# The Superset Paradigm: Data DAOs and the Democratization of Digital Publics

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**Abstract:**

Technological advancements are continuously reshaping traditional notions of the "public sphere". Digital platforms such as Facebook, X, and Reddit have evolved into networked digital arenas in which public discourse thrives. Yet, as Habermas (1991) observed the "refeudalization" of the public sphere in the 19th and 20th centuries as a result of the shifting role of capitalism, a similar trend is currently playing out within these digital spaces. This is evidenced by the prevailing reign of 'implicit feudalism' (Schneider, 2022) that largely characterises current platform governance.

Rooted in the cypherpunks' vision for autonomy and privacy, web3 and automated governance technologies have since emerged in an effort to disrupt such centralised power structures (Nabben, 2023). Given their potential to enhance the scale and scope of coordination, web3 technologies have renewed interest in experimenting with cooperative forms of self-governance. This paper introduces an empirical case study of one such organization that is pioneering the application of these technologies to foster a more democratic digital sphere; Superset.

By leveraging the technological affordances of web3 technologies with Ostrom's (1990) governance design principles, Superset is one of the first chartered data trusts slated to represent a digital organisation of data contributors. As the first to pioneer this approach, Superset hopes to provide the technical infrastructure and legal support to act as a "collective voice" in advocating for the interests of data contributors. If successful, this model may provide the tools needed to counter the rampant imposition of 'implicit feudalism', thus altering the digital landscape and the networked digital publics on which we have come to rely.

# Introduction

<span style="color:red">[Introduction needed.]</span>

# The Public Sphere

Jürgen Habermas' (1991) notion of the 'public sphere' can broadly be defined as the arenas in which individuals gather to identify, discuss, and debate societal problems with the aim of influencing political action. While mass media, such as print, radio, and television, has traditionally shaped popular understandings of the public sphere, technological advancements are reshaping these conceptions (Benkler, 2006; Bruns, 2023; Seeliger & Sevignani, 2022). For instance, unlike earlier forms of mass media, whose "technical architecture was a one-way, hub-and-spoke structure, with unidirectional links to its ends, running from the center to the periphery" (Benkler, 2006, p. 179), digital platforms digital platforms have emerged as networked digital spaces through which bi-directional public discourse thrives.

Yet, just as Habermas (1991) observed the 'refeudalization' of the public sphere in the 19th and 20th centuries as a result of the shifting role of capitalism, a similar trend is currently playing out within these digital spaces. Many platforms that dominate digital spaces govern through what Nathan Schneider (2022) has deemed 'implicit feudalism'. Implicit feudalism describes "a pattern that grants user-administrators absolutist reign over their fiefdoms, with competition among them as the primary mechanism for quality control, typically under rules set by platform companies" (Schneider, 2022, p. 1966). Moreover, this power dynamic further extends to the corporate governance of digital platforms themselves. In other words, if user-administrators are akin to nobles, then platform founders and CEOs are comparable to monarchs, wielding absolute power over the rules governing these nobles (Schneider, 2022). As a result, users are afforded limited, if any, capacity to alter the governance of these platforms. Given that digital platforms have become public utilities - "the modern-day equivalents of the railroad, telephone, and electric utility monopolies of the late 19th and the 20th centuries" (Plantin et al., 2018) - terms of service have effectively become "terms of servitude" (Peek, 2023).

Notably, the framework that Habermas (1991) sets out for the public sphere closely resemblance to the way in which "the commons" has historically been understood within the United States. In this context, "the commons" referred to the open, communal spaces, such as New England town commons, that facilitated the exercise of free speech and democratic engagement (Hess & Ostrom, 2006). Echoing Habermas's insights on the public sphere, Hess and Ostrom (2006) further highlight the critical role that these shared spaces and collective knowledge play in nurturing robust, democratic societies. Furthermore, from a commons analytic framework, the 'refeudalization' of the public sphere can also be understood as a modern form of enclosure that threatens these foundational democratic spaces.

# The Commons

The commons - also known as common-pool resources (Euler, 2015) - refer to resources shared by a group of people that face social dilemmas in their allocation and utilisation (Hess & Ostrom, 2006). Within neo-classical economics, common pool resources represent one of four different categories of economic goods,[1] each of which is defined by their degree of excludability and subtractability. The concept of excludability denotes the extent to which access to a resource can be restricted, while subtractability (sometimes referred to as rival) pertains to how the consumption of a resource by some can limit its use by others. Common pool resources are characterised by a low degree of excludability and a high degree of subtractability. For instance, natural resources like fisheries are commonly understood as common pool resources. Not only is it difficult to safeguard fisheries against unauthorised use (low excludability), but overfishing threatens to deplete their stock, preventing others from equally benefiting from the resource (high subtractability).

