Analyzing the Voting Patterns of Delegates in Arbitrum Proposals

(Analysis of Delegates Voting Patterns in Arbitrum Proposals)

Description of the main task: The "Analysis of Delegates Voting Patterns in Arbitrum Proposals" project aims to investigate the voting behaviors of delegates within the Arbitrum governance framework. Through rigorous statistical analysis of a comprehensive dataset, we seek to uncover consistent patterns and correlations in delegate voting across various proposals. The approach prioritizes systematic methodology and thorough documentation, aiming to provide valuable insights into delegate participation and decision-making dynamics.

Description of the sub-task - “Optimizing Voting Periods: An Analysis of Day-Wise Voting Patterns in Arbitrum Proposals”: The sub-task "Optimizing Voting Periods: An Analysis of Day-Wise Voting Patterns in Arbitrum Proposals" investigates the feasibility of shortening voting periods from 7 to 6 days. By analyzing day-to-day vote counts and voting power, we aim to identify opportunities for optimization while ensuring effective decision-making. This involves examining trends in vote distribution, identifying influential voters, and assessing the impact of last-day voting. The goal is to provide insights to streamline governance processes within the Arbitrum DAO ecosystem.

Table Of Content:

Summary:

This report investigates voting patterns across various proposals with the aim of evaluating the possibility of reducing the voting period on Snapshot proposals from 7 days to 6 days. The analysis utilizes a dataset containing day-wise vote counts and voting power data to gain insights into voter behavior within the Arbitrum DAO ecosystem.

Introduction:

Snapshot is a platform facilitating off-chain voting on proposals submitted by different DAOs. Currently, the voting period for each proposal spans 7 days. This analysis aims to explore day-wise voting behaviors of participants across diverse proposals based on both the number of votes and the associated voting power. The objective is to check whether reducing the timeline from 7 days to 6 days is feasible for the network participants. Reducing the timeline can save a valuable day in the proposer's waiting cycle for action.

Methodology:

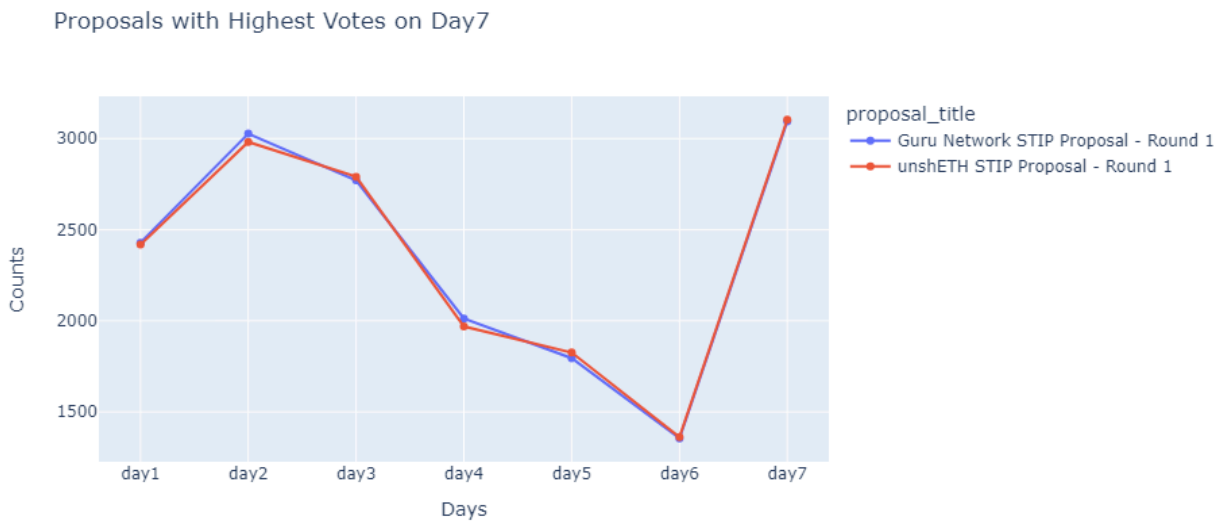
1. **Data Collection:**
    - Data collected from closed proposals within the Arbitrum DAO Ecosystem using the Snapshot GraphQL API Endpoint.
    - Utilized GraphQL queries to extract relevant data from the API.
    - Created two distinct datasets containing day-wise vote counts and day-wise voting power for each proposal.

