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DAOs, cooperatives and the educational principle

Alyce Jean Thomas

Independent scholar, Washington, D.C., USA

E-mail: JTjurisdoc123@protonmail.com.

Abstract: Decentralized autonomous organizations ('DAOs') are the digital successors to traditional cooperatives due to their shared ownership structure, but DAO cooperatives must also confront the complex legacy of education in cooperative history. Two aspects of that legacy will be extremely important in the future: 1) whether member education should be considered an indispensable organizational and legal component of the cooperative form in the digital era, and 2) whether DAO cooperatives should be required to provide both 'on-chain' and 'off-chain' educational opportunities. This Article examines the political, technological, organizational and legal meaning of education in Anglophone cooperative history.

Keywords: cooperatives; DAOs; blockchain; education; labor; self-governance; shared ownership; platform capitalism; tokens; platform cooperativism

1. Introduction

In the early twentieth century, Aaron Sapiro and Edwin Nourse foreshadowed a debate that will determine the political and legal fate of twenty-first century digital cooperatives [1]. That debate concerned the wisdom of encouraging agricultural cooperatives to run their operations using 'lock-in' contracts [2]. 'DAO' (decentralized autonomous organizations) [3] cooperatives are facing their own version of the Sapiro / Nourse debate.

Against the backdrop of cooperative history, the Sapiro / Nourse debate is significant for two reasons. The first reason is that it was a bridge between the past, when cooperative life was dominated by trade unions, small groceries and agricultural operations, and the future, when cooperative life came to be dominated by consumerism, competitive pressures strong enough to trigger antitrust scrutiny, and digital enclaves. The second reason is that it demonstrated the continuing relevance of three different models of cooperative education: 'utopian' (education is a non-negotiable, organizational priority), 'pragmatic' (education is important but negotiable), and 'mechanical' (imposing severe decisional and educational constraints on ordinary members might be the most efficient way to operate a cooperative).

DAOs, the digital successors to traditional cooperatives, are not immune to the historic tension between the mechanical, pragmatic and utopian approaches to cooperative education.

Member education in cooperatives [4] is actually more complicated now than it was in the 19th century because DAO cooperatives have to consider the proper balance between operational activity reduced to code in smart contracts and operational activity conducted 'off-chain' [5]. Many DAO cooperatives have discovered that there are a variety of educational opportunities traditionally provided by cooperatives that cannot be conducted 'on-chain'.

Using qualitative analysis of recent studies dealing with blockchain technology, cooperative laws, critiques of platform capitalism and the cooperative movement, this paper examines the complex relationship between cooperative education and the DAO cooperative movement.

Section 2 examines the mechanical, pragmatic and utopian approaches to member education in Anglophone cooperative history. The debate between the Rochdale Pioneers and the Owenites over the role of cooperative education represented a conflict between the pragmatic and utopian approaches, whereas the debate between Aaron Sapiro and Edwin Nourse represented a conflict between the mechanical and pragmatic approaches. Section 2 also examines the legal status of traditional cooperatives.

Section 3 examines the blockchain ecosystem, the evolution of DAOs and the tokenization of DAO operations. Section 4 proposes a typology of educational objectives typically undertaken by traditional cooperatives, examines a case study of specific educational initiatives undertaken by community DAOs dedicated to land stewardship and regenerative culture, and considers three ways to 'nudge' DAO cooperatives seeking legal recognition into providing comprehensive educational opportunities for all members, both on-chain and off-chain.

Section 5 examines the role of member education in the platform cooperative movement. There are two main prongs of platform cooperativism : 1) traditional, hyper-competitive corporate capitalism undermines human flourishing by steering most of the wealth generated by capitalist economies towards shareholders and managerial elites, and away from ordinary workers; and 2) the modern 'gig' economy (ie. 'platform capitalism') offers workers more freedom than ever, but at the cost of job security, privacy and access to a greater share of profits. DAO cooperatives that embrace platform cooperativism are well-positioned - organizationally, technologically and financially - to steer more of the wealth generated by our digital economy into the hands of ordinary workers. The same DAO cooperatives are also likely to endorse either a utopian or a pragmatic justification for member education.

Section 6 evaluates a variety of moral, technological, psychological and political rationales for 'off-chain' educational support in DAOs that pragmatic and utopian proponents of cooperative education are likely to support. Section 7 examines two core / periphery problems that will determine the future of blockchain technology, DAO cooperatives and cooperative education.

2. Cooperatives, contracts and education

2.1. Ownership, control and profits

Cooperatives distribute "net income based on patronage rather than investment" [6]. Formal [7] ownership belongs to all members collectively, and members receive a share of the cooperatives' equity capital proportional to their use of cooperative resources [8]. In addition to shared ownership, members also share control of the cooperative, although cooperative bylaws might assign members who conduct more business on the cooperatives' behalf, or contribute a large percentage of the cooperatives' equity capital, more voting rights than other members [9].

The third core component of cooperativism is the distribution of profits. Cooperatives typically return all or part of their annual profits in two forms : 1) dividends on investments (members or non-members), and 2) a proportion of profits based on patronage (members). Since cooperatives are designed to protect insider members more than outsider investors, most jurisdictions place limits on dividend payouts.

Cooperatives are now considered to be a legitimate alternative to top-down, investor-oriented capitalist enterprises [10]. The relative success of cooperatives has proved that non-traditional organizations can compete in the marketplace [11]. Cooperatives are also considered to be an attractive solution to pervasive market failure [12]. They've proven effective in protecting consumer purchasing power from monopolies [13], preventing excess supply problems, and providing services on a non-profit basis [14]. Cooperatives succeed when markets fail because private actors cannot afford high capital costs or the likelihood of low profits [15].

2.2. Historical purpose and organization

The cooperative movement was a response to poverty and horrific labor conditions in the early 19th century [16]. The first major architect of Anglophone cooperativism was Robert Owen, an industrialist, philanthropist [17] and reformer who was deeply critical of 'laissez-faire' industrial capitalism. Along with socialism and trade unionism, Owen embraced a communitarian vision of society that included the creation of 'villages of cooperation' in New Lanark, Scotland [18]. By the 1830's, Owenism had spawned a host of new enterprises, including cooperative stores, trade unions and even a 'Cooperative Congress' in Manchester, Liverpool and London. In the history of cooperativism, Owenism is important for three reasons. The first is that Owenite enterprises prioritized member education and mutual aid. Owen tried to "raise the standard of practical education – and by practical they meant especially politics and economics – through libraries and courses". Second, Owenism was associated with socialism, and as a result, Owenite operations were often harassed and vandalized [19]. And third, Owen's version of cooperativism was also deeply utopian. Owen was a leader of the trade union movement in England and the United States, but his resolute refusal to get involved with politics, brash personality [18] and hostility to religion alienated

radical reformers and hastened the demise of Owenite organizations like the Grand National Consolidated Trades Union and the Queenswood community project [20].