In addition to low excludability and high subtractability, Purtova (2017) suggests that common pool resources are also defined by a third characteristic: complexity. Purtova (2017, p. 183) continues, "[Common pool resources] are system-resources, meaning that they comprise entire 'resource ecosystems', a combination of interrelated and interdependent elements that together form a common-pool resource." For example, natural resources, like fisheries, typically comprise two main ecological components: stock and 'flow units' (Purtova, 2017). In a fishery, the stock encompasses not only the fishing pond but also the entire ecosystem vital for sustaining the fish population. The condition of the stock and, consequently, the resources it yields (i.e. the fish) depends on factors such as water quality or biodiversity. The social dilemmas that impact the condition of the stock are known as provision problems (Gardner et al., 1990). Therefore, provision problems pertain to the creation, maintenance, or improvement of the resource, as well as the prevention of its destruction.

Flow units, on the other hand, refer to the resources derived from the stock. In the case of a fishery, the flow units constitute the fish extracted from the fishing pond. The sustainability of flow units is contingent on regulating resource extraction, as overharvesting can lead to resource depletion. The social dilemmas that relate to flow units are known as appropriation problems (Gardner et al., 1990). These problems occur when the marginal costs of appropriation outweigh the value of the yield, leaving appropriators with less or lower quality flow units. Appropriation problems may result from either uneven distribution of resource access (e.g. the inequitable allocation of fishing spots) or technological disparities between extractors (e.g. when one individual's use of explosives for fishing increases the

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[1] The remaining categories of economic goods include private goods, public goods, and club goods.

fishing costs for those using fishing rods) (Purtova, 2017). Because social dilemmas can emerge with the provisioning and allocation of common pool resources, the appropriate management of *both* the stock and the flow units is critical to the sustainability of natural resources.

## The Digital Commons

However, common pool resources are not limited to natural resources. As digital information technologies gained popularity in the 1990s, some noticed that many of the conditions and dynamics they were observing on the web - such as congestion, free riding, conflict, and "pollution"- closely resembled those found in the tangible commons (Hess & Ostrom, 2006). This prompted many scholars to turn to commons literature for insights into these emerging digital spaces, which were neither fully public nor private. In discussing this trend in new commons research, Hess and Ostrom (2006, p. 4) note:

> "Commons became a buzzword for digital information, which was being enclosed, commodified, and overpatented. Whether labeled the "digital," "electronic," "information," "virtual," "communication," "intellectual," "Internet," or "technological" commons, all these concepts address the new shared territory of global distributed information."

Like the tangible commons, the digital commons are vulnerable to issues such as underproduction, discoverability, and pollution, which can degrade the quality of the resources (such as in the case of mis- and dis-information) or even destroy the resource altogether. Thus, like their tangible counterparts, preservation of the digital commons requires well-established governance and participation norms that guide their curation, management, and protection (Dulong De Rosnay & Stalder, 2020). One key characteristic that distinguishes the digital commons from the tangible commons is the non-subtractability of digital resources, which eliminates the threat of overuse. Hence, the pressing challenge for digital commons management lies not in the depletion of finite resources, but in maintaining open access to digital resources, while preventing private enclosure.

## Enclosure of the Commons

The threat of enclosure, or the privatization of public assets, has remained a persistent challenge to the commons for centuries, particularly in Western contexts (Boyle, 2003; Encyclopedia Britannica, 1998; Hess & Ostrom, 2003, 2006; Murdock, 2013). More recently, over the past two decades, critical scholars have observed a gradual enclosure of the digital sphere by market forces, describing various facets of this phenomenon with terms such as digital capitalism (Schiller, 1999), information capitalism (Schiller, 2007), platform capitalism (Srnicek & De Sutter, 2017), platformisation (Poell et al., 2019), and surveillance capitalism (Zuboff, 2019). According to Hess and Ostrom (2006, p. 12), "This trend of

enclosure is based on the ability of new technologies to 'capture' resources that were previously unowned, unmanaged, and thus, unprotected". In other words, technological advancements can transform the nature of a resource from a public good (low subtractability and low excludability) to a common-pool resource, thereby impacting its vulnerability to enclosure.

For example, due to the newfound simplicity with which digital data can be documented, duplicated, and archived, there has been a significant shift towards datafication, or the quantification of human life and social action into digital data streams that can be indexed, monitored, and analysed (Mayer-Schönberger & Cukier, 2013; van Dijck, 2014). Using platform extensions such as apps, trackers, plug-ins, and sensors, commercial interests can quantify "virtually every instance of human interaction into data: rating, paying, searching, watching, talking, friending, dating, driving, walking, etc." (Poell et al., 2019). Digital platforms subsequently leverage this quantified data to fuel elaborate data infrastructures that power the algorithmic systems on which their platforms and business models depend. Given that reach, attention, and engagement are key revenue drivers, many platforms tune their algorithmic systems to maximise these metrics. Moreover, digital platforms also utilise these sweeping data infrastructures to strategically position themselves at the centre of multi-sided markets, where network effects often result in the consolidation of power and capital (Poell et al., 2019; Srnicek & De Sutter, 2017).