2. **Data Preprocessing:**
    - Conducted preprocessing tasks to ensure data readiness for analysis.
    - Formatted the data into a suitable structure for analysis purposes.
    - Ensured consistency and accuracy by converting data types as required.
    - Addressed missing values through appropriate handling techniques.
    - Generated new columns and datasets derived from existing ones to enhance analytical capabilities.

Key Insights on the Analysis on Day-Wise Vote Counts

Proposals with highest votes/voters on the last day:

- 'Guru Network STIP Proposal - Round 1'
- 'unshETH STIP Proposal - Round 1'

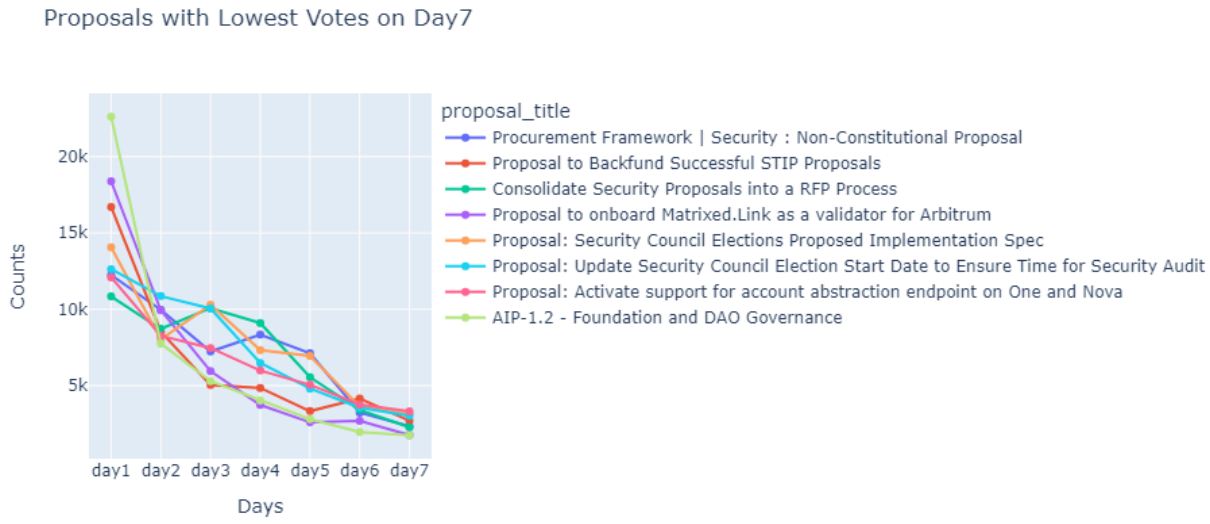


Source: [Graph Link]

Based on the line chart presented above, it is evident that the proposals titled 'Guru Network STIP Proposal - Round 1' and 'unshETH STIP Proposal - Round 1' garnered the highest number of votes on the final day of voting on Snapshot proposals. This observation underscores the significance of last-minute voting activity and its impact on the outcome of proposals within the Arbitrum DAO ecosystem.

Proposals with lowest votes/voters on the last day:

- 'Procurement Framework | Security : Non-Constitutional Proposal',
- 'Proposal to Backfund Successful STIP Proposals',
- 'Consolidate Security Proposals into a RFP Process',
- 'Proposal to onboard Matrixed.Link as a validator for Arbitrum',
- 'Proposal: Security Council Elections Proposed Implementation Spec',
- 'Proposal: Update Security Council Election Start Date to Ensure Time for Security Audit',
- 'Proposal: Activate support for account abstraction endpoint on One and Nova',
- 'AIP-1.2 - Foundation and DAO Governance'



Source: [Graph Link]

Based on the line chart presented above, it is evident that the above listed 8 proposals' received the lowest number of votes on the final day of voting on Snapshot proposals.

