synergy* would have no significant impediments to being part of a co-op DAO.

Synergy Toolkit is integrated by a Digital Wallet and deployed in a Quorum Blockchain infrastructure: a permissioned ledger implementation built from Ethereum code. Since *Synergy* is deployed on Quorum, only authorized nodes within the network can connect. In addition, Quorum supports the implementation of smart contracts. The execution of these smart contracts and transactions and access to the information encoded in the ledger are restricted to authorized nodes.

The possibility of encoding the governing rules of platform co-ops in smart contracts opens up new opportunities. In the case of Sociality, Quorum blockchain allows implementation of the rules governing the digital co-op itself and many of the features of the *Synergy Toolkit*. The resulting DAO-enhanced platform co-op could function internally as an autonomous infrastructure. Such infrastructure would enable modularized task distribution, secure, transparent transactions; and unbiased automatized allocation of community loyalty program resources and microfunds through redistributive algorithms. Finally, the smart contract's code could be inheritable, enabling self-replication of both the digital platform and the toolkit.

Synergy's Community Loyalty Program generates value in two complementary ways: on the one hand, generating engagement by providing the cooperative's customers with loyalty benefits, and on the other hand, encouraging the investment of resources within the cooperative's network. These two features are mutually reinforcing, contributing to sustaining the livelihoods of platform co-op members and ensuring the survival of the platform co-op and its network. Furthermore, implementing *Synergy's Community Loyalty Program* rules in a DAO-enhanced platform co-op smart contracts guarantees an autonomous, fair and unbiased application. Encoded automatized redistributive algorithms take care of allocating resources among the involved parties or the network. Eventually, loyalty programs encoded in a DAO can be the cornerstone for token-based reputation systems¹⁸ serving as performance indicators of platform co-op members' performance. Platform co-op members investing their time and effort inside the co-op ecosystem would be rewarded for re-investing in the community. In this sense, a well-designed token-based reputation system can also help activate and enhance network effects inside the platform co-op.

18 All figures and tables in this paper have been elaborated by the authors.

A situation like the previously described would apply to local co-op members, joint efforts between different co-ops, and digital nomads. Especially in the case of the latest, having no fixed location presents some practical difficulties. Partaking in several different public administration systems, bureaucratic processes, multiple identity registrations, tax arrays, and social security systems is an advantage in many ways but also presents handicaps: not having a fixed territory where to be fully accountable, but instead belonging to several different administrative jurisdictions sequentially over time or simultaneously (citizenship, permanent residency, tax residency, seasonal residency, Etc.) derives in fragmentation of identity. The Estonian e-Residency program provides the missing part for DAO-enhanced platform co-ops: a legal backbone in a well-reputed (digital) state and access to its public and private services for e-residents. When part of the e-Residency program, digital nomads are always connected to the Estonian administrative system regardless of their current nationality or residency status.