For Murdoch (2013), these developments amount to a new enclosure movement in which the digital commons are being seized by commercial interests. He explains:

> "Their reach has been consolidated by the migration of Internet access from personal computers to tablets and smart phones, and the move from surfing the Web by following links to downloading dedicated applications. Rather than providing a public park, open to a variety of uses and serendipitous encounters, the Web is becoming a series of walled gardens tailored to already-established interests and preferences." (Murdock, 2013, p. 163) 163)

Because these digital platforms have become public utilities, participation in these enclosed spaces has become a prerequisite for participation in public discourse. In essence, digital platforms have essentially "monetized an essential function of the body politic" (Hubbard et al., 2023, p. 5). This dynamic has been met with criticism, as proponents of the open web advocate for measures to dismantle these 'walled gardens' (Doctorow, 2021, 2022; Holmes, 2013; Rokoff, 2023; Schulman & Callas, 2022; Steele, 2010).

## Managing the Commons

Within his widely cited 1968 article, "The Tragedy of the Commons", Garrett Hardin (1968) argued that common-pool resources that were open, shared, and finite would inevitably face depletion as a result of over-exploitation by individuals motivated by self-interest. He further concluded that this 'tragedy of the commons' could only be avoided via

privatisation or state regulation. Having spent her career examining "the micro politics of human cooperation" (Wall, 2017), Elinor Ostrom challenged this assumption in commons management.

Elinor Ostrom was the first woman to earn a Nobel prize in economics for her seminal work on commons theory, a field of research devoted to defining the parameters under which common pool resources can be sustainably managed (Taylor & Purtova, 2019). Ostrom (1990) conducted extensive research documenting examples from around the world where common pool resources were successfully (and unsuccessfully) managed by a community without the interference of either government or markets. Drawing from case studies from around the world, Ostrom (1990) was able to empirically demonstrate that the "tragedy of the commons" that Hardin (1968) had outlined, was not, in fact, inevitable. One significant finding to emerge from Ostrom's ethnographic research was the identification of eight factors that were present in communities that were successful in collectively managing the commons but were absent in those that could not. These design principles include:

1. ***Clearly defined boundaries***: A clear distinction must be made regarding who is permitted and not permitted to use the shared resource. There must also be a well-defined demarcation of the resource's boundaries.

2. ***Congruence between appropriation, provision rules, and local conditions***: Regulatory frameworks should be context-specific and tailored to local conditions in which the resource is situated. The frameworks should be flexible enough to adapt to changes to the local environment.

3. ***Collective-choice arrangements***: Those who are impacted by the regulatory frameworks regarding the shared resource should have the capability to contribute to their modification. The associated costs of these alterations should also remain low.

4. ***Monitoring***: Those who oversee the conditions and appropriation of the shared resource should be accountable to the appropriators.

5. ***Graduated sanctions***: Violations of operational rules should be subjected to sanctions proportional to the severity of the infraction. These penalties should be administered by fellow appropriators and/or accountable officials.

6. ***Conflict-resolution mechanisms***: Appropriators and accountable officials should have ready access to low-cost forums through which conflicts (either among appropriators or between appropriators and accountable officials) can be resolved.

7. ***Minimal recognition of rights to organise***: Appropriators should hold the right to form their own institutions uncontested by external government bodies.

8. *Nested enterprises*: All of the provisions outlined above should be configured in several layers of polycentric, nested enterprises.

Importantly, these design principles are descriptive without being overly prescriptive. Rather than offering up a universal set or rules, Ostrom's principles are expansive enough to enable communities to invoke their situated knowledges. Importantly, Ostrom (1990) challenged the notion that institutional change must be imposed on communities externally, acknowledging the vital role that tacit, localised knowledges play sustaining a healthy ecosystem.

## Managing the Digital Commons

Although early commons scholarship largely centred around the sustainable management of natural (and often local) resources, it has since been expanded to account for the effects of globalisation and technological advancements. Thus, building upon Ostrom's work, Purtova and van Mannen (2023) advocate for a political-ecological approach to digital governance. This method involves mapping out the ecological landscape of the governance situation, while also acknowledging that governance decisions are intrinsically political and value-laden - such as choices about what is important and how resources should be managed, accessed, and sustained. By situating resources within the broader societal context, this approach facilitates adaptive governance strategies that are responsive to a dynamic and interconnected digital ecosystem.