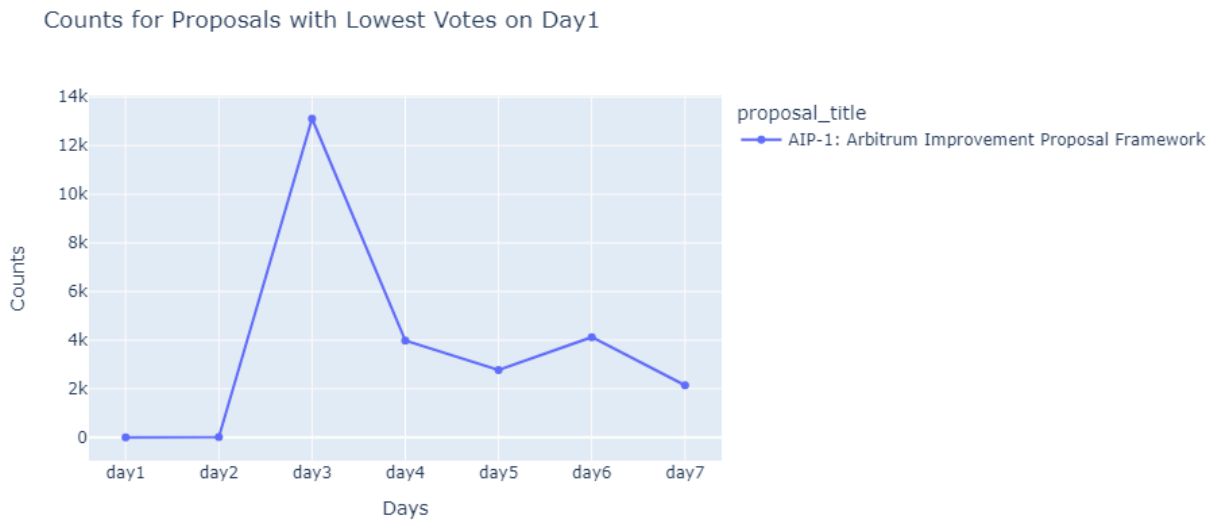
Proposals with highest votes/voters on the first day:

- There are 52 proposals that have the highest votes/voters on day1.

The observation that 52 proposals garnered the highest number of votes or voters on the first day of the voting period suggests an early surge in engagement and participation within the Arbitrum DAO ecosystem. This early enthusiasm may indicate strong initial support or interest in these proposals from the community. Furthermore, it highlights the significance of early voting behavior in shaping the trajectory and potential success of proposals, underscoring the importance of effectively engaging stakeholders from the outset of the voting process.

Proposals with lowest votes/voters on the first day:

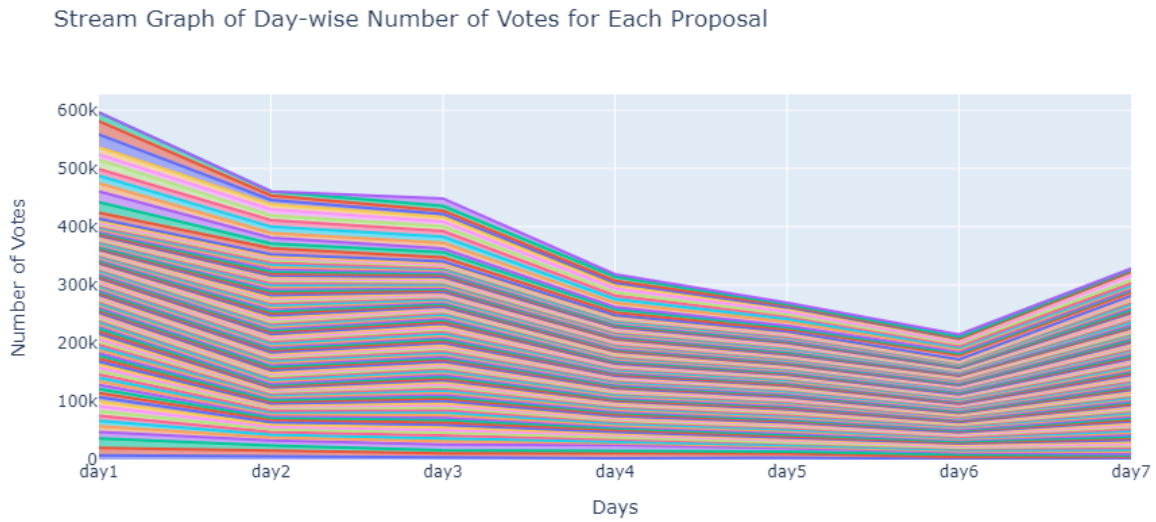
- 'AIP-1: Arbitrum Improvement Proposal Framework'



