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

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Summary

Cooperative responses to the exploitative practices of the platform labor have primarily focused on the creation of alternative platforms, and, to a somewhat lesser extent, the promise of decentralized cooperativism made possible by emerging DeFi and Web3 technologies. However, the question of what an equitable platform is - or should be — is somewhat murky and characterizations of decentralization often obscure structuring power dynamics and enable recapitulations of market capture.

Building on conversations with coordinators of established cooperative networks, the authors present their work in progress to explore alternate ways of structuring and understanding these systems — as **mycorrhizal meshes**: networks of more loosely-affiliated, symbiotic, interoperable, local-scale systems. We advocate for a technology creation process that attends to concerns often excluded from standard processes used in deigning platform and decentralized systems. Such processes should be rooted in the demonstrated needs and practices of existing cooperative collectives, and aim to expand collaborative capacity among cooperatives wherever possible, and which focuses on measures of scale that prioritize local impact and community development.

Cooperative Responses to Platform Labor

Cooperativist responses to the emergence of platformed labor have primarily viewed the problem as one of scaling, and taken two forms: Platform Cooperativism and Decentralized Cooperative Technologies

Platform cooperativism draws on collective ownership, democratic control, and participatory systems design in its effort to erect a more equitable and humane framework for platform labor. It involves the creation of large scale cooperative systems using components associated with "Web 2.0": scaleable "cloud" server architectures, web application frameworks, and relational databases. These often take the form of marketplaces, enhanced forums, and collaborative documentation sites.

Decentralized cooperative systems utilize encryption, data standards, and distributed network architectures to enable large-scale decoupled federation of cooperative enterprise. Applications include decentralized identity, broker-less financial transactions, and tokenized resources.

Platform Limitations

The structure of the technology platform carries the code of its origins in ways that threaten to limit its interventive capacity if not addressed:

The term "platform" is deeply ambiguous, and often points to different underlying concepts (e.g. low-level cloud hosting infrastructure, applications delivered on the web or mobile devices, or centralized data-gathering systems and analytics tools) (Bødker et al. 2020)

It implies a form of data capture within singular, separated infrastructure, that yields a lack of sharing amongst organizations, or, when they do share, a tendency towards requirements utilize ontologies that don't fit (what Basman calls "broken relations" (Basman 2019)

Base on our own experience designing cooperative platforms and other large scale open systems, we note a number of concrete challenges resulting from this context :

1. There is a tendency to underestimate the cost of platform systems, and sufficiently capitalizing full scale cooperative platforms can be extremely challenging without resorting to conventional venture-backed sources
2. Design of cooperative platform involves extensive iterations of stakeholder participatory design, often dramatically slowing the pace at which the system can launch, grow, and evolve.
3. The needs and considerations of multiple stakeholders included in such platform design process can radically constrain the possibility space for the final product, often reducing its feature set in ways that limit its market fit.

We posit that these are not incidental setbacks, but indicate the challenges in undertaking the process of platform creation without resorting to the standard approaches for capitalization, design process exclusion, mechanisms of direct control, and extractive economics that mark platform labor generally.

Decentralization's Complications

Decentralization strategies attempt to avoid the constraints inherent in platform creation through technological approaches that remove the reliance on centralized infrastructure, offer alternative capitalization options, and offer the possibility of collaboration without the need for universal consensus on functionality. As one of our interviewees noted, 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.