The second major architect of the Anglophone cooperative movement was William King, a British physician [21]. But the most durable inspiration for a pragmatic understanding of cooperative education was the Rochdale Pioneers. More than any other entity, the Rochdale Pioneers transformed Owen's utopian vision into an organized, explicitly political cooperative model [22] that could compete with, and incrementally reform, industrial capitalism [23]. Unlike Owen, the Rochdale Pioneers did not believe that cooperatives could appeal to any government, regardless of its form. They were, ironically, more committed to democratic participation, as an organizational and political tool, than Owen [24]. They also, unlike Owen, tried to reconcile cooperativism with the ideological and religious sensibilities of the working class in England.

For most people, the Rochdale principles require, among other things, one person / one vote, open membership, equity ownership by members, net income distributed to members based on patronage, limits on dividends, and the 'duty to educate' members [25]. But the journey to those rules was circuitous. The first set of principles was published in 1844, under the title 'Laws of the Rochdale Pioneers' [26]. The 1844 guidelines did not mention member education at all, but the list was amended in 1854 to encourage cooperatives to set aside a portion of their profits for "the intellectual improvement of the members" [27]. Increased formal recognition of, and commitment to, educational activities occurred alongside dramatic growth, as Rochdale enterprises expanded their investment into wholesaling [28]. Eventually, Rochdale enterprises in England transformed into predominantly consumer, rather than worker-oriented cooperatives [29]. Subsequent modifications of the Rochdale principles during the late 19th century continued to mention education, but decision-makers increasingly turned their attention to profits and market share. By 1937, education was officially demoted to second-tier status when the International Cooperative Alliance (ICA) 'clarified' the Rochdale Principles in Paris : "The committee did not regard all seven points as equal. The first four were held to be essential to the co-operative character of any organization, as they had been for decades, and today (1994) are still pretty much enforced as requirements of associations wishing to affiliate to the ICA. The last three of the 1937 points, however, were seen as parts of the cooperative systems but not features required for admission to the ICA." [30]. In 1963, the ICA restored education to top-tier status [31]. The ICA's cooperative principles are now very similar to the public's perception of the original Rochdale principles, requiring "voluntary and open membership", "democratic member control", "member economic participation", "education, training and information" and "concern for community".

2.3. The Sapiro / Nourse debate

The debate between the utopian Owenites and the pragmatic Rochdale Pioneers over the role of education in cooperatives was largely confined to England. Another phase of the same debate took place in the United States, but in this case, the contest was between pragmatic and mechanical proponents of cooperative education.

Aaron Sapiro, a prominent labor lawyer, believed that the biggest difference between England and the United States was that cooperativism in the former was "a consumers' movement" whereas cooperativism in the latter was "a producers' movement" [32]. Instead of the Rochdale approach, which was geared towards consumers and "small, local cooperatives", Sapiro developed a 'commodity pool' (or cartel) approach based on marketing [33]. In 1919, Sapiro proposed a uniform model for agricultural cooperatives that was adopted, either partially or completely, by 26 states. Sapiro also believed that in order to maximize cooperative control over commodities, cooperatives should enter into long-term, non-negotiable, 'lock-in' contracts [34], just part of what came to be known as the California School of Cooperative Thought [35].

By contrast, Edwin Nourse's approach to cooperativism encouraged decentralization, rather than centralization of the cooperative community. Instead of a uniform cooperative model, Nourse's "competitive yardstick' approach encouraged local cooperatives to enter into weak federations, coordinate their purchasing and marketing activities and acquire just enough power to challenge the hegemonic, monopolistic tendencies of investor-oriented firms ('IOF's) [36]. Nourse feared that cooperatives might begin to mimic the behavior of monopolistic corporations. Sapiro's tactics, according to Nourse, transformed cooperatives into "domestic cartels" or 'commercial Napoleons' [32]. Instead of blurring the boundary between corporations and cooperatives, Nourse wanted to reinforce the boundary. He also wanted to encourage cooperatives to protect farmers, a group that he perceived to be the most vulnerable members of the agricultural community. To accomplish both aims, Nourse wanted agricultural cooperatives to "be content merely to maintain 'stand-by' capacity or a 'yardstick' operational position rather than try to occupy the whole field or a dominating position within it" [37]. Cooperatives needed to remain relatively small – but "sufficiently large" [32] to achieve 'efficiencies' [38] – and to inculcate rural values that respect the "traditional division of labor and economic specialization" [39].

Sapiro and Nourse also disagreed on the value of cooperative education. Sapiro believed that cooperative marketing organizations should be run like banks, with a strict focus on business, rather than politics or member education. Only 'experts' were qualified to manage cooperative affairs [40]. He referred to cooperative gatherings over purchase levels as "indignation meetings", and believed that "many members feel that they can run the cooperative as well as a trained manager and at much less expense". As a result, Sapiro's approach to cooperative education was 'mechanical' in two senses. First, it deprived ordinary, 'non-expert' cooperative members access to the educational benefits derived from full participation in all cooperative affairs. Sapiro encouraged ordinary members to ratify expert judgements, but that ratification, constrained by limited information and faith in the decisions of appointed 'experts', was largely automatic. Second, Sapiro's 'lock-in' contracts deprived ordinary members of the freedom to not only re-negotiate agreements, but also derive educational benefits from the re-negotiation process.

Sapiro's approach to cooperative education was mechanical, but Sapiro harnessed mechanical educational thinking in service of progressive ideals. The latter point clearly

distinguishes Sapiro's agenda from another, similarly named, intellectual movement that briefly overlapped with Sapiro's California Cooperative Thought movement : 'mechanical jurisprudence'. During the late 19th and early 20th centuries, conservative American judges employed a mechanical, formalistic, deliberately narrow, socially-blinkered interpretation of legal rules in order to undermine or slow-down the ambitious, transformative aspirations of progressive reformers [41]. Sapiro did not embrace mechanical jurisprudence, but he did believe, along with many progressive lawyers during and after the New Deal, that complex social and economic problems should be solved with empirical social science or managerial expertise rather than popular majorities [42,43]. Professional expertise appeared to be the most 'efficient' way to manage cooperative pools, even if that decision systematically suppressed the crowd-sourced wisdom of ordinary members.

Nourse, on the other hand, believed that member education, rather than 'lock-in' contracts, was the best way to ensure member loyalty [44], and that "member education was essential to ensure the democratic governance of the cooperative would be sustained" [45]. But it is at least arguable that member education served another purpose in Nourse's worldview. Nourse distrusted monopolies as well as any business model that undermined the development of a "self-regulating, purely competitive economy of relatively small, integrated firms" [46]. His views were typical of someone steeped in the Chicago School of Economics, hardly in keeping with the ideology of the Rochdale Pioneers. But Nourse also wanted agricultural cooperatives to retain their local uniqueness. Member education seemed to be a perfect way to nurture the unique skills of members and develop internal expertise, providing cooperatives with an advantage over their competitors.

2.4. Groundwork for a pragmatic triumph

In terms of judging the impact of the Sapiro / Nourse debate on cooperative marketing strategies, the intellectual legacy of both men is mixed. Sapiro's model was popular in the 1920's, but fell out of favor when cooperative cartels failed to control prices [47]. According to one commentator, however, "the long-term marketing contracts proposed by Sapiro are now relatively common, not only for reasons of control, but also for coordination of production, processing, and marketing to ensure full utilization of resources and facilities." [48]. Nor is it uncommon for agricultural cooperatives to enter into contingency agreements "to accept all that members deliver with specified bonuses and discounts associated with product characteristics and delivery dates", not to guarantee prices but to reduce investment risks [49]. For his part, Nourse was criticized for discouraging cooperatives from acquiring more power and control over market conditions [50].

