Mesh Cooperativism: Toward Mycorrhizal (Infra)structure for the Cooperative Movement

Colin Clark, Lichen Community Systems, colin@lichen.coop
Ethan Winn, Obran Cooperative, ethan@obran.org

Initial draft presented at the 2022 International Cooperative Association Research conference in Athens, Greece, July 2022. Final revision December 2024.

Abstract

Cooperative responses to the inequities of the platform economy have primarily focused on the creation of cooperative platforms and on the promise of a decentralized cooperativism made possible by emerging technologies. However, the question of what an equitable platform is, or should be—as both a technical artifact and set of interrelated social processes—is somewhat murky, and characterizations of decentralization often fail to attend to structuring power dynamics and the potential to reproduce extractive models of growth and scale. With members of the cooperative technology community, the authors explore a model for conceptualizing cooperative sociotechnologies as mycorrhizal "meshes" or networks of more loosely-affiliated, interoperable, local-scale systems. We advocate for a technology creation process that attends to concerns often excluded from platform capitalist design priorities. Such processes should: 1) be rooted in the demonstrated needs and practices of existing cooperative collectives; 2) aim to expand collaborative capacity among cooperatives wherever possible, and 3) focus on measures of scale that prioritize local impact and community development.

Introduction

The deleterious impacts of platform labor have, at this point, been extensively documented. Van Doorn summarizes how labor platforms utilize strategies of immunity, control, fluidity and fungibility, (in)visibility, and violence in order to extract maximum shareholder value from the work of participating laborers. The resulting precarity, poverty, and harm of platforms is meted out disproportionately to economically marginalized groups, and results in profoundly restructured social relations far beyond the boundaries of the platforms themselves (Van Doorn 2017).

If we are to intervene in this, there is a need for further and more nuanced consideration of the nature of platforms, both in terms of their technical infrastructures and the social and economic activities within the organizations and communities who use them—which are in turn shaped by platform technology (Bødker et. al 2020). Platforms must be understood as more than their transactional and computational aspects, taking into account their patterns of capitalization, systems design methodologies, legal frameworks, and structures of inclusion and exclusion. We propose the term *mesh cooperativism* in order to highlight three key priorities for the design of cooperative systems:

1. A concern with designing for situated, local cultures while simultaneously developing global collaboration and interoperation amongst cooperatives
2. Consideration of cooperative technologies as smaller, more localized, and less uniform than today's Silicon Valley-inspired platforms
3. Development of alternative models for scale and growth of technologies, which remain rooted in communities and the quality of their impacts on workers, and distinct from the global-scale metrics and data capture of traditional platforms.

These priorities were developed through a series of interviews with members of the cooperative movement who have experience bringing cooperatives together to collaborate and mutually support each other. This work documents promising practices and proposes to help grow a coalition of others who share an interest in building cooperative technology beyond platforms.

The Challenge of Platforms

Platform cooperativism draws on collective ownership, democratic control, and participatory systems design in its effort to establish a more equitable and humane framework for technology-mediated labor (Scholz 2016). As a movement, this has been a critically important project to articulate the possibility of alternative economic systems, highlight the injustices of extractive labor platforms, and generate real technologies and new co-ops that have a meaningful impact on their members.

The concept of technology as "a platform," however, carries with it the code of its extractive origins in ways that threaten to limit its interventive capacity if not critically examined. The term *platform* itself is ambiguous and multivalent, often obscuring multiple underlying socio-technical concepts (Bødker et al, 3-4). Platformism assumes particular constructions of data and how it is gathered—too often understood as a singular, standalone infrastructure that couples data centralization with a uniform feature set and user interface, a lack of sharing amongst organizations, and a tendency to impose the use of standards, data ontologies, and roles that may not fit all participants (what Basman calls "broken relations") (99). As one of our interviewees noted, platforms are often, by their nature, sources of lock-in and dependence.

From our own experience designing cooperative platforms and other large scale open systems, we have noticed that there is a tendency to underestimate the cost, complexity, and time investment required to build platforms. Designing platforms in ways that are consistent with the cooperative principles involves extensive participatory engagement, often dramatically slowing the pace at which the system can be built and frequently drastically constraining the possibility space for the system. To be clear, however, we nonetheless believe that these constraints are for the better, producing more equitable and appropriate solutions in the end—but they demand a different orientation to complexity, scale, and time. Our interviewees highlighted the tensions involved in building shared infrastructure that can be used across cooperatives: such collaborative efforts are often costly, can be seen as a distraction from core cooperative business concerns, and are a site of contention when organizational or cultural needs differ amongst collaborators. Further, as Farshchian, et. al. note, the organizational dynamics of platform support bodies will tend to "create a power imbalance by putting some participants in charge of the 'platform core' and others in the periphery" (3). We posit that these are not incidental setbacks, but indicate the extent to which processes of platform creation rely on capitalist and normative approaches to fundraising, design methods, mechanisms of direct control, and extractive economics that mark platform labor generally. As a result, there is a significant need to create coalitions of cooperatives, designers, and technologists who can support each other in the process of designing technologies that are tailored for the unique ways of working and social relations of the cooperative sector.