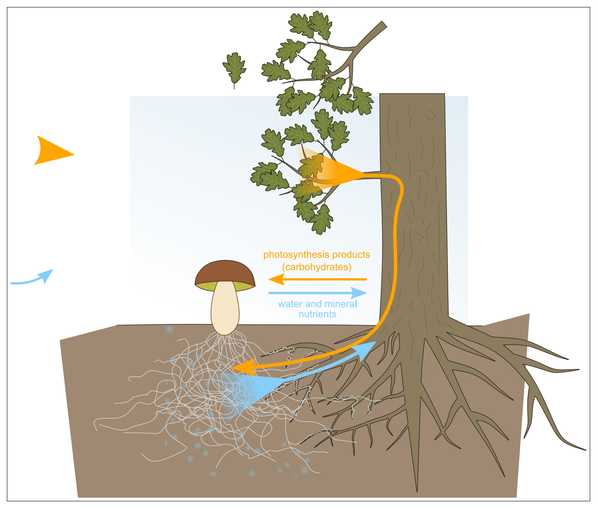
But decentralization has shown itself to be a slippery term, as summarized by Schneider's review of the literature ahead of his insights that the "rhetoric of decentralization thus obscures other aspects of the re-ordering it claims to describe. It steers attention from where concentrations of power are operating, deferring worthwhile debate about how such power should operate." (Schneider 2019)

Often enthusiastically built atop emerging technologies, decentralization projects can be vulnerable to the challenges of designing software architectures or interoperability standards a priori. As Blackwell, Church, and Green(A.F. et al. 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."

Next Steps

Our goal with this research effort is to help grow a collaboration among cooperatives, researchers, and technologists. We seek to follow the design approach outlined here to explore, design, and prototype cooperative technologies that reflect the nature of cooperative work, are inclusive of the unique realities of individual cooperatives, and foster robust interoperation and data exchange. 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, now? Are there new design/development projects that could provide a useful starting point for participating together in a mesh?

Mycorrhizal Mesh Cooperativism: "Working Like a Forest"



Nefronus 2007

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 highlight the critical role of information flows across the CMN that coordinate localized sites of "partner choice" and transaction. The participants in these systems are remarkably heterogeneous: if heterokayotic fungal cells can have "hundreds of nuclei of different genetic composition" what component in each of the plant and fungal entities are being chosen and choosing to form mutualistic networks? (Noë and Kiers 2018)

Just as Noe and Kiers encourage cellular 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 metaphor of mycorrhizal systems dynamics in the visioning, design, and creation of cooperative systems.

The concept of "mesh cooperatives" thus draws on mesh network topologies to serve as a creative prompt, an additive concept to that of the platform. How might the process of infrastructure creation mirror the evolution of the CMN? How might distributed cooperative systems support collaboration between cooperatives that parallels the autonomous symbiotics of the mycorhizzal?

Design Considerations of a Mycorrhizal Approach

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. We draw on our interviews with facilitators of current cooperative networks to identify functional domains that might be indicated for heightened attention within a mesh approach. In this, we follow Bodker, et. al.'s identification of collective belonging as an under-addressed functional area in platform design (Bødker et al. 2020).

- **Discovery and visibility** within distributed cooperative networks, which often exhibit high "opacity," limiting connections between cooperatives.
- **Heterogeneous interoperability** that permits cooperators to participate in different symbiotic relationships with different sets of partners. This might mean participating in numerous localized and sector-specific "micro-platforms" for different operational needs.
- **Bottom-up network design** that evolves from specific needs demonstrated at sites of connection.
- **Value attribution methods** that recognize the many forms of value generated by all participants and support participant decision-making about exchange and investment
- **Rapid information exchange** across the network that allows for timely action and collective governance within a complex multi-stakeholder arrangement

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References

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

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

Basman, A. (2019). "The Naturalist's Friend". In: *PPIG*.

Schneider, N. (2019). ""Decentralization: an incomplete ambition."". In: *Journal of Cultural Economy* 12.4, pp. 265–285.

Noë, R. and E. T. Kiers (2018). ""Mycorrhizal markets, firms, and co-ops"". In: *Trends in Ecology & Evolution* 33(10), pp. 777–789.

A.F., A. B., L. Church, and T. Green (2008). ""The Abstract is 'an Enemy': Alternative Perspectives to Computational Thinking."". In: *Proceedings of the PPIG Conference 2008*, p. 5.

Nefronus (2007). *Mutualistic mycorrhiza en.svg*. URL: https://commons.wikimedia.org/

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