Appendix B: Case Study – Oxcart on Arbitrum

The application of the Oxcart Method in the real world highlighting the potential to reshape governance by continuously recalibrating legitimacy through dynamic delegation flows.

This appendix explores the real-world application of the <u>Oxcart Delegation Engine (ODE) on the Arbitrum blockchain network</u>, where it was <u>implemented to optimize governance and enhance delegate participation</u>. This case study demonstrates the effectiveness of the Oxcart Method in incentivizing active governance through dynamic delegation and legitimacy-building mechanisms.

Overview

The ODE has two primary features:

> Backup Self-Selection: Participants can delegate their unused voting power to another delegate, with the option to change their delegation at any time.

> Cascading Vote-Capital Accounting: Voting capital that is not used by inactive participants is carried forward along self-selected paths to active decision-makers, allowing decisions to reflect the will of the most trusted active delegates.

These features work together to ensure that decisions are attributed to those most trusted by their peers, with each vote representing the cumulative trust of one or multiple delegation paths, or 'hops'.

Testing Purpose

The experiment sought to explore whether the non-fungible elements of p2p trust — expressed through continuous delegation — could be converted into group legitimacy; a property we refer to as the 'transitive nature of trust'. While the ODE allows for vast numbers of potential delegation formations among decision-makers, these formations are mathematically enumerable, making it possible to identify trust patterns that contribute to legitimate group decision-making. This is exciting for governance efficiency, safety, and prediction forming capabilities.

The ODE was designed to provide a set of tools to Arbitrum's most influential delegates to manage and visualize delegation flows. These delegates are given the freedom to redelegate their voting power, with the ability to change their decisions at any

time. This functionality allows for transparent vote-capital accounting that reflects the ongoing trust and preferences of ARB token-holders in concert with her most trusted delegates.

Key elements of the Oxcart engine include:

> A fully connected set of delegates among the top 100 Arbitrum voters.

> A simple interface and visualization tools for testing, backtesting, and analyzing delegation flows and legitimacy.

Background

The Oxcart Delegation Engine was launched on Arbitrum as a tool to support decentralized governance by allowing top 100 delegates to manage their voting capital and maintain alignment with their delegators. The key feature of ODE is its ability to assign and change backup delegates in real time, with decisions recorded on-chain. The primary goals of this experiment are to:

> Affirm or diverge from traditional voting models through intra-delegate support.

> Analyze the impact of meta-delegation on delegate and tokenholder activity.

Implementation

Delegates in the top 100 by voting power were invited to register a trusted backup delegate, allowing for continuous re-delegation as preferences shifted. This system aimed to:

> Reduce voter fatigue by enabling smooth visual transfers of voting power without the need for constant decision-making.

> Increase legitimacy by allowing delegates to assign representatives for their constituencies even when inactive.

An API and dashboard were introduced to further streamline delegate interactions and provide insights into voting patterns. Over time, this data-driven approach could help recommend metrics for improving governance processes and sustaining legitimacy across governance cycles.

Results and Impact

The program embarked upon three concurrent initiatives:

Smart Contract Registry and API (SCRAPI):
This phase focused on developing an on-chain registry and API to track delegation choices, including an on-chain lottery reward mechanism to incentivize participation.

Delegate Applied Research Tracking (DART):
DART provided visualization tools for delegates to analyze and manage their voting power. These included delegate connection graphs, which displayed voting capital flows between participants.

Delegate Redelegation Incentive Program (DRIP):
DRIP incentivized metadelegates to participate by offering rewards for registering and delegating on-chain.

ODE incentivized delegates through a reward-based mechanism, where participants were eligible for ARB upon selecting a backup delegate. This gamified approach encouraged active engagement and increased the number of registered backup delegates, ultimately providing a clearer picture of self-selected delegate relationships through a delegate connection graph including visual representations of:

Voting power held by each delegate (displayed as node size) and relative trust byu other delegates through self-selection or similarity score (displayed as shaded node size).

Backup delegate connections (solid lines) and similar voting patterns (dashed lines).

This graph revealed interesting patterns, including linear and branching delegation structures. Notably, no problematic recursive structures (delegation loops) were observed during the test, suggesting that the system encouraged transparent and straightforward selection of delegation paths.

This tool allowed for the exploration of delegation chains, where multiple layers of delegation were visualized, creating a social graph that could be analyzed to determine trust dynamics and power distributions within the DAO. The initial results suggested that such systems could potentially increase governance efficacy by allowing more fluid participation and re-delegation, helping maintain high levels of legitimacy.

A bar chart shows the impact of increased representative context by including cascading delegation chains in the backtesting of 50 proposals. By codifying these delegation flows on-chain, ODE could improve the accuracy of representative decision-making, particularly in situations where certain tokenholders are unable or unwilling to participate directly; rather shifting governance power to a default-optimistic function for long-tail or specialized delegates.

The final chart gives a snapshot of delegate voting frequency in relation to in-process registration of their vote within the voting period, on average. Here we see that the most frequent voters often vote later in the voting period; providing validation to early, more specialized or equipped deciders. In addition to identifying key voters, Oxcart would effectively amplify the decision-making power of early and frequent voters within a voting process, potentially inspiring more delegates to bring context into the active voting process sooner, improving decision-making efficiency.

Future Directions

The ODE experiment on Arbitrum aims to evolve with additional features, including:

Research on intra-delegate support metrics to better understand how legitimacy flows between delegates over time.

Expanded experiments to include more delegates beyond the top 100, enabling a broader range of participation.

Continued collaboration with researchers to analyze the large datasets generated by the tool and explore how decentralized governance can be further optimized.

The ODE experiment demonstrates the potential of the Oxcart Method to foster a more responsive and dynamic governance system, providing valuable insights for DAOs seeking to balance flexibility and legitimacy in their governance models.