Decentralization

There are no doubt designed aspects of the tools used to construct platforms that contribute to these dynamics, and it is tempting to pursue technological solutions to these complex interorganizational challenges. One such approach is seen in the turn toward "decentralization," which is popular in the platform cooperative discourse. One of our interviewees noted that the decentralized standards of Web 3.0 technologies such as Solid suggest a potential for cooperatives to share finer-grained software features that are not locked into a particular platform, while retaining autonomy and agency over their data locally.

However, the use of decentralized technologies carries its own ambiguities, and does not necessarily lead to distributed or decentralized organizational relationships, processes, or systems. Indeed, decentralized technologies may not produce the independence and equity that its proponents promise at all (Schneider 2019). In practice, efforts to design software architectures or interoperability standards a priori are fraught with challenges. As Blackwell, Church, and Green (2008) note, software architectural abstractions, particularly when designed early in the development process, often end up producing designs that are incompatible with the

needs of users, despite intentions of “empowerment” or “user-centredness.” Decentralized technologies often promise abstract forms of liberation for users, while focusing on technical algorithms and protocols while they search for need-driven uses beyond cryptocurrency. It is worth noting that these processes of technical abstraction are not passive, but can actively shape social relations within an organization as a result of mismatches between a technology’s attempts at representation and the realities of organizational practice. The result is that “organizational abstractions are made more rigid through their expression in computational form, resulting in an amplification of abstract structures” both within the system and, in turn, within the organization (36). This often leads organizations to have to harden their own social practices as a result of a technology’s inflexibility to account for the diversity of ways of working together.

We suggest that efforts to create decentralized architectures (and their associated standards) should accompany, rather than precede, organized collaborative efforts to support specific shared challenges. In other words, cooperatives should start with the social and financial commitment to collaborate and to share the use of, and costs associated with building and maintaining, one or more technologies collectively across multiple organizations. This suggests the need to approach collectivity across multiple scales, both local and global. One such approach involves conceptualizing the cooperative movement as a network comprising both nodes (or individual cooperatives) and edges (the relational connections and commitments across cooperatives to shared solidarities). The edges include sharing technology capacity at a scale that reaches beyond the scope of an individual cooperative—a shift from platform technology to relational technologies. What modes of networking can be found within natural systems that might serve as a metaphor for this shift towards multi-scale cooperation?

Mesh Cooperativism

The concept of “mesh cooperatives” draws inspiration from mesh network topologies and the highly distributed nodal interconnections of mycelial networks as well as the autonomous symbiotics of mycorrhizal systems found in the natural world. Through mutualistic mycorrhizal associations, plants and fungi share nutrients as they connect across the “common mycorrhiza network (CMN).” Some fungal phyla are able to associate with over 80% of plant species in the world, with single mycorrhizae joining numerous plants of the same and different species, allowing plants to access nutrients and water that would otherwise be unavailable (Figueiredo et al. 2021). Noe and Kiers (2018) highlight an economy of exchange within the forest floor marked by pervasive polygamous interconnection, complex axes of exchange among heterogeneous agents, and complex arrangements of multiple symbiotic relationships. The participants in these systems are remarkably heterogeneous[1]. Just as they encourage cellular

[1] Basman, drawing on mycorrhizal networks in his critique of the Semprola programming language, writes about them as a source of another kind of critique: when viewed closely, they challenge stable notions of ontologies which divide up the world into "entities" connected by "relations." He noted in personal correspondence with the authors that “instead, networks guide us to a more pluralistic notion of sense-making about the systems we are embedded in.

biologists to look to the structures of human economic cooperativism for sense-making about this ecosystem, we encourage cooperative theorists, developers, and technologists to draw on the example of mycorrhizal systems dynamics in the visioning, design, and creation of cooperative systems. To adapt Scott's formulation, how can we "work like a forest?"

Similarly, Light and Miskelly invoke ecology to advocate for "economies that are... full of enduring negotiations," proposing the verb "meshing" to denote the growth of "an ecology of mutually-supportive systems in a place," in contrast to the emphasis on scaling within platform discourse (8). For example, another interviewee noted the approach of the Self Employed Women's Association Federation, which scales differently by locating governance power within small, decentralized, independent, and self-governed worker cooperatives composed of informal women workers. Each cooperative, in isolation, has self-imposed limits on their size and scale in order to prevent co-optation or takeover by the professional class and men. Yet each cooperative also contributes financial capacities and decision-making power from the bottom up to sustain a larger overall network to access the scaling potential of federated labour.

The mesh approach decenters the singular concept of "the platform" as the socio-technical focus of cooperative technology, and highlights the importance of relational scaling—developing the relationships, supports, and solidarity needed for healthy growth while remaining rooted to the local community. Another example of such a mutualistic association is the canton system of the Rojava region in Northeast Syria, where significant power and autonomy over specific decision-making practices are constitutionally decentralized and governed through direct democratic participation by each canton's people.[2]

We emphasize the importance of "meshing" as an activity—of working simultaneously from the bottom up and top down. This involves designing with local leadership in substantively participatory ways, and focusing on the creation of smaller-scale technologies that make stepwise improvements to the situation, while at the same time attending to collective, orchestrated efforts to identify and secure funding, expertise, and technical infrastructure. It is also worth noting that technical systems, when developed using conventional design methods and software development practices, tend to exclude the needs of small minorities (what Treviranus calls the "difficult 20%"), while also raising the risk of costly and unsustainable long-term technology dependencies that prevent small organizations and communities from having sufficient creative influence to change or modify the technical systems they depend on over time (Clark and Shahi 2018).