With regard to cooperative education, the legacy of the Sapiro / Nourse debate is organizationally unclear, but legally conclusive. In terms of the former, managerial or professional experts frequently sit on the boards of large, well-established cooperatives, wielding authority that could reduce voting decisions made by members to empty ratifications. The presence of these managers and experts suggests that at least some cooperatives are prepared to restrict the decision-making authority of, and educational

opportunities available to, ordinary members in order to maximize revenues, even if profits are ultimately shared by all members.

But Nourse's faith in the decision-making acumen of ordinary members also became popular. Most cooperatives educate all members about cooperative values through democratic participation and leadership training. ('Tier 1') The former typically consists of voting, while the latter consists of attending conferences or industry meetings, and serving on the co-operatives' board of directors. Traditional cooperatives also encourage members to take advantage of continuing education. ('Tier 2') Members of agricultural cooperatives, for example, learned about new techniques for growing valuable crops and bringing them to market with minimum spoilage, while members of rural electrification cooperatives took classes about the dangers of installing electricity in heavily wooded areas or competition from local utility companies. Continuing education enhances the skills of members, and increases the expertise and efficiency of the entire cooperative. Cooperatives are also expected to pay for the continuing education of their members. 'Tier 3' educational obligations consist of self-promotion efforts undertaken either by the entire cooperative or individual members. Promotions could range from information specific to a cooperatives' main area of concern to information about the advantages of shared ownership, non-hierarchical decision-making and cooperative values.

Organizationally, the legacy of the Sapiro / Nourse debate on cooperative education is inconclusive. Some cooperatives are prepared to tolerate the political and emotional dis-empowerment inherent in a mechanical approach to cooperative education in order to maximize revenues, while other cooperatives are prepared to invest a considerable amount of financial and political capital on the provision of educational opportunities for all members at every level of the organization, either because it is good for business (pragmatism) or out of principle (utopian). Legally, however, one aspect of the pragmatic approach to cooperative education achieved dominance : most American jurisdictions do not require cooperatives to set aside funds for member education as a condition of legal recognition.

2.5. Limited legal recognition

In the United States, local and federal laws regulating cooperatives began to appear in 1865, and many of these laws mirrored the Rochdale principles. Every state now recognizes cooperatives by law, and the language of these laws is surprisingly uniform. Regardless of whether the cooperative provides agricultural products, rural electrification, low-income residential housing or secondary school education, cooperatives under state law generally require one man-one vote, limit the number of shares one member can own, and distribute profits or excess revenues primarily to members rather than investors. During the late 19th and early 20th centuries, the federal government adopted an aggressive anti-monopoly policy, and courts consistently struck down collaborative arrangements that appeared to restrain trade. As a result, many state laws that permitted cooperatives to set prices were struck down as a violation of the Sherman Anti-Trust Act. Eventually, Congress clarified the legal status of cooperatives, first by exempting non-profit, non-capital horticultural and agricultural

cooperatives from the antitrust laws with the Clayton Act of 1914, and later by exempting capitol stock and non-capitol stock agricultural cooperatives from the antitrust laws with the Capper-Volstead Act of 1922.

Many American states permit cooperatives to devote a portion of their profits to educational activity. Colorado's Uniform Limited Cooperative Association Act, for example, permits limited cooperatives to devote "reasonable unallocated reserves for specific purposes, including expansion and replacement of capital assets; education, training, and cooperative development; creation and distribution of information concerning principles of cooperation; and community responsibility." [51]. A number of other states, including Wisconsin [52], Massachusetts [53] and Minnesota [54], also give cooperatives permission to set aside funds for member education, usually up to 5% of profits. But no state, consistent with the pragmatic approach to cooperative education embraced by the Rochdale Pioneers and the ICA, absolutely requires traditional cooperatives to reserve a portion of their profits for educational activities in order to receive legal recognition. Unlike profit-sharing, member education in traditional cooperatives is not 'non-negotiable' under either state or federal American law.

3. The DAO revolution

3.1. Blockchains and distributed ledgers

For hundreds of years, organizations used ledger systems to record changes to valuable data [55,56]. Under such a system, all changes are recorded, and nothing is erased, providing a carefully maintained history of authorship, date and modifications. Modern day distributed ledgers, or 'blockchains', store digital information sequentially as data blocks. In blockchain systems, cryptographic processes attempt to maintain trust in block transactions without human interaction [57].

Blockchains police access to transaction histories and block contents through public and private keys. Instead of using an intermediary like a bank to verify transfers of blockchain-based (or'crypto-currency') transactions from the sender to the receiver, senders possess a private key and receivers possess a public key [58]. To spend any crypto-currency obtained from the sender, the receiver must prove that his private key is authentic. This system provides most of the verification services developed by commercial third party intermediaries, without requiring any trust (or even personal interaction) between senders and receivers [59].

3.2. Smart contracts

Under Blockchain 1.0, smart contracts could run executable code, but that code was not 'Turing complete', which refers to the abstract idea of a 'Turing machine' that is capable of running any encoded problem, regardless of its complexity. Ethereum smart contracts, on the other hand, can run any executable code, and are therefore considered to be 'Turing complete.' There is no theoretical limit to the complexity of Turing complete smart contracts,

but there are many practical and legal limits, the most important of which is that smart contract code is always vulnerable to hackers. Smart contracts are also pseudonymous rather than purely anonymous, which makes it difficult to maintain the legal confidentiality of executed transactions. Perhaps most importantly, it is difficult to write code capable of anticipating every event that could affect a transaction, or keep transactions open and untainted even after the smart contract has been executed [60]. In spite of these shortcomings, complex smart contracts lay the transactional and computational groundwork for 'Blockchain 2.0', 'Blockchain 3.0' and eventually the 'DAO' revolution [61].

3.3. DAOs and DACs

Blockchains have always held potential for digital communities, both in terms of providing a secure architecture for private communications between users, and in terms of authenticating the value of valuable goods and services without a governmental intermediary. In the past decade, users developed two kinds of blockchain-based communities: DACs (decentralized autonomous corporations) and DAOs (decentralized autonomous organizations) [62].

DACs reconceptualize corporate life, reducing traditional structures like CEOs/COOs, hierarchical boards of directors, stockholders, employees, legal structures and specific functions to a tangled web of smart contracts [63,64]. None of these relatively discrete functions require human interaction in a DAC, but they must conform to well-established business rules, legal expectations and jurisdictional constraints. DACs can issue cryptocurrency, as well as manage the conversion of ordinary hard currency into cryptocurrency (or vice versa). However, unlike ordinary Bitcoin transactions that assign private keys to a single person, cryptocurrency transactions involving DACs require multiple private key authorizations [65].

Compared to DACs, the growth of DAOs has been explosive due to the transformative potential of virtually unlimited organizational flexibility and sustained interest in community building online. Millions of people are now members of thousands of DAOs that control around 8 billion dollars in assets.