For example, data is widely accepted as a club good, not a common pool resource, within the economic literature (Dosis & Sand-Zantman, 2020; Duch-Brown et al., 2017; Farboodi & Veldkamp, 2021; Jones & Tonetti, 2020; Purtova & van Maanen, 2023; Varian, 2019). Within the digital age, data is excludable either through the use of technical processes like encryption or by barring access to the physical hardware on which the data is stored. Data is also non-rival due to its low replication cost, which allows for virtually unlimited use by those afforded access (Purtova & van Maanen, 2023). For instance, platforms such as Facebook, X, or Reddit enable third parties to access user data via APIs, which often require payment for access. Although web scraping may provide access to platform data in some instances, many platforms use technical means and/or legal regulations to bar access to this data.

However, in implementing a political-ecological approach to digital governance, Purtova and van Mannen (2023) argue that a 'club good' characterisation of data fails to acknowledge its inherently relational nature. This perspective accounts for neither the context from which data is derived nor the social consequences of its production and use. What is often thought of as personal data can be better understood as interpersonal data, especially in the context of an increasingly digitised world (Regan, 2002; Ruhaak, 2019; Taylor & Purtova, 2019). When this digital data is aggregated, cleaned, and processed for consumption, it can be

used to infer information about others, even without direct access to their personal information. Consequently, while data itself may not be a common good, privacy - or "the appropriate flow of information" (Nissenbaum, 2004) - can be (Regan, 2002; Ruhaak, 2019).

Consequently, Purtova and van Mannen (2023) advocate for a "dynamic classification of data", in which data can be simultaneously a club good and part of a larger commons, depending on the purpose of analysis. On the one hand, a club good characterisation of data is most relevant in the neo-classical economic sense, in which priority concern is placed on data quality and quantity. On the other hand, a commons analytical framework is much better suited for situations in which data is instrumental to the sustainability of broader societal values, such as privacy, sustainability, or social good (Purtova & van Maanen, 2023; Taylor & Purtova, 2019). With this understand of the commons as complex systems-resources (Purtova, 2017), a fractal understanding of the commons begins to emerge. In this way, data becomes both a resource within a larger resource ecosystem as well as a complex resource ecosystem in and of itself.

The underlying premise within Purtova and van Mannen's (2023) political-ecological approach to digital governance is that although the designation of a resource as a common pool resource is grounded in empirical evidence, frameworks surrounding subtractability and excludability are socially constructed. As the open web is increasingly enclosed by state and market actors who govern the ecosystem with their own interests in mind, the autonomy of online communities to build, maintain, and engage in digital ecosystems that reflect their own values is compromised. Within this context, Purtova (2017) argues that data can, in fact, be considered a commons. According to Purtova (2017, p. 15), "people and data inherent in the very fact of them existing are the core resource, and the data collected about or in relation to them is simply a benefit generated by the core resource". In other words, the people and data inherent in them are the stock, while the data extracted are the flow units. Unlike natural resources that can be overexploited and depleted, Purtova (2017, p. 18) argues that subtractability:

> "should be understood in terms of the long-term effects of commoditization of personal data and modern data processing practices, compromising [the] survival of certain social values and hence leading to 'extinction of society' as we would like it to be, taking the shape of 'data poaching.'"

This view of subtractability highlights the provision problem, suggesting that the current state of the data economy may reshape society in undesirable ways. Furthermore, given the monopoly that digital platforms hold on data infrastructures and analytics, data can further be construed as non-excludable. This enclosure by digital platforms exemplifies the appropriation problem.

However, when the resource pool of a data commons is defined as expansively as 'people', operational challenges emerge. In response, Purtova (2017) suggests that "data

ecosystems", defined by the community of people who produce and are impacted by data, offer a more practical framework for managing a data commons.

[Transition to web3 needed]

# Web3

Frustrated by the growing centralisation of the web, Ethereum co-founder Gavin Wood minted the term web3 in 2014 to convey a broader vision towards "creating an independent tech protocol stack that [competes] with the traditional centralized protocol stack at all levels" (Buterin, 2023). At the heart of this vision is blockchain, a decentralised, secure, and immutable ledger that offers a reliable mechanism for truth verification and enables trust-minimised transactions independent from centralised control. Released in 2008, Bitcoin was the first blockchain protocol to demonstrate the feasibility of a decentralised financial system by eliminating the need for intermediaries, such as banks. Building off these developments, Ethereum and other blockchain protocols later expanded the utility of blockchain technology to enable peer-to-peer sharing within socio-technical institutions.

Notable innovations stemming from the Ethereum protocol included smart contracts for automating rules and agreements, cryptographic tokens for establishing digital asset ownership, and decentralised autonomous organisations (DAOs) for novel governance frameworks. Together, these blockchain technologies are recognised for unlocking new forms of social and economic coordination, thus offering alternatives to existing institutional structures (Davidson et al., 2018; DuPont, 2023). Over time, web3 has come to signify a diverse ecosystem of tools, applications, and protocols that support the vision for a "more open internet stack" (Buterin, 2023). Thus, in contrast to the 'walled gardens' that lock users into digital platforms, web3 embodies a paradigm shift towards a decentralised web, where users, not platform intermediaries, have ownership and control over data and value.

