DAOs: Organizations Without Managers

Module 3: The Trust Problem — Companion Lecture

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Digital Finance — BSc Course

Companion lecture — explores how blockchain-based organizations replace managers with code and token voting.

Why do shareholders have so little say in the companies they own?

The corporate governance problem:

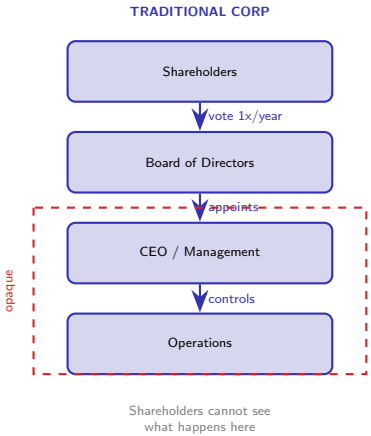
- Shareholders vote once a year at annual meetings
- Board of directors appoints the CEO
- Management controls day-to-day decisions
- Shareholders cannot see how money is spent in real time

When governance fails:

- **Enron (2001):** $74 billion lost, executives hid debt off-balance-sheet
- **Wirecard (2020):** €1.9 billion in cash that never existed
- **FTX (2022):** $8 billion in customer funds misappropriated
- In each case, boards and auditors failed to prevent fraud

The core tension:
Shareholders own the company but cannot observe or control what managers do between annual meetings.

Key insight: Corporate governance relies on trusting people. DAOs propose replacing that trust with code.



Traditional governance puts layers of delegation between owners and operations — each layer adds cost, delay, and opacity.

Imagine 10,000 owners voting on a $50K decision — in 72 hours, with automatic execution

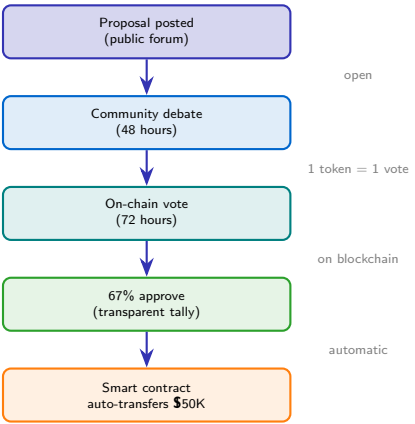
The scenario:
A decentralised protocol earns $2 million per year in fees. Someone proposes: "Hire a marketing agency for $50,000 to expand into Asia."

What happens in a DAO:

1. Proposal posted on governance forum (public, transparent)
2. Community discusses for 48 hours
3. On-chain vote opens — 10,000 token holders can vote
4. Vote lasts 72 hours — each token = one vote
5. Result: 67% approve
6. Smart contract automatically transfers $50,000 to the agency
7. No CEO needed. No board meeting. No middleman.

In a traditional company:
Board discusses behind closed doors, CEO decides, shareholders learn about it in the next quarterly report.

The difference: Every decision is public. Every vote is recorded. Every transfer is auditable.



A DAO replaces board meetings with public proposals, annual votes with continuous governance, and CEO decisions with smart contract execution.

What is a DAO and how does token-based voting replace boards and managers?

Definition: Decentralised Autonomous Organisation (DAO)

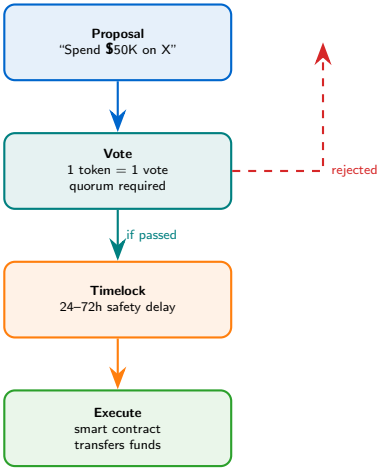
An organisation governed by token holders through on-chain voting, where proposals are executed automatically by smart contracts. Treasury funds are controlled by code, not by individuals.

Core components:

1. **Governance token:** 1 token = 1 vote (like shares, but with direct voting power)
2. **Proposal system:** anyone with enough tokens can submit a proposal
3. **Quorum:** minimum percentage of tokens must vote for validity
4. **Timelock:** delay between vote passing and execution (safety buffer)
5. **Treasury:** smart contract holding funds, released only by vote

Key differences from corporations:

- No board of directors — token holders vote directly
- No CEO — execution is automatic or delegated by vote
- Treasury is on-chain — every transaction visible
- Global membership — anyone can buy tokens



How does MakerDAO govern a $8B+ protocol with token votes instead of a board?

MakerDAO (rebranded to Sky in 2024):

- Created DAI, the largest decentralised stablecoin
- Total Value Locked: ∼$5–7 billion (Source: DeFi Llama, 2026)
- Governed entirely by MKR token holders
- No CEO, no board, no headquarters

What MKR holders vote on:

- **Collateral types:** which assets can back DAI
- **Stability fees:** interest rates on DAI loans
- **Liquidation ratios:** when to sell collateral
- **Protocol upgrades:** smart contract changes
- **Budget allocations:** funding for development teams

Scale of governance:

- 300 governance proposals voted on in 2024
- Approved $70M+ in annual budget for 20+ sub-DAOs
- Decisions that would take months in a corporation happen in weeks

Key insight: MakerDAO proves that a multi-billion dollar financial system can operate without a traditional management structure.

Metric	MakerDAO / Sky
TVL	∼$5–7B (DeFi Llama)
Stablecoin	DAI
Gov. token	MKR
Proposals/yr	300
Annual budget	$70M+
Sub-DAOs	20+
Employees	0 (contributors only)
Headquarters	None
Legal entity	Cayman foundation

The paradox: MakerDAO has no employees, yet it manages more assets than most banks. "Contributors" are funded by governance votes, not employment contracts.

Rebranding: In 2024, MakerDAO rebranded to Sky and introduced "SubDAOs" — smaller governance units for specific functions.

MakerDAO manages $8B+ with token votes instead of a board — the most successful experiment in decentralised corporate governance to date.

How does a DAO proposal go from idea to execution — step by step?

The governance pipeline (typical DAO):

Step 1 — Forum discussion:
Anyone posts a proposal on the governance forum. Community debates merits, risks, and alternatives for 3–7 days.

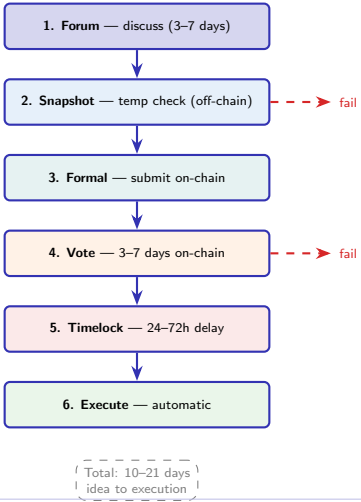
Step 2 — Temperature check (Snapshot):
Off-chain vote to gauge support (Snapshot is a platform for off-chain, gasless governance voting). No gas fees. Simple majority needed.

Step 3 — Formal proposal:
If temperature check