The natural world is rich in such systems. I could also have referred to lichens which challenge our notions of species and organism boundaries." See: https://www.shift-society.org/salon/papers/2018/critiques/critique-semprola.pdf

[2] See https://en.wikipedia.org/wiki/Constitution_of_the_Autonomous_Administration_of_North_and_East_Syria for links to the Rojava Constitution.

Next Steps

Approaching cooperative systems design through the framework of mycorrhizal meshes calls designers and technologists to consider ways in which local agency can be supported while also building coalitions of mutual support within regional, national, and global cooperative networks. It suggests a range of alternate design dimensions than those that are conventional in platform design.

We might follow Bodker, et. al.'s identification of collective belonging as a functional modality insufficiently addressed in standard platform design to articulate other under-attended domains that indicate further exploration through the mesh approach (12-13), such as:

- **Discovery** of other system participants with whom mutually beneficial relations might be established, either within or beyond the system at hand
- **Heterogenous interoperability** that permits cooperators to form different collective groupings along various operational needs and cultural ways of working
- **Identity and presence** that encourage caring and robust relations between participants
- **Apparent indicators of** network health and function that allow all participants to assess the state of the system and their place within it
- **Value generation / attribution** that recognizes the many forms of value generated by all participants
- **Rapid information exchange** between parties that allows for timely action and collective governance within a complex multi-stakeholder network

Our practical goal with this reconceptualization of cooperatives as relational, interdependent, and multiscale networks is to help grow collaboration among cooperatives, researchers, and technologists to explore, design, and prototype cooperative technologies that:

1. Reflect the nature of cooperative work
2. Are inclusive of the unique needs and realities of individual cooperatives, and
3. Foster interoperation and sharing of data, technology, and resources wherever possible.

We are interested in building a coalition that shares technical expertise, design practices, and funding to work on components of a cooperative mesh at the practical level. Are there mutual opportunities to share existing technical systems? Are there new design/development projects that could provide a useful starting point for participating together in a mesh?

The authors would like to acknowledge the support of the Canadian Institute for Advanced Research (CIFAR) for the Data Communities for Inclusion Solution Network.

References

Basman, A. (2019). “The Naturalist’s Friend”. *Proceedings of the PPIG Conference 2019.*

Blackwell, A.F., Church L., and Green T.R. (2008) “The Abstract is ‘an Enemy’: Alternative Perspectives to Computational Thinking.” *Proceedings of the PPIG Conference 2008,* pg. 5.

Bødker, S., Lewkowicz, M., & Boden, A. (2020). “What’s in a word? Platforms Supporting the Platform Economy”. *Proceedings of the 11th Nordic Conference on Human-Computer Interaction: Shaping Experiences, Shaping Society*.

Clark, C. and Shahi, S. (2018) “On Continuing Creativity.” *Proceedings of the PPIG Conference 2018.*

Farshchian, B. A., Grisot, M., Hochwarter, S., Sigríður Islind, A., Mikalsen, M., Parmiggiani, E., & Vassilakopoulou, P. (2021). “Platform-Supported Cooperative Work.” *Proceedings of 19th European Conference on Computer-Supported Cooperative Work*. European Society for Socially Embedded Technologies (EUSSET).

Figueiredo, A. F., J. Boy, and G. Guggenberger (2021). “Common Mycorrizae Network: A Review of the Theories and Mechanisms Behind Underground Interactions”. *Frontiers in Fungal Biology 2*.

Light, A. and Miskelly C. (2019) “Platforms, Scales, and Networks: Meshing a Local Sustainable Sharing Economy.” *Computer Supported Cooperative Work* (CSCW) 28: 591–626.

Noë, R. and Kiers, E. T. (2018). “Mycorrhizal markets, firms, and co-ops.” *Trends in Ecology & Evolution*, 33(10), 777-789.

Sambra, A. V., et al. (2016). “Solid: a platform for decentralized social applications based on linked data.” Technical Report. https://emansour.com/research/lusail/solid_protocols.pdf

Scholz, T. (2016). “Platform cooperativism: Challenging the corporate sharing economy.” Rosa Luxemburg Foundation. https://rosalux.nyc/wp-content/uploads/2020/11/RLS-NYC_platformcoop.pdf

Schneider, Nathan. (2019). "Decentralization: an incomplete ambition." *Journal of cultural economy* 12, no. 4: 265-285.

Treviranus, J. (2019). “The value of being different.” In *Proceedings of the 16th International Web for All Conference* (pp. 1-7).

Van Doorn, N. (2017). “Platform labor: on the gendered and racialized exploitation of low-income service work in the ‘on-demand’ economy.” *Information, Communication & Society*, 20:6, 898-914.