Despite the potential web3 holds for digital governance, it remains unclear whether web3 technologies are the necessary means through which online communities can prevent the exploitation and/or enclosure of the digital commons. To this end, Superset is pioneering a new model of data governance that creatively combines web3 technologies with existing regulatory and governance frameworks towards the management of a digital commons.

# Superset Case Study

Superset emerges as an innovative project aimed at rebalancing the relationship between data consumers (i.e. digital platforms, advertisers, market prediction firms) and data contributors. The overarching aim of the Superset project is to create a viable model that repositions data contributors at the centre of the data economy by granting them greater agency within the ecosystem. To this end, Superset is in the process of establishing a data ecosystem that consists of a DAO[2] (Superset DAO) through which data contributors coordinate and express their collective preferences over how their data is utilised by data consumers (Superset DAO) and a data trust (Superset Trust) that forms the legal support structure to enforce these preferences. According to Michael Zargham, one of the architects of the system, "We're trying to cultivate a community that has... awareness over the relationship that they're in with their data service provider[s]." Having established the first formally chartered data trust with fiscal autonomy, Superset combines the technological affordances of web3 technologies with Ostrom's (1990) design principles to manage a digital commons.

## Superset Governance Framework

Though Ostrom's work does not specifically discuss fiduciary trusts, they offer an effective regulatory framework through which the management of a common pool resource can be governed. A fiduciary trust is a legal structure in which an independent person, organisation, or entity takes on a fiduciary responsibility to steward assets on behalf of another. Typically, a fiduciary trust has three major stakeholders; a grantor, a trustee, and a beneficiary (Arturo III, 2023). The grantor, or trustor, establishes the trust, which is funded with property (such as real estate, currency, or other assets) for the benefit of the beneficiary. Furthermore, the grantor entrusts the trustee with the maintenance and administration of the trust and the property therein. This arrangement is enshrined in a charter that a) specifies the roles and duties of the trustee, b) names the beneficiaries, and c) outlines the benefits to which beneficiaries are entitled. As such, many have suggested data trusts as a means of mitigating the growing power imbalance between digital platforms and their users (Lawrence, 2016; Ruhaak, 2019, 2020; Wylie & McDonald, 2018).

Due to their generous tax advantages and flexible trust laws, Guernsey, an island bailiwick located off the northern coast of France, is a popular jurisdiction in which to constitute a trust. Of particular interest to Superset was the fact that Guernsey trusts tend to be more accommodating at holding trustees accountable to the beneficiaries than US law. To meet their specific use case, the Superset project adopted a slight variant of the typical Guernsey trust - the Guernsey Special Purpose Trust. As the name suggests, rather than being established to provide a benefit, a Guernsey Special Purpose Trust is chartered to fulfill a

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[2] DAOs are broadly defined as "a blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralised (i.e. independent from central control)." (Hassan & De Filippi, 2021)

specified purpose (Arturo III, 2023). Another feature that distinguished the Guernsey Special Purpose Trust is the introduction of an "enforcer", whose role is to ensure that trustees are acting in accordance with the trust purpose (Carey Olsen, 2017). Within the Superset ecosystem, data contributors within the Superset DAO act as grantors, the Superset Board of Trustees assumes the trustee role, and the responsibility of the enforcer is held by O'Neil Risk Consulting & Algorithmic Auditing (ORCAA) is assigned the role of the enforcer.

**Purpose (Schedule 3)**

| 1 | To hold any digital asset wallet or other financial account for the purpose of meeting the fees, costs, and expenses associated with this Settlement and the Purposes, including the fees and expenses of the Trustees and the Enforcer and to apply such funds in furtherance of the same. |
|---|---|
| 2 | To faithfully and exclusively represent Members' interests in permitting Delphia Group Companies and other third parties to collect and use their data. |
| 3 | To seek to: |
| 3.1 | Put data contributed by Members to exciting or productive uses; |
| 3.2 | Ensure that Members receive a fair share of the returns resultant from the use of their data and its derivatives; and |
| 3.3 | Receive input from Members for due consideration by the Trustees in the course of the Trustees' activities performed under this Settlement by providing infrastructure for Member communications with each other and the Trustees. |
| 4 | To negotiate on behalf of Members with Delphia Group Companies and other third parties to determine: |
| (a) | how Members' contributed data may be collected, processed, stored, and used (to include consideration of the data privacy and security practices of such Delphia Group Companies and other third parties); and |
| (b) | what consideration Members will receive in exchange for such permitted uses, including both financial and non-financial forms of compensation. |