Source: [Graph Link]

The proposal titled 'AIP-1: Arbitrum Improvement Proposal Framework' stands out as the only proposal with the lowest number of votes on the first day of voting, receiving just 8 votes. Notably, this proposal's voting period spanned 6 days instead of the standard 7 days, which explains the absence of votes on day 1. This observation highlights the potential impact of voting duration on early engagement levels and underscores the importance of considering the timing and duration of voting periods in maximizing community participation and decision-making efficacy.

Day-wise Votes Count of all the Proposals (Stream Graph):



Source: [Graph Link]

The stream graph visualizing the 114 proposals of basic types portrays the day-wise count of votes or the number of voters engaging with each proposal. Initially, there is a consistent trend of diminishing votes observed in the aftermath of the initial 24 hours following the commencement of each proposal. This trend suggests a gradual waning of voter participation over the course of the proposal's duration.

However, a significant deviation from this declining trend becomes evident during the concluding phase of the proposals. Specifically, on day 7, which denotes the culmination of the voting period for each proposal, there is a notable surge in votes. This surge represents a heightened level of engagement from voters, likely spurred by the impending closure of the voting window.
This suggests that more people tend to vote just before the voting period ends, making the last day especially busy for voting.

Key Insights on the Analysis on Day-Wise Voting Power

Proposals with highest voting power on the last day:

- There are a total of 101 proposals with the highest voting power on day7.

The data reveals that on the last day of voting, a significant number of proposals, precisely 101 in total, exhibited the highest voting power. This observation suggests a potential trend where voters with substantial influence tend to concentrate their voting activity towards the conclusion of the voting period. Such concentrated voting power on the final day may indicate strategic decision-making or heightened engagement among influential stakeholders, emphasizing the pivotal role played by these stakeholders in shaping the outcomes of proposals within the Arbitrum DAO ecosystem.

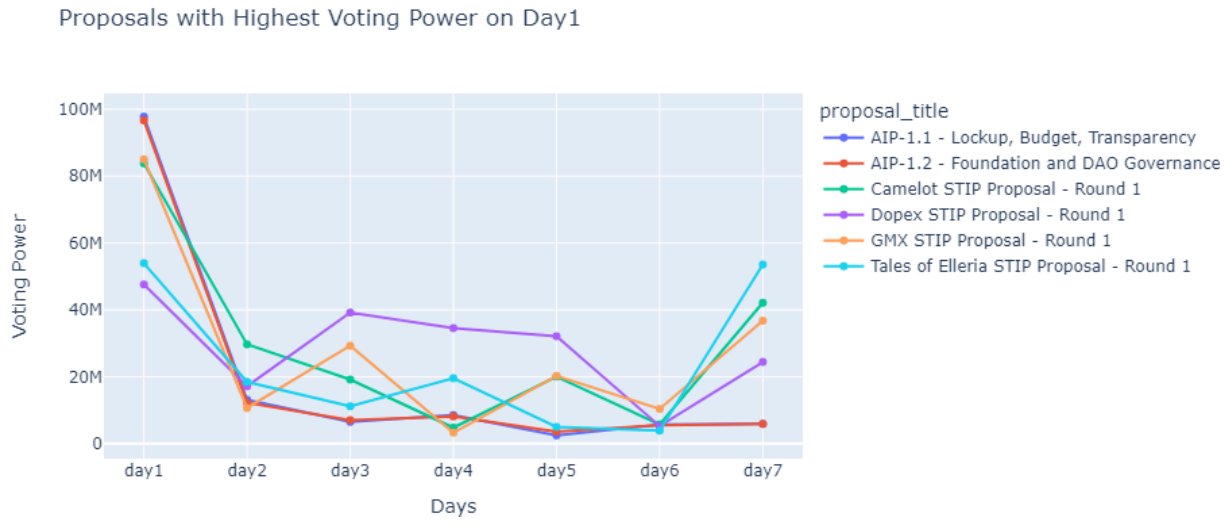
Proposals with lowest voting power on the last day:

- There are no proposals with the lowest voting power on day7.