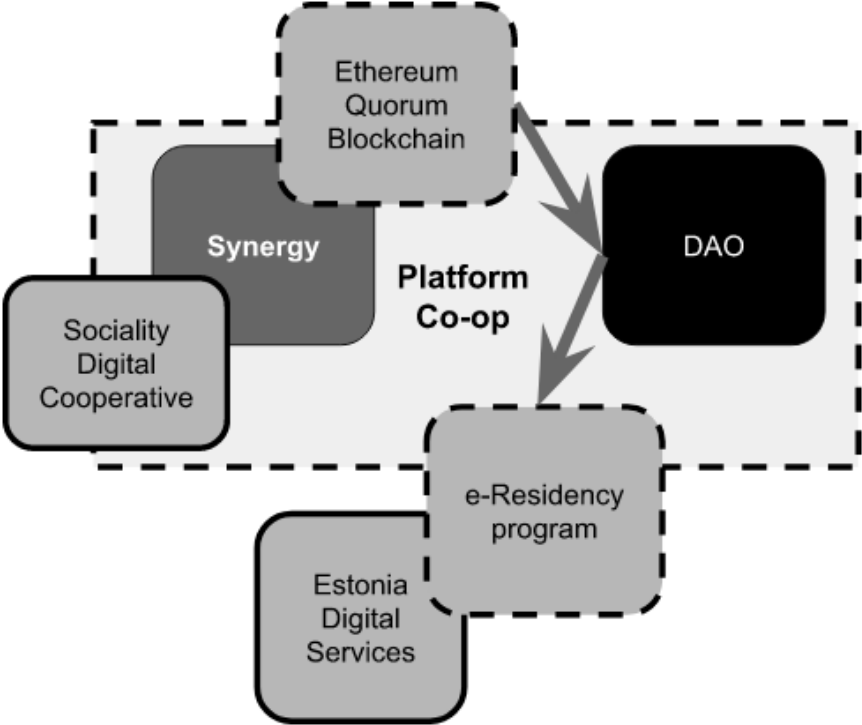


Fig. 4. e-Residency DAO-enhanced platform co-op for Sociality Digital Cooperative

DAO-enhanced platform co-ops could function as an interface, linking its members with the Estonian administrative system through the e-Residency program. Having the DAO-enhanced platform co-op members registered under the same state digital legislative framework, the collective management of resources produced by the platform co-op members located globally should be significantly simplified. Specifically, nearly all services the government delivers in Estonia are digitized, opening a path for algorithms to operate in Estonia's e-state environment. Moreover, these DAO-

enhanced platform co-ops could encode in smart contracts the legislation and procedures regarding workers' rights, occupational categories, taxation and insurance and payment systems, among other parameters. The stored code and its execution would be available for every platform co-op member. Hence, the DAO would function as an automatized interface between Estonian digital services and platform co-op members.

Redistributive algorithms encoded in a DAO can allocate resources between platform co-op members and automatise administrative processes like taxes or sick leave applications. After completing a job, the DAO algorithm would identify the resources produced and allocate them between the platform co-op members, the e-Tax office in Estonia, and other institutions. The complementarity between platform co-ops, DAO and the e-Residency program would enable post-precarity features for digital workers. Furthermore, the automatisisation of tasks would relieve platform co-op members from burdensome administrative processes by using a state-of-the-art administrative system and digital technologies. There is a significant possibility of DAO-enhanced platform co-ops potentially playing a role in the future development of post-precarious digital work.

Finally, by having secure, accessible and transparent encoded sets of rules for co-ops, a new breed of organisation (e-residency DAO-enhanced platform co-op) would be born. Despite operating in different digital and national spaces, anyone willing to comply with the platform co-op rules could become a member. This global community (or association of communities) operates under the same rules in a truly distributed network, helping to unlock and evolve, perhaps, a blueprint for post-capitalist grassroots global organisations.

7 Conclusion

Platform co-ops feature salient characteristics for potentially becoming blueprint global horizontal organizations for a post-Globalization ICT Age. Even if platform co-ops lag behind corporate platforms in technological development and user adoption, leapfrogging current platform ecosystems by adopting state-of-the-art digital organizational models such as DAO and the e-Residency program is a real possibility. The internal logic of the key technology components of the ICT Age (computers and the Internet) determines the path for best organizational and business practices. Some characteristics that differentiate digital and pre-digital organizational practices (such as modularization, cooperation, communicational density and other features) showcase better adaptability for the ICT Age best practices and organizational models (platforms, co-ops, DLT).

Local co-ops like Sociality Digital Cooperative or global digital workers like the digital nomads are potentially the core members of a new cooperative model described as an e-residency DAO-enhanced platform co-op. We have shown through the case of

Synergy that platform co-ops are already developing tools and practices for scaling into distributed network ecosystems.

Acknowledgements

The authors' work was financially supported by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (Grant Agreement No. 802512) and by the EU Regional Development Fund through the Dora Plus Program.

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