*Figure 1: Superset Trust Charter Purpose (Alston et al., 2023, p. 26)*

## Superset Board of Trustees

Because the Superset Trust is chartered as a Special Purpose Trust in Guernsey, the primary role of the Superset Board of Trustees is to uphold the Purpose of the trust charter (Figure 1). The Purpose tasks trustees with the responsibility of negotiating and enforcing the terms and conditions through which data consumers can utilise data contributed by members of the Superset DAO. Furthermore, trustees are required to "faithfully and exclusively represent[ing] Member's interests", to "put data contributed by Members to exciting or productive uses", and to "[e]nsure that Members receive a fair share of the returns resultant from the use of their data" (Alston et al., 2023, p. 26). Importantly, the Superset Trust Charter outlines a novel mechanism, known as the 'circuit breaker function', through which the Superset Board of Trustees can hold data consumers accountable. If the agreed terms and conditions are violated, the circuit breaker function enables non-affiliated trustees with the legal authority to batch revoke consent on behalf of data contributors, cutting data consumers off from access to contributor data.[3] This acts as an accountability mechanism to ensure that data clients are negotiating with them in good faith as well as respecting data contributor preferences in how the data is used. The structure of the special purpose trust also empowers trustees to initiate legal action in particularly egregious cases of malfeasance.

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[3] Non-affiliated trustees refer to trustees without a conflict of interest.

## Superset DAO

As a governance technology, blockchains offer the potential to create institutions that are better equipped to respond to and enact rules for digital actors and infrastructures. As such, the architects of the Superset ecosystem opted to employ a DAO as the organisational structure through which the ecosystem's network of data contributors coordinate. Thus, in order for their interests to be represented by the Superset Trust, data contributors must become members of Superset DAO. Upon becoming a member of the Superset DAO, data contributors are issued non-transferable NFTs (or Non-Fungible Tokens)[4] which functions as a membership card. By recording membership status on the blockchain through NFTs, smart contracts can be utilised to efficiently manage access to community forums, voting eligibility, and the disbursement of member benefits. Moreover, without DAO membership, data contributors have no rights within the ecosystem.

Because the Superset project is in its infancy, the ecosystem requires further development and testing before folding the DAO into its governance decisions. As a result, governance over the ecosystem remains largely with the Board of Trustees, as they navigate various technical, social, and regulatory challenges. However, according to one of the founders of Superset, Andrew Peek, the long-term goal of the project is "to increase the surface area of the DAO's ability to impact governance". At present, a Discord channel is the only means through which member preferences are signalled. However, system architects anticipate that the Superset DAO will adopt web3 governance tooling over time. As the ecosystem matures, stakeholders also hope to explore different forums to facilitate communication between the Superset Trust and the Superset DAO. For example, one practical approach could involve digital town halls hosted by the Board of Trustees. These sessions would serve as platforms for open dialogue, where the trust actively listens to and addresses the concerns, opinions, and queries of the DAO members. Alternatively, in instances where the DAO faces a significant issue requiring immediate attention, the DAO could potentially hold a referendum to express its stance on the issue. As legal representatives of the DAO, the Superset Board of Trustees can further use the insights gained from these forums to better negotiate with data users on their behalf. The primary mechanism of accountability that is afforded data contributors is the ability to oust trustees with a supermajority vote (75%) (Alston et al., 2023). This ensures that trustees faithfully represent member data contributor interests within the ecosystem.

## The Enforcer

In assuming the role of Enforcer, the independent algorithmic auditor, ORCAA, plays a critical role in fostering transparency and fairness within the Superset ecosystem. According

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[4] Non-fungible tokens (NFTs) are unique digital representations of assets and cannot be exchanged on a one-to-one basis.

to the Superset trust charter, the Enforcer's primary duty is to provide oversight in the representation, utilisation, and storage of contributor data (Alston et al., 2023). This includes ensuring that the Board of Trustees are acting in accordance with the trust's purpose. Crucially, the Enforcer is also responsible for monitoring and recording not only how contributor data is utilised by data consumers, but also the extent to which the use of contributor data generates commercial profits or other benefits. This information is crucial for enabling the Board of Trustees to "[e]nsure that Members receive a fair share of the returns" (Alston et al., 2023). For example, in scenarios where the commercialisation of contributor data does not yield substantial revenue, data consumers may be unable to provide financial compensation. In these instances, data consumers may offer alternative forms of value to data contributors. Conversely, if it is established that significant revenue resulted from the use of contributor data, the Board of Trustees can negotiate for a greater portion of these profits on behalf of data contributors. In this way, the Enforcer keeps both data consumers accountable to the Superset Trust and the trustees accountable to the DAO members.