DAO growth closely tracked important developments in web technology. People often forget that Web 1.0 only provided users with read-only access to web pages. The typical web experience was non-interactive and pages were static. Users could not comment or interact with the system in any meaningful way. Under Web 2.0, read-write interactivity was established. Interactive communications with Google, Facebook and other data processing and information markets thrived. But Web 2.0 also provided a small number of technology firms with enormous power to gather, aggregate, monetize and control user data, with or without the user's consent. Twitter, Facebook or Google could use customer data to drive advertising, steer users towards specific content and away from other content, sell vast quantities of customer data to third parties, and even censure user content. Web3 was part of a larger movement to secure data online. It also contributed to the gradual 'normalization' of blockchain technology. Blockchain has always had its admirers, but it existed on the fringes

of internet discourse for many years. With Web3, however, blockchain joined the internet mainstream. User data under Web3 is stored all over the planet on public or private blockchains. Users can also keep their virtual and digital identities separate by storing their information in a wallet rather than simply handing it over to an internet or web content provider. Web pages are stored on sites all over the world, and are validated regularly by blockchain nodes. As a result, links rarely expire due to massive redundancy across nodes.

Most people assume that DAOs consist entirely of smart contracts, engage in financial transactions that are entirely transparent, operate non-hierarchically, and enjoy success because they don't rely on an intermediary. A closer look at the history and operation of DAOs, however, reveals a more complex narrative. The earliest DAO-smart contract experiment, suitably called 'The DAO', illustrated the folly of the dominant DAO narrative. TheDAO was conceived in 2015 by a small blockchain company named SlockIt that intended to create an investment vehicle [66]. TheDAO went online on April 30, 2016, and by the time the funding period ended on May 30th, theDAO had raised 250 million dollars [67]. On June 30th, however, a vulnerability in the smart contract code was exploited by an unknown attacker, resulting in the loss of approximately 50 million dollars worth of Ether. Eventually a consortium of stakeholders proposed a 'hard fork' of TheDAO's blockchain. A majority of TheDAO's voting members approved the hard fork, and the new Ethereum blockchain became active on July 20th [68].

The DAO's hard fork disaster was instructive for two reasons. First, it demonstrated that even for DAOs exclusively dedicated to the pursuit of profits, automatic smart contract execution can be problematic due to possible vulnerabilities. And second, even though hard forks are a well established 'on-chain' solution to blockchain mishaps, the decision to hard fork TheDAO was made 'off-chain', where moral concerns and real-world impacts could receive full consideration [69]. The lasting legacy of theDAO disaster is that relying too heavily on smart contracts is risky for blockchain operations.

Since theDAO disaster, users have devised a variety of strategies to secure blockchain transactions. Most people are aware of on-going efforts to dramatically increase code resilience to cyber attacks, but another strategy has also been effective : the development of off-chain transaction protocols and governance models. In terms of the former, most blockchain transactions, including trading crypto-currency, voting and the execution of smart contracts, occur on-chain. On-chain transactions ensure transparency, increase participation rates and avoid dependence on intermediaries. But on-chain transactions also consume 'gas' (the cost of executing computations on the Ethereum network) [70], may be slow due to network traffic or complex 'proof of work' [71] or 'proof of stake' computational delays [72], or simply fail to resolve negotiations adequately because there are many events that cannot be coded into, or anticipated by, smart contract code. In response, 'second layer', off-chain protocols were developed to handle transactions that used to be processed on-chain, such as the settlement of debt agreements, between trusting partners [73]. Actual trust between trading partners, handled by off-chain protocols like the Liquid Network [74] and the Lightning Network [75], introduce a human element that on-chain transactions simply

cannot replicate. Users have also developed large-scale, organized, off-chain 'protocol DAOs' that operate as a forum for discussing matters related to on-chain operations. The forum might consist of chat rooms or Facebook pages [76], but regardless of form, protocol DAOs enable users to 'signal', though a variety of consensus mechanisms (including voting), off-chain community support for social or political causes without disturbing or binding on-chain operations [77]. The group of ETH stakeholders that saved theDAO with a hard fork after informally conferring off-chain were an early example of a protocol DAO. In addition to providing a governance model for on-chain / off-chain coordination, protocol DAOs also lay the groundwork for the expression of transformational, off-chain signalling actions by DAOs off-line (ie. in the real world). I address this issue more extensively in Section 5.2.

Many people also assume that DAOs are little more than vehicles for keeping track of pooled resources and investments in blockchains. In reality, there are many kinds of DAOs, including protocol DAOs, investment DAOs, media DAOs similar to Steemit that pool creative content, and reward contributors or curators who identify and promote valuable content before other users do, service DAOs (pools talent offerings and receives a portion of the cut paid to customers and talented individuals/contributors in the pool), and grant-making DAOs (contribute to a fund that rewards worthy applicants, with no expectation of compensation).

The most popular member of the rapidly growing DAO ecosphere, however, is the 'community DAO' (also referred to as the 'social DAO'). Community DAOs draw inspiration from three sources : 1) bulletin board communities that dominated Web2 like Facebook, Myspace and AOL Home, 2) open-ended online communities like Reddit that developed during the Web2 period, and still thrive today in spite of the explosion in blockchain-based DAOs, and 3) peer-to-peer file sharing networks like BitTorrent, Pirate Bay, Limewire and Napster that flourished during the Web1 period. But community DAOs are the poster child of Web3, and few community DAOs are more dynamic than Friends with Benefits (FWB). FWB hosts a variety of chat rooms and channels – ranging from parenting, popular restaurants, taxes, clothing and local schools – on its Discord server. The community is extremely diverse, and a large number of members know almost nothing about blockchains, cryptocurrencies or smart contracts. Like the residents of a traditional city, FWB members share a desire to learn from, and share resources with, relatively like-minded people. Membership is not free; one has to purchase a certain number FWB 'tokens'. Depending on the costs of tokens, membership could costs thousands of dollars, but FWB has made it clear that it really wants to attract certain kinds of people – 'creatives', influencers, artists, celebrities – to its community and members-only events. Possession of tokens also enables members to vote on community matters.

3.4. Tokenomics and incentive design

Instead of relying exclusively on traditional currencies backed by reputable sovereign powers [78] that are widely accepted, and easy to convert into currencies, DAOs raise money by issuing cryptocurrency and tokens. The issuance of tokens in blockchain organizations is part

of a broader movement called ‘tokenomics’, or the selected use of platform-specific digital tokens to provide incentives [79], steer behavior and encourage early adopters of the platform [78]. In addition to incentivising participation towards commonly valued ends and the efficient use of resources [80], tokenomics (or crypto-economics) also enables DAOs to “collect highly reliable data” [81].

At present, there are four major forms of cryptocurrency. The first is currency like Bitcoin and Ethereum that can be used to purchase a wide variety of items. Another form of cryptocurrency consists of investment tokens, or assets designed to provide investors with a positive cryptocurrency cash flow. A third form of cryptocurrency consists of utility tokens that convey functional utility to investors other than payment for external goods or services, in the form of access to a product that the token issuers themselves created [82].