Interestingly, the analysis indicates that there are no proposals with the lowest voting power on the final day of voting. This observation may suggest that even on the last day of voting, all proposals within the Arbitrum DAO ecosystem maintain a certain level of voting power, implying continued engagement and interest from the voting community across various proposals. Such sustained participation underscores the importance of every proposal, regardless of its voting power, in the democratic decision-making process within the DAO ecosystem.

Proposals with highest voting power on the first day:

- 'AIP-1.1 - Lockup, Budget, Transparency',
- 'AIP-1.2 - Foundation and DAO Governance',
- 'Camelot STIP Proposal - Round 1',
- 'Dopex STIP Proposal - Round 1',
- 'GMX STIP Proposal - Round 1',
- 'Tales of Elleria STIP Proposal - Round 1'

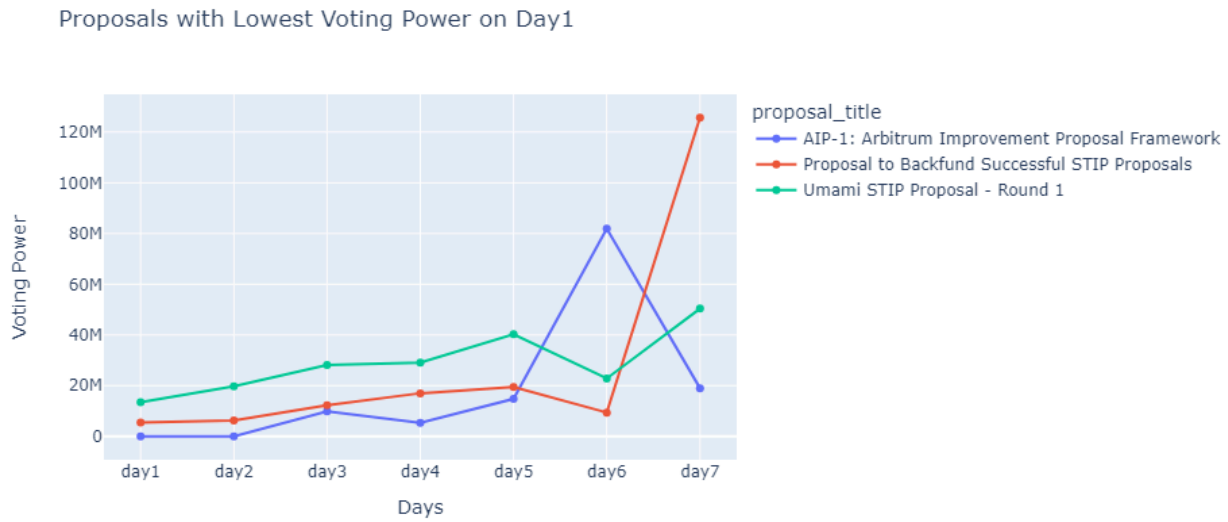


Source: [Graph Link]

The analysis reveals that six proposals listed above exhibited the highest voting power on the first day of voting. This early surge in voting power for these proposals may indicate strong initial support or strategic voting behaviors by participants. Further investigation into the nature of these proposals and the voting dynamics could provide deeper insights into the factors influencing their early popularity and support.

Proposals with lowest voting power on the first day:

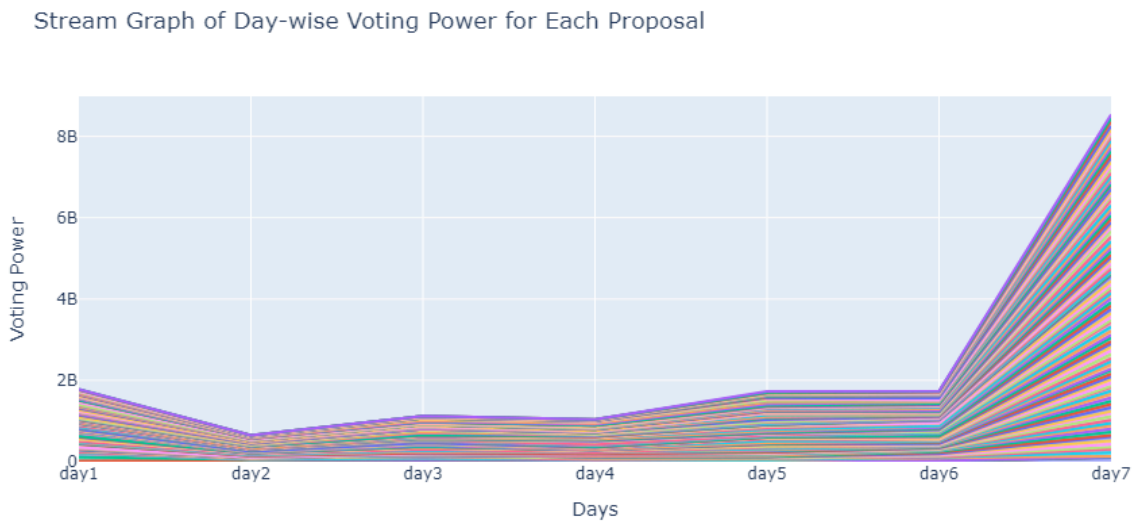
- 'AIP-1: Arbitrum Improvement Proposal Framework',
- 'Proposal to Backfund Successful STIP Proposals',
- 'Umami STIP Proposal - Round 1'



Source: [Graph Link]

The analysis identifies three proposals, namely 'AIP-1: Arbitrum Improvement Proposal Framework', 'Proposal to Backfund Successful STIP Proposals', and 'Umami STIP Proposal - Round 1', with the lowest voting power on the first day of voting. This suggests that these proposals initially attracted less support or attention from voters compared to others in the ecosystem. Understanding the reasons behind the relatively low voting power on the first day could provide valuable insights into voter engagement and proposal dynamics within the Arbitrum DAO ecosystem.

Day-Wise Voting Power of Each Proposal (Stream Graph):



Source: [Graph Link]

The stream graph depicting the day-wise voting power of each proposal provides valuable insights into the temporal dynamics of voting activity within the Arbitrum DAO ecosystem. Notably, the voting power exhibits a discernible pattern over the course of the voting period. Initially, on day 1, there is a surge in voting power, suggesting a strong initial engagement from voters. Subsequently, there is a slight decline in voting power on days 2 to 4, followed by a gradual increase leading up to day 7, where the voting power reaches its peak. This trend indicates a heightened level of participation and engagement from voters as the voting period progresses, culminating in a significant increase in voting power on the final day. Understanding these temporal variations in voting activity provide valuable insights for optimizing voting strategies and enhancing voter engagement initiatives within the ecosystem.

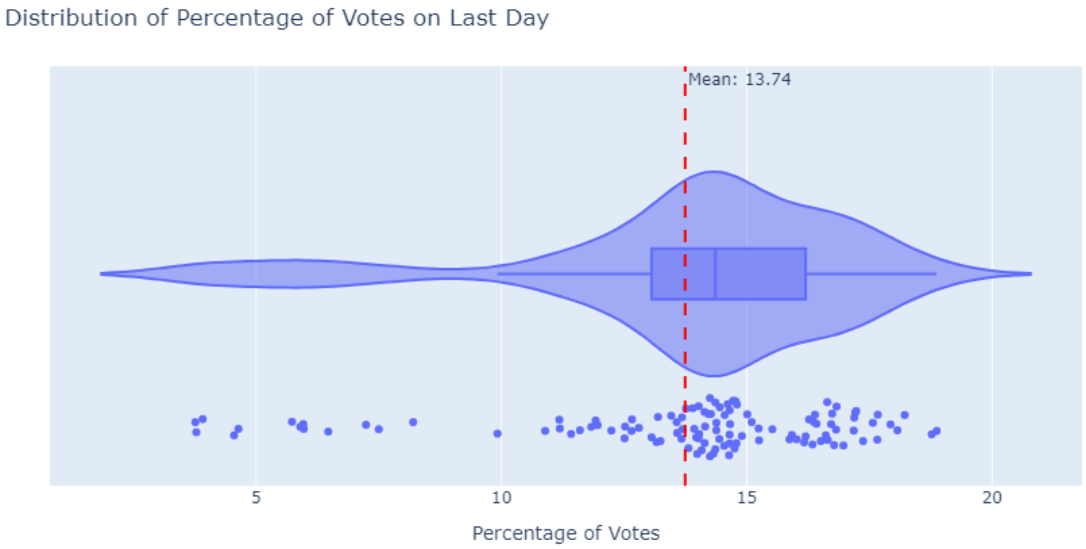
Influence of the Voters who Votes on Last Day based on their Voting Power:

- **Filtering Dataset for Last 24-Hour Voters:**
  The dataset was filtered to isolate the records corresponding to voters who cast their ballots within the final 24 hours preceding the conclusion of the proposals.
- **Calculation of Total Voting Power on Last Day:**
  Subsequently, the total voting power wielded by voters who participated on the last day was computed.
- **Determination of Percentage of Last-Day Voting Power:**
  The percentage of the total voting power attributed to voters engaged on the last day was then calculated in relation to the aggregate voting power of the entire proposal.
- **Identification of Proposals with High Last-Day Voting Power:**

Finally, proposals exhibiting a voting power exceeding 70% from participants who voted on the last day were identified.

Based on the analysis results, it has been observed that there are a total of 40 proposals meeting the criterion of possessing more than 70% of their voting power contributed by participants who voted on the last day. Remarkably, all these proposals belong to the category of STIP (Short Term Incentive Program) proposals. This finding underscores the significant influence of last-day voters in shaping the outcomes of STIP proposals within the voting ecosystem.

Last-Day Voting Percentage Analysis: Understanding the Proportion of Votes Cast on the Final Day of All Proposals



Source: [Graph Link]

Insights from Last-Day Voting Percentage Analysis:

1. **Distribution Overview:** The violin plot illustrates the distribution of the percentage of votes cast on the final day across all proposals. The plot reveals various characteristics such as the range, spread, and density of the voting percentages.

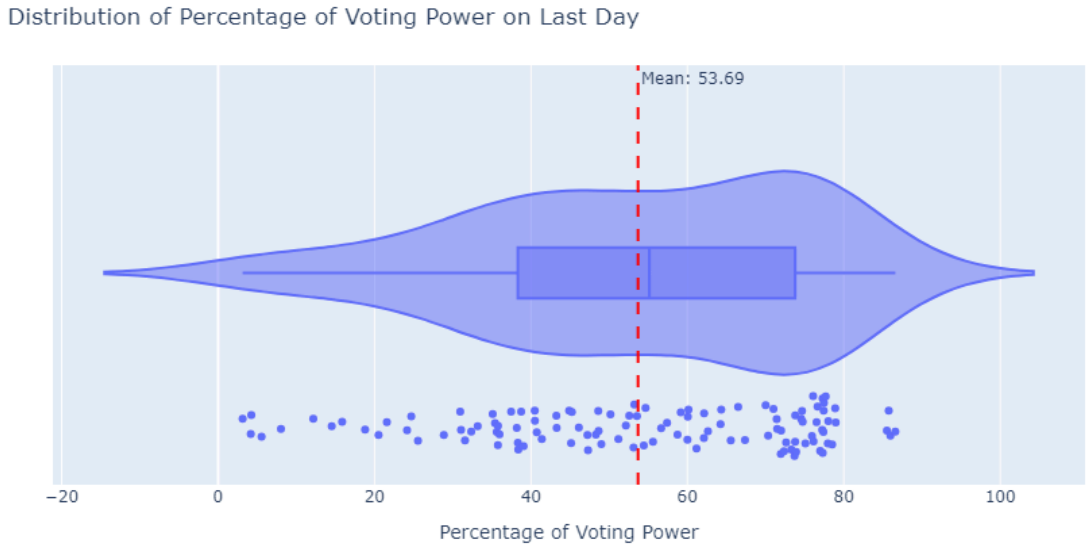
2. **Central Tendency:** The mean voting percentage on the last day is approximately 13.74%, indicating that, on average, around 13.74% of the total votes are cast on the final day of voting for each proposal.

3. **Variability:** The standard deviation of approximately 3.44 suggests a moderate degree of variability in the voting percentages. This variability is further reflected in the interquartile range (IQR) between the 25th and 75th percentiles, which spans from approximately 13.08% to 16.19%.

4. **Outliers:** The minimum and maximum values of 3.76% and 18.87%, respectively, indicate the presence of some proposals with significantly lower or higher voting percentages on the last day compared to the majority of proposals.