The relationship between stakeholders within the Superset ecosystem can be summarised as follows:
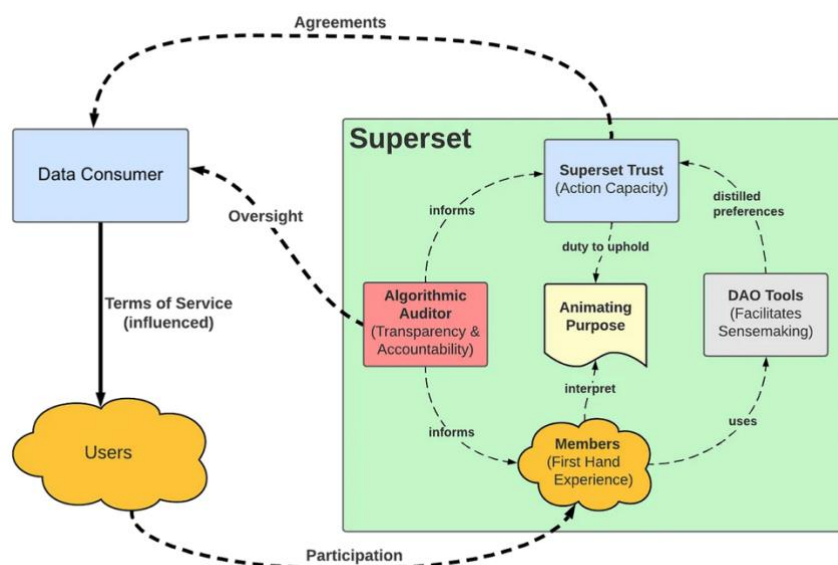


*Figure 2: Superset Ecosystem (Case, 2023)*

Given that the Superset project faces numerous social, technical, and regulatory challenges, particularly in the uncertain regulatory landscape surrounding blockchain technologies, many design questions have yet to be resolved. Nonetheless, Michael Zargham maintains that their progress thus far represents a "new frontier of organizational innovation". He continues, "I don't know if we figured out the exact set of ingredients surrounding the presence of an enforcer intended to reduce possible incentives for collusion, etcetera. But to me, it's innovation in this space that's necessary to figure out new data governance models." The overarching objective of the Superset project is to establish a proof-of-concept demonstrating that alternatives to the current structure of the data economy are feasible.

Ultimately, Superset designers aspire to establish a paradigm that other organisations can emulate, build upon, and improve. Should Superset's model gain widespread adoption, it could fundamentally reshape existing power dynamics within the data economy.

# Ostrom's Eight Principles of Design

Given that one of Superset's primary objectives is to establish a data ecosystem that promotes and protects the agency and autonomy of its data contributors, its governance structure can effectively be analysed using a commons analytical framework. Thus, I next examine how Superset's novel governance framework, which leverages blockchain technologies under the regulatory guidelines of the Guernsey Special Purpose Trust, aligns with Ostrom's eight principles of sustainable management in commons.

## 1. Clearly defined boundaries

To guard against the tragedy of the commons and prevent free riders from over-utilising shared resources, the first principle for commons management is to clearly delineate those who are granted access to the shared resources from those who are denied access (Ostrom, 1990). To accomplish this, the Superset ecosystem utilises NFTs to bound the membership of the DAO, effectively functioning as a digital membership card. Those who hold the NFT in their digital wallet are entitled to join community discussion forums, vote on governance measures, and receive membership benefits. Data contributors who are not members of Superset DAO have no official rights within the Superset ecosystem.

## 2. Congruence between appropriation, provision rules, and local conditions

Next, Ostrom (1990) notes that the rules governing the allocation and provision of the shared resource should be specifically designed for its local context and sufficiently adaptable to accommodate changes in that environment. Because Superset pioneers an innovative governance framework, the founders were required to develop a regulatory framework that was specifically tailored to the Superset ecosystem. For instance, in order to incorporate the input of each set of stakeholders, the Superset trust charter underwent several months of iterative alterations. Similarly, Superset has had to shift its business model over time away from a hedge fund model and towards more general data services to ensure that the system was viable and fit for purpose.

Furthermore, the terms and conditions under which data consumers can utilise contributor data, is negotiated on a case-by-case basis. Andrew Peek notes that Superset is attempting to "provide a thin level of regulation that puts the right checks and balances in place to ensure that Delphia, or... whomever is abiding by... a good steward nature of the data. And what that means over time, may be different." For instance, it may be informed by the

desired level of competition at the commercial level, the need to raise governance standards, or the need to keep up with technological advancements, such privacy preserving technologies. Finally, despite being chartered in Guernsey, the ecosystem is nonetheless subject to the regulatory frameworks within the local jurisdictions in which it operates.