A fourth kind of crypto-currency rewards participation and governance. DAO communities like Steemit, for example, reward people who contribute valuable content with participation tokens [83]. Other DAOs reward people who choose to serve on the board of directors, engage in altruistic behavior, or interact with targeted outside groups in a morally or politically desirable manner with participation or governance tokens. These kinds of tokens typically have no exchange value, but they have considerable value within specific DAOs, allowing holders of large blocks of tokens to acquire a majority stake in the blockchain governance structure [84].

4. The educational principle in DAOs

4.1. Education tiers in DAOs

Table 1 describes three ‘tiers’ of education in DAOs : 1) leadership training, 2) continuing education and 3) promotion. In terms of leadership training. DAO cooperatives educate members about cooperative values using democratic participation in the same manner as traditional cooperatives, but some DAOs allow members to purchase governance tokens that enable holders to vote on cooperative matters. DAO voting also takes place on-chain, and there is very little evidence that voting via blockchain fails to confer significant educational benefits on DAO members

Unlike voting, however, a significant proportion of actual ‘tier 1’ leadership training takes place ‘off-chain’. Training might occur on-line via zoom meetings or online webinars, but it must take place ‘off-chain’. The intricacies and interactivity required to conduct effective leadership training simply cannot be reduced to code in a smart contract [50].

Most DAOs ‘tokenize’ participation in DAO activities. Tokenization is a relatively non-controversial way to translate off-chain activities and deliberations into digital objects that can be stored and monitored on a blockchain. Vote tabulations can be added to blocks very easily, and smart contracts can be programmed to make decisions based on supplied vote totals. It is also possible to tokenize participation on boards of directors, or successful participation in leadership training programs. Gitcoin DAO, for example, tokenizes ‘cooperative labor’. The Gitcoin DAO governance structure contains three kinds of

community members : stewards, delegators and contributors. Stewards are evaluated using 'steward cards', a system of participation actions ranging from forum activity and voting to time served as the leader of a 'workstream' (which could be entirely or only partially online) [85]. Contributors facilitate day-to-day operations and receive evaluation from workstream leaders [86]. In addition, participating community members receive GTC tokens. Tokenizing participation in 'Tier 2'continuing education classes has also taken place in ride-sharing digital platform cooperatives. 'Tier 3' promotional efforts have been tokenized as well, but actual classes and promotions are conducted off-chain.

Table 1. The Tiers of Cooperative Education in DAOs.

	On-Chain	**Off-Chain**
Tier 1 – leadership training	voting	Zoom meetings On-line webinars Off-line seminars
Tier 2 – continuing education	web3 coding, database management and crisis prevention games authenticated by blockchains	'Upskilling' classes in non-technical areas (ie. maintaining sustainable environments, driving safely, civil disobedience or food preservation)
Tier 3 – promotion	offering participation and utility tokens to new members, or crowd-funding opportunities authenticated by blockchains	Physical lectures at book fairs, schools, companies or local governments

4.2. Case study : Land stewardship and regenerative cultures

Land stewardship projects have existed for hundreds of years, each built around the goal of protecting land from over-development, spoilage, exploitation or destruction. Recently, some land stewardship projects have started to take advantage of blockchain technology to develop publicly available land registries that can be run cheaply and without the assistance of large private landowners or the government. One of the most prominent land stewardship communities is the Regen Network, an ImpactDAO project ('Regen Ledger') that "[uses] smart contracting capacity to reward ecological regeneration" [87]. In addition to tracking land usage data, the Regen Network issues its own token ($REGEN) as a way to "fund and reward desired change in ecological state". They have also reserved a portion of their tokens for designated experts in land stewarding and ecological management (Tier 2).

Regenerative, land stewardship networks develop DAO cooperatives in order to coordinate real-world community villages for people who want to live in rural, protected areas, personally steward vulnerable land, and heal. These DAO cooperatives, much like communes, are deliberately land-based and interpersonal. They are not digital cities; they exist on land, engage in regenerative projects that protect land and teach members how to live in harmony with nature, and each other.

Portal DAO, for example, bills itself as an "integrated regenerative culture that encompasses the intellect, emotions and physical well being of its participants." [88]. Central

to this effort is physical land : the Wells Gray Golf and RV resort in British Columbia, Canada [89]. The land provides users with an experimental space for personal healing and sustainable living. Portal DAO also offers a wide array of educational opportunities, ranging from voting and governance rights (Tier 1, online) to instruction by regenerative culture experts and participation in expert-lead group workshops (Tier 2, online and offline) [90]. Through the sale of NFTs ('archetypes') and online crowd-funding, the Portal DAO supports resilient, experimental community-building in the digital and physical worlds.

Similar to the Regen Network, the Bloom Network supports the development of regenerative (ie 'non-extractive') cultures. It is an ImpactDAO with a membership of 30,000 people, all dedicated to building "community on the ground, create food sovereignty, bioregional economics, teach transformative justice, and repair micro-climates" [91]. Local 'blooms' support "meetups, garden builds and skillshares" [92]. Members have access to the 'Bloom Womb', where they can "support one another's passion projects and career development" [93]. Local blooms are also the focal point for off-line engagement: "our audience wants to spend less time online and more time with people who live near them, doing hands-on actions and building vibrant local communities" [94]. In addition to voting privileges, members can participate (via token-weighted voting based on their "regenerative actions reputation") in the management of community treasuries run as Moloch DAOs (digital funds based on the ethereum ecosystem that distribute grants) [95]. Tier 2 education, in the form of regenerative 'upskilling', occurs at the local, regional and international level.

The 'KinDAO', another community dedicated to the preservation and creation of sustainable, ecologically friendly, land-based communities, created an educational game called Metaopoly "in an effort to teach foundational DAO concepts through play" [96]. Through its collaboration with Primordia, a self-billed 'DAO of DAOs', the KinDAO educates members about land stewardship, food shortage issues, homelessness, climate change and personal development (Tiers 2 and 3) TheKin DAO was also one of the first DAOs to sell NFTs in person using a mobile coffee cart in order to "[onboard] communities to the blockchain while maintaining human connection" [97]. Similar to Kin DAO, the EFAM (Essential Food and Medicine) DAO provides educational opportunities for members, only instead of land stewardship, EFAM DAO teaches members how to detoxify and heal though the use of food surplus, natural medicines and 'earth-based', indigenous knowledge [98]. Like Portal DAO and Kin DAO, the EFAM DAO limits voting ('Tier 1') and access to educational resources ('Tier 2') to cooperative members.

4.3. Nudging DAOs

Utopian proponents of cooperative education often believe that jurisdictions should require, as a condition of legal recognition, DAO cooperatives to provide support for educational activities. There are at least three possible rationales for the utopian position. The weak rationale nudges DAO cooperatives towards member education using existing law. The underlying assumption is that the best way to encourage DAO cooperatives to not only set aside funds for member education but also, quite possibly, support both off-chain and on-

chain educational activities, is to use legal sanctions. Statutory language requiring DAO cooperatives to devote a portion of their profits to educational activities should influence the decision-making process of DAO cooperative members seeking legal recognition, especially if non-digital cooperatives are subjected to the same requirement. Unfortunately, the weak rationale is unlikely to change the organizational decisions of DAO cooperatives because comparatively few DAO cooperatives have tried to secure legal recognition. In addition, the few existing states that do recognize DAOs (Vermont, Wyoming and Tennessee), permit DAOs to form as limited liability corporations or partnerships (Delaware), or permit LLCs to incorporate DAO principles (Colorado), don't provide DAOs with a compelling incentive to provide member education, either on-chain or off-chain.