5. **Central Tendency Representation:** The dashed red line in the violin plot represents the mean voting percentage of 13.74%, providing a visual reference for the central tendency of the distribution.

Last-Day Voting Power Percentage Analysis: Understanding the Proportion of Voting Power on the Final Day of All Proposals



Source: [Graph Link]

Insights from Last-Day Voting Power Percentage Analysis:

1. **Central Tendency:** The mean percentage of voting power allocated to the last day is approximately 53.69%, indicating that, on average, a significant portion of voting power is concentrated on the final day of proposal voting.

2. **Variability:** The distribution of voting power percentages on the last day exhibits notable variability, with a standard deviation of approximately 21.50%. This variability suggests

that proposals vary widely in terms of the proportion of voting power allocated to the final day.

3. **Quartile Analysis:** The interquartile range (IQR), defined by the 25th and 75th percentiles, spans from 38.34% to 73.76%. This range encapsulates the middle 50% of the data and highlights the diversity of voting power distribution among proposals.
4. **Skewness:** The distribution of voting power percentages on the last day appears to be positively skewed, as evidenced by the median (50th percentile) being closer to the lower quartile (38.34%) than the upper quartile (73.76%). This skewness suggests that a higher proportion of proposals have voting power percentages skewed towards the lower end of the distribution.

5. **Outliers:** Although the majority of proposals fall within the interquartile range, there are outliers with voting power percentages as low as 3.14% and as high as 86.59% on the last day. These outliers represent proposals with exceptionally low or high concentrations of voting power on the final day compared to the rest of the dataset.

6. **Implications:** Understanding the distribution of voting power percentages on the last day is crucial for stakeholders involved in proposal decision-making. The concentration of voting power on the final day underscores the importance of timely engagement and strategic planning to maximize influence and ensure favorable outcomes for proposals.

Conclusion:

In conclusion, the analysis conducted on the day-wise voting patterns within the Arbitrum DAO ecosystem provides valuable insights into the feasibility of reducing the voting timeline from 7 days to 6 days. The objective of this analysis was to assess whether such a reduction would be viable for network participants, with the aim of saving a valuable day in the proposer's waiting cycle for action.

Based on the findings, several key observations emerge:

1. **Early Engagement and Last-Day Activity:** The analysis revealed a surge in voting activity both at the beginning and end of the voting period. This indicates that participants tend to engage early on and also make significant contributions towards the conclusion of the voting window. This suggests that even with a shorter timeline, participants are likely to remain engaged throughout the voting process.

2. **Influence of Last-Day Voters:** A significant proportion of proposals, particularly those under the Short Term Incentive Program (STIP), saw a substantial portion of their voting power concentrated on the last day. This underscores the influence of last-day voters in shaping proposal outcomes.

3. **Sustained Engagement:** Despite variations in voting power and percentages across proposals, the analysis indicates sustained engagement throughout the voting period. Even on the final day, there was no proposal with the lowest voting power, implying continued interest and participation from the voting community.

4. **Potential Impact of Shorter Timeline:** While the analysis does not directly assess the impact of reducing the voting timeline, the observed patterns suggest that such a reduction may not significantly hinder participant engagement or decision-making efficacy. Given the sustained engagement and concentration of voting activity towards the end of the voting period, it is plausible that a shorter timeline could streamline the decision-making process without sacrificing community involvement.

In light of these observations, it is reasonable to conclude that reducing the voting timeline from 7 days to 6 days appears feasible for network participants within the Arbitrum DAO ecosystem. Such a reduction could potentially optimize the decision-making process, save valuable time in the proposer's waiting cycle for action, and maintain robust community engagement throughout the voting period.

Resources:-

Snapshot API Docs (For getting snapshot votes data): https://docs.snapshot.org/tools/api
Pandas (Python Library for Data Manipulation): https://pandas.pydata.org/docs/
Plotly (Python Library for Interactive Visualization): https://plotly.com/python/
Lighthouse (For Hosting Visualization Files): https://docs.lighthouse.storage/lighthouse-1
IPFS Pinata (For Hosting Dataset): https://black-decisive-cobra-689.mypinata.cloud/ipfs/

Dataset:-

Link: Dataset Link