## 3. Collective-choice arrangements

According to Ostrom's (1990) third principle of design, individuals affected by the rules governing the shared resource should be given the opportunity participate in their revision. Given the power imbalance that currently exists within most data economies, the Superset ecosystem shifts this dynamic by providing data contributors with a legal support structure (the Superset Trust) to negotiate the terms of data usage and hold data consumers legally accountable to these agreed terms. Moreover, the Superset trust charter explicitly holds trustees accountable to data contributors in requiring them to "faithfully and exclusively represent[ing] Member's interests" (Alston et al., 2023, p. 26). Further, if it is determined that a trustee has failed to uphold this or any of the mandates outlined in the trust charter, they can be ousted by either a) unanimous approval by the remaining trustees AND written approval by the Enforcer or b) a supermajority vote by the Superset DAO. Although governance over the Superset ecosystem largely rests with the trustees, Superset leadership has explicitly stated their intention to increase the governance powers of the DAO once the system has been more thoroughly developed, tested, and refined.

## 4. Monitoring

The fourth design principle for the sustainable management of the commons stipulates that the those responsible for supervising the conditions and allocation of the shared resource should be accountable to those with the rights to exploit it (Ostrom, 1990). Within the Superset ecosystem, the Board of Trustees and the Enforcer are both tasked with overseeing the distribution of contributor data, which directly impacts the degree to which data contributors can exert autonomy and agency over the data ecosystem (Alston et al., 2023). As previously demonstrated Superset's trust charter holds trustees accountable to data contributors in assigning them the fiduciary duty to "faithfully and exclusively represent Member's interests" and "[e]nsure that Members receive a fair share of the returns resultant from the use of their data" (Alston et al., 2023, p. 26). Perverse outcomes amongst trustees, such as the free rider problem, are mitigated by substantively compensating them for their labour. Moreover, the presence of the Enforcer also limits the potential for collusion amongst trustees, by monitoring the Board of Trustee's performance towards the trust purpose. Reports and audits generated by the Enforcer are further accessible to DAO members. Furthermore, not only is the Enforcer motivated to protect their professional reputation, but they are also paid substantially enough to make collusion untenable.

### 5. Graduated sanctions

Ostrom's (1990) fifth principle of design indicates that breaches of operational guidelines should incur penalties corresponding to the severity of the violations. The Board of Trustees are empowered to invoke the 'circuit breaker function' should data consumers violate their terms of use (Alston et al., 2023). The Board can also escalate to more aggressive legal actions in the event that data consumers flagrantly disregard the terms of service. As outlined above, trustees who fail to uphold their mandate to uphold the Purpose of the charter can also be removed either by unanimous approval by the remaining trustees and the Enforcer or via a supermajority vote by the Superset DAO. Similarly, the Enforcer can also be deposed if the Board of Trustees determine that they have violated the terms outlines within the trust charter.

### 6. Conflict-resolution mechanisms

According to Ostrom's (1990) sixth principle of design, appropriators and accountable officials should have access to low-cost, easily accessible forums to facilitate conflict resolution. As previously stated, members of Superset DAO currently communicate and coordinate with one another via a Discord channel, which can also be utilised to field governance votes. It is further anticipated that the DAO will adopt more sophisticated tools, such as voting platform Snapshot, to support coordination within Superset DAO. Likewise, although they do not currently exist, stakeholders within the Superset ecosystem plan to experiment with forums such as digital town halls or referenda to aid in conflict resolution.

### 7. Minimal recognition of rights to organise

Next, Ostrom (1990) highlights that appropriators should have the right to establish their own institutions unopposed by external government authorities. The Superset ecosystem offers DAO members minimal recognition of rights to organise by providing a legal support structure - via a Guernsey Special Purpose Trust - through which to enforce those rights.

### 8. Nested enterprises

Finally, Ostrom's (1990) eighth principle of design states that all of the provisions outlined above should be organised in multiple layers of polycentric, nested enterprises. As illustrated in Figure 1, the Superset trust charter outlines a robust set of checks and balances that distribute decision-making powers across different actors within the ecosystem. Aside from this, the Superset project aims to enact a model of polycentric governance in a much more expansive way. Within the current data economy, data processing operates in a monolithic structure, known as a data lake, which is controlled and managed by a centralised authority, typically a digital platform. Within this framework, data that inhabits a variety of domains all passing through the same input stage, is aggregated and processed together, then

formatted into a digestible format for data consumers. If the Superset model reaches widespread adoption, it has the potential to shift data processing architecture from a data lake to a data mesh. Under a data mesh architecture, each domain of data is managed and controlled by separate entities. In other words, it provides the opportunity for sub-organisations or smaller more specialised organisations that are only concerned with a particular domain within the dataset to operate within the confines of a larger federated computational governance layer.

# Conclusion

Superset stands as an innovative response to the enclosure of the digital commons, aiming to empower individuals with greater agency in data governance through a blockchain-based DAO and legal data trust. In aligning with Ostrom's principles for managing common resources, Superset establishes a framework where data contributors have a say in the utilisation of their data, paralleling traditional fiduciary structures but with enhanced accountability and decentralised enforcement. As Superset navigates the complexities of the digital realm, it serves as both a proof-of-concept for an alternative data economy and a potential model for others, suggesting that a shift towards more equitable power dynamics in the data economy is possible.

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