The intermediate rationale nudges DAO cooperatives towards member education using moral arguments rather than the force of existing law. Some utopians and pragmatists believe that DAO cooperatives should set aside profits for member education even if statutes fail to require, or even encourage, member education. They should also support both on-chain and off-chain educational activities because communities work better when individuals learn to trust each other face-to-face. The core assumption is that eventually the law will 'catch up' to evolving moral norms about the importance of education in DAOs. I consider some of these moral arguments in Sections 5 and 6.

The strong rationale nudges DAO cooperatives towards member education using a pragmatic interpretation of cooperative history. Pragmatists, ever aware of the need to balance member education against other pressing cooperative matters, may support statutory language that encourages DAO cooperatives seeking legal recognition to provide off-chain and off-chain educational opportunities, but they are unlikely to support statutory language that demands it. Pragmatists dating back to the Rochdale Pioneers and the ICA also understand that law lags behind the development of cooperatives. It is not surprising that law still lags behind the rapid development of DAOs. That lag partially explains the current state of cooperative law with regard to member education. In Section 2.5, I argue that a settled, pragmatic legal consensus has probably developed on the significance of education is cooperative cultures. But regardless of the explanation, the cumulative weight of member education in cooperative history just isn't persuasive enough to convince states to require member education in legally recognized cooperatives, and that trend is likely to continue for legally recognized DAO cooperatives.

5. The limits of digital cooperativism

5.1. Platform capitalism v. platform cooperativism

DAOs developed amid a growing recognition that the 'gig' or sharing economy was deeply flawed. The operational centerpiece of the new sharing economy is 'platform capitalism', a form of modern capitalism that concentrates enormous wealth and control over data in the hands of a relatively small number of firms, and reduces the bargaining power, wages and well-being of 'gig' workers who often trade flexible hours and free internet access [99] for

security and benefits. ‘Extractive’ digital platforms have been accused of harming workers in many ways, including increased surveillance, invasion of privacy and discrimination [100]. Human beings, like the algorithms that run digital platforms, are easy exchangeable, low-wage widgets [101] unless they fall into the category of workers that tech firms value highly.

Platform capitalism also takes advantage of the tools of traditional capitalism, such as the tendency to convert profits or surpluses into dividends for investors rather than capital improvements or increased benefits for workers [102]. Technology firms frequently tout the benefits of decentralization as a check on authoritarianism to create virtual monopolies [103,104], but they also use the same benefits to undermine organized labor [105], and suppress the wages of gig workers.

The counter-narrative to platform capitalism is platform cooperativism, and for many activists, DAOs are a perfect vehicle. Platform cooperativism is both a critique and an aspirational agenda. The former challenges platform capitalism, while the latter reflects a particularly understanding of traditional cooperativism, the role of cooperativism in the global economy, and the potential of DAOs. In terms of the traditional role of cooperativism, platform cooperativism, developed primarily by Trebor Scholz and Nathan Schneider [106], is the belief that cooperatives are economic self-help organizations for the under-served and under-represented, experimental sandboxes for new forms of democratic participation, and vehicles that reward sweat equity and long-term commitment rather than detached investment [107]. As a result, platform cooperativism largely adheres to the cooperative principles laid out by the Rochdale Society and the ICA [108].

Traditional cooperatives, however, did not develop during a digital age in which cooperatives are not only competing with corporations for control of traditional goods and services, but also for control over resources that ignore jurisdictional boundaries like digital data. In response to the perils of platform capitalism and the dominance of global data in contemporary society, Scholz proposed ten additional principles for platform cooperatives, including data portability and the right to log off [109].Some of these principles mirror the Rochdale / ICA guidelines, but others only make sense for cooperatives living in the shadow of globalized data.

Proponents of platform cooperatives have also embraced alternative forms of cooperativism in order to control the data that digitized platforms accumulate on a regular basis. Open cooperatives, for example, “self-organize to create commons for the benefit of its members” [101]. Data cooperatives like EVA Coop, Salus Coop, MIDATA and Polypoly, by contrast, pool data into private ‘data trusts’ or ‘data vaults’, often for the benefit of existing cooperatives like credit unions or drive-sharing networks [110,111]. In the same way that cooperatives utilized their considerable purchasing power to accumulate and protect resources for their members, open cooperatives and data cooperatives act as a repository, protector and even monetizer of data collected by their members [112].

5.2. Which legacy best reflects the platform cooperativist agenda?

Platform cooperativists are very optimistic about the organizational, technological and ideological elasticity of the cooperative form. That optimism seems well-founded. Standing alone, cooperativism is a reasonably successful alternative to traditional capitalism because it creates profit-sharing vehicles that can survive in competitive markets, as well as serve the needs of vulnerable people in difficult environments when neither traditional corporations (‘market failure’) nor the government can provide those services in a reliable, cost-effective manner. Platform cooperatives have also managed to create organizations that protect gig workers, provide health care / job security and avoid surveillance problems. Each successful new operation brings digital cooperativism potentially one step closer to achieving the political and legal advantages that traditional cooperatives already enjoy, such as tax breaks, subsidies and possible exemption from the anti-trust laws.

Table 2. Platform cooperativist justifications for cooperative education.

	Utopian justification	**Pragmatic justification**
Critique of capitalism	• platform cooperativism requires a shift from ‘Ayn Rand to Robert Owen’ * explicit identification with Owenian socialism * egalitarian community formation, rather than organizational hierarchy and hyper-competition, should be the goal of all cooperatives	• up-skilling’ provides digital cooperatives with a competitive advantage over platform capitalist operations
Control of resources	* preserve the moral right to control the fruits of one’s labor	* in a global economy, workers need to pool and monetize digital data
Collective bargaining	* protect the moral right to form unions	* increase wages, job security, conditions and benefits

Given this track record, platform cooperativists should commit to member education initiatives that advance three important goals: 1) the critique of capitalism, 2) the control of resources, and 3) collective bargaining, all described in Table 2. Some platform cooperativist justifications for member education could be based on utopianism, while others could be based on pragmatism. In terms of the critique of capitalism, for example, cooperatives may explicitly link the platform cooperativist movement to socialism in continuing education classes (off-chain, Tier 2) or in promotional materials (off-chain, Tier 3). Such an educational strategy would probably enjoy the support of Schneider, who endorsed many tenets of Owenism in Everything for Everyone [113], and Scholz, who quipped that the platform cooperative movement required “a shift of mental orientation from Ayn Rand to Robert Owen” [114]. Consistent with the legacy of Owen, utopian educational initiatives could teach members that egalitarian community formation, rather than organizational hierarchy and hyper-competition, should be the goal of cooperativism. Pragmatic justifications for anti-capitalist educational programming, by contrast, might emphasize that ‘up-skilling’ (off-

chain, Tier 2) provides members of platform cooperatives with a competitive advantage over platform capitalist operations.

Controlling the digital resources of members is another goal of the platform cooperative movement, and DAO cooperatives could advance that goal through educational programming. Schneider has already called for the establishment of 'tech schools' capable of instructing students about the mechanics of creating, owning and operating online cooperatives. He also wanted to dramatically increase the number of "distance-learning programs that could prefigure platform co-op models for massive open online courses (MOOCs)." [115] Tech schools are a key component of Schneider's overarching educational vision for platform cooperatives, a vision that he traced back to the Rochdale Pioneers [116]. In many ways, the educational infrastructure required to realize Schneider's vision already exists. Many private organizations, for example, offer blockchain [117] and Web 3 courses, and a new school governance organization has developed a curriculum to teach high school students about DAOs [118]. Some DAOs create educational content or offer classes in Web 3 coding (Emerald City DAO, Developer DAO, Odyssey DAO, Learn Web3 DAO) and community development (Bankless DAO, Carib DAO, Blu3 DAO, Seed Club, CityDAO and Rise DAO). The most prestigious academic institutions in the United States, China, Japan, Australia and Europe offer courses on blockchain technology [119]. And EduDAO, which is financed by BitDAO, an international blockchain community worth billions, is collaborating with top universities to fund early-stage, blockchain, DAO and Web3 student projects [120]. Not surprisingly, the platform cooperative community is taking advantage of increased public interest in distributed ledger technology to educate people about workers rights in the gig economy. At the forefront of this educational movement is the Platform Cooperativism Consortium (PCC), housed at the New School in New York City. Trebor Scholz is the Founding Director. The PCC offers seminars on the history and management of platform cooperatives [121], and an extensive archive of information about DAOs that subscribe to platform cooperativism [122].

Pragmatic proponents of cooperative education could expand PCC classes, packaged as recommended off-chain 'Tier 2' initiatives, to teach members how to pool and monetize digital data. Utopians could take PCC's educational mission one step further by linking the control of 'digital labor' to socialism, just part of a larger socialist movement to prevent unscrupulous business owners from exploiting the labor of ordinary workers [123]. Utopians might even require all DAO cooperative members to attend expanded 'tech schools' if possible.

The third major goal of the platform cooperative movement is the re-invigoration of worker unions and collective bargaining agreements that platform capitalist firms have undermined for decades. At present, members of platform cooperatives face a dual dilemma. On the one hand, they often compete with low-wage workers for short-term employment opportunities, and may face a similar set of market challenges, including low benefits, workplace harassment, job insecurity and sub-par conditions. On the other hand, however, as independent contractors, they don't have guaranteed rights to unionize under the National Labor Relations Act [124] or the Fair Labor Standards Act. [125]. And even if they could

form traditional, legally recognized unions, the decentralization of gig workers, combined with the platform capitalist tendency to emphasize tasks rather than human labor, makes it difficult to maintain large, organized protest communities in the real world.

Navigating the political, legal and economic terrain of what is now referred to as 'decentralized collective action' (defined narrowly as traditional unions using blockchain technology, or more broadly as informal worker unions that exist almost exclusively on-line as DAOs) [126] is a complex task, and platform cooperatives are perfectly positioned to fill the void through member education. On-chain educational activity could range from giving cooperative members a chance to vote on union-related matters such as working with traditional unions on certain projects or developing union-like consortia with other DAO cooperatives (Tier 1), to promoting the cooperative through the issuance of limited edition, pro-union tokens that confer benefits and privileges on token holders within the cooperative (Tier 3). Gig workers consortia have already voted to support informal 'digital unions' [127] like the Freelancers Union (independent workers) [128], the Instagram Meme Union [129] (meme creator demanding more transparency from Instagram) and the Union of Musicians and Allied Workers (UMAW) [130] (fighting for better deals from music labels). But pro-union educational initiatives developed by platform cooperatives are more likely to be successful off-chain, and even off-line. DAO cooperatives, for example, may choose to conduct 'Tier 1' off-chain classes to inform members about independently available digital employer polls like FYPM [131] and Turkopticon [132], similar to the employer polls that traditional unions often share with their members, but 'tier 1' classes should be made available to unionized non-cooperative members as well in order to ease tensions between traditional union members and platform cooperative members. Opening up classes like the PCCs 'Union Co-ops Online' seminar to co-op members and non-members should appeal to both utopians and pragmatists. 'Tier 2' off-chain educational initiatives could encourage platform cooperative members to join 'mutual aid' communities [133] and insurance pools [134] shared by gig workers and traditional union members. Off-chain 'Tier 3' promotional efforts could also encourage cooperative members to join striking traditional union members on the picket line, presenting corporations with a unified front of worker opposition [135]. In fact, platform cooperative DAO members actually appearing on picket lines with traditional union members – after receiving the appropriate training – could be an incredibly powerful example of off-chain 'signalling' [136].

6. Modern rationales for off-chain education in DAOs

6.1. Aversion and biases

All three educational tiers typically offered by traditional cooperatives could be offered by DAO cooperatives. Some of these opportunities should be managed on-chain, but others must be conducted off-chain. Deciding to devote a considerable amount of DAO cooperative resources to off-chain activity, however, is likely to be controversial. In response to possible

criticism, pragmatic and utopian proponents of cooperative education are likely to offer two rationales.

The first rationale is that, in general, cooperatives should avoid completely automating interactions between cooperatives and their members unless it is absolutely necessary. Even during a modern age dominated by digital communications, the pragmatic / utopian distaste for hegemonic automation persists, just part of a larger phenomenon called 'algorithmic aversion' [137]. People tend to rely on convenient heuristics to make decisions in uncertain situations, or environments in which cause and effect relationships may not be clear. Some of these heuristics contradict known or easily ascertainable facts about current situations, exhibiting what appears to be irrational behavior. Scientists have noticed a similar pattern in our treatment of algorithmic processes, a pattern that persists even though studies have shown that algorithm-based forecasting and predictive models tend to be more accurate than human forecasting. In response to an algorithmic aversion in the general population, many states have enacted legislation that prohibits algorithms from exacerbating racial stereotyping in hiring practices, or from creating dangerous 'filter bubbles' and 'echo chambers' online [138]. There is active public resistance to legislation that allows smart contracts to hard-code business ethics [139] without clear guidelines [140]. Public distaste for 'excessively' algorithmic operations has also made its way into blockchain legislation. Section 17-31-104(e) of the Wyoming DAO LLC law, for example, states that all DAOs registered under the law must "establish how the decentralized autonomous organization shall be managed by the members, including to what extent the management will be conducted algorithmically."

For people who believe that DAOs are just a more specialized version of blockchain-driven operations that rely almost exclusively on computational automation, smart contracts and 'trustless transactionalism', algorithmic aversion is an unfortunate artifact of a pre-digital age. Some of these people believe that many DAOs are essentially glorified 'tradenets', or automated environments in which transactions for desirable goods and services can be conducted with little, if any, human intervention. Like smart grids for electricity, water and solar power, DAO cooperatives could operate more or less autonomously, allowing individuals with resource collection capabilities to exchange resources or contribute their own resources to a common pool that everyone, including the government, can easily access. The same can be said for DAO-based stock markets, sports betting sites, auctions, political prediction pools and currency transfer operations. Just like Sapiro's carefully managed cooperative pools, DAOs conceptualized as glorified tradenets can operate without a tremendous amount of political debate; they only require the periodic assistance of algorithmic 'experts'.

But pragmatic and utopian proponents of cooperative education do not believe that DAOs are just glorified tradenets. For these people, algorithmic aversion is not an unfortunate historical artifact; it is a behavioral reminder that cooperativism works best when people learn to trust each other 'face-to-face'. The best example of this phenomenon is member education. Even though some forms of cooperative education can be performed on-chain, and many other aspects can be tokenized, 'Tier 2' and 'Tier 3' off-chain educational activity is more effective.

6.2. Morality and the external footprint of DAOs

The second rationale foregrounds the off-chain requirements of DAOs with a significant physical footprint. Every 'real-world' organization that adopts blockchain technology has to balance 'high-level' moral norms that successful communities have relied on for millennia, and 'low-level' administrative efficiencies afforded by blockchain that socio-political communities may implement in order to sustain themselves in the digital world. DAO cooperatives that evolved from existing physical organizations or manage a substantial physical community face the same balancing act. Moral beliefs, rather than shared enthusiasm for a particular administrative, technological or accounting regime, are often the glue that binds tight-knit, physical communities together.

The best example of this is a new activist-oriented community loosely referred to as 'blockchain for good' (BFG) [141]. Many participants in the BFG movement did not become activists due to blockchain technology or the promise of cryptocurrency. They were already deeply invested in social causes. Blockchain simply provided them with an opportunity to reduce the cost of activist projects through increased efficiency, security and transparency, and expand the reach of activist projects across the globe. Self-labelled BFG events have taken place all over the world [142], on issues ranging from poverty reduction, food supply problems [143] and environmental sustainability to the protection of vulnerable or displaced persons. The most important thing to remember, however, is that the BFG movement, like the land steward DAO movement, is not limited to the digital sphere. It is not just a digital city, content to exist online or in a metaverse. It isn't a glorified tradenet either. BFG proponents actively pursue specific political and economic reforms in the non-digital world, and they do so with a strong moral sensibility.

7. Synthesis, core and periphery

Table 3 describes the complex political, technological, historical and legal architecture of cooperative education. Extending that architecture into the world of DAOs will depend, in turn, on two crucial distinctions: 1) the core *vs.* the periphery of blockchain, and 2) the core *vs.* the periphery of cooperativism.

Debates about the core of blockchain usually divide into two camps. On one side, proponents of 'code is law' and *lex cryptographica* [144] believe that the core of blockchain discourse is the algorithm, and as a result, on-chain governance should be the norm. The counter-narrative, embraced by proponents of 'law is code' [145], is that social norms and moral considerations that can not, and should not, be reduced to code are the real core of blockchain discourse. Given these constraints on the accuracy of algorithmic processes, every blockchain operation should make ample provision for off-chain interventions and governance structures. The debate itself is not just about the ontological core of a new technology or the doctrinal core of an established body of law [146]. It is also an attempt to eliminate all vestiges of political / moral bias and domination from specific social environments. 'Code as law' proponents, for example, believe that even though an off-chain

intervention temporarily saved theDAO, it also raised the specter of 'blockchain collusion' in which the most powerful stakeholders in a blockchain community seize control of the entire system [147]. Relegating off-chain processes to the periphery appears to be the best way to prevent abuse. Studies have shown, however, that it is relatively easy to embed political, economic and moral bias into algorithms. Neither the core nor the periphery of blockchain technology, therefore, can avoid all discrimination and bias.

Table 3. The Architecture of Cooperative Education.

	Mechanical	**Pragmatic**	**Utopian**
Practical configuration in traditional cooperatives	Cooperative marketing (producers)	Cooperative buying (consumers)	Communitarian cooperatives
Competitive model in traditional cooperatives	Lock-in contracts and organized cartels	Free market competition	Anti-capitalist, discourage competition
Guiding principles in traditional cooperatives	Sapiro's 'commodity pool' model	Rochdale / ICA	Owenite
Role of education in traditional cooperatives	Managerial education for ordinary members is unnecessary in some situations	Education is negotiable	Prioritize education
Likely legal status of education in DAO cooperatives	No mention of education in founding charter	Either encourage or permit educational set-asides	Require educational activities for recognition
Likely availability of off-chain education in DAO cooperatives	Exclusively on-chain (just voting and leadership)	Hybrid / mostly on-chain (participation, peer interaction)	Hybrid / mostly off-chain (extensive real-world training)

Since it is virtually impossible to eliminate all bias from blockchain operations, stakeholders need to be taught how to engage blockchain technology responsibly. This leads to the second core / periphery problem facing DAO cooperatives : member education. This paper identified three different approaches to cooperative education, each shaped by governance conflicts, inter-cooperative experimentation, the dominant ideological sensibilities of specific cooperative communities, regulation of the cooperative form and the cost of actual administration. For the most part, the same factors that constrained agricultural cooperative accommodation of member education in the nineteenth century and rural electrification cooperative accommodation of member education in the twentieth century will constrain digital cooperatives in the twenty first century. But there are two additional factors that the predecessors of DAO cooperatives never had to address: algorithms and globalization. In the future, both factors may make it difficult to realize the utopian dream of moving member education permanently to the political and legal center of cooperative life.

8. Conclusion

Since the beginning of the 19th century, Anglophone cooperatives have defined member education in mechanical, pragmatic and utopian terms. The utopianism of Owenism made education indispensable; the pragmatism of the Rochdale / ICA principles made education negotiable; and the mechanical governance of Sapiro's cooperative cartels rendered a particular form of member education expendable.

DAO cooperatives confront this historical landscape from three angles. First, some DAOs are determined to honor the historical legacy of cooperativism. If this is the objective (and for many DAOs it isn't), DAOs have to determine if the historical impact of member education is best interpreted through the lens of the mechanical, pragmatic or utopian approaches. Second, DAOs committed to platform cooperativism have to determine if a mechanical, pragmatic or utopian approach to member education is the best way to critique platform capitalism. And third, DAOs have to determine if they will only provide educational opportunities to members 'on-chain' through voting, through a mixture of initiatives heavily weighted towards on-chain activities, or through a mixture heavily weighted towards off-chain activities.

Regardless of their choice, DAO cooperatives have to reconcile the complex historical narrative of cooperative education with the technological fantasy of a community completely dependent on algorithms. Sapiro and Nourse anticipated this challenge, but so did another architect of modern democratic theory: Jane Adams. Adams subscribed to the old adage that the best cure for the ills of democracy is more democracy [148]. For pragmatic and utopian proponents of cooperative education, however, the best cure for the ills of blockchain in DAO cooperatives might be less blockchain, not more. Trustless transactionalism might be an aspirational ideal for many blockchain operations that perceive themselves as little more than super-efficient, online portals for crowd-sourcing and wealth accumulation. But most DAO cooperatives with a significant real-world footprint, an ambitious transformational agenda and a broader sense of self-purpose recognize the political and organizational folly of trustless transactionalism. For these DAOs, member education will always be important, and a significant portion of that education will always occur 'off-chain'.

Conflicts of interests

The author declares no conflict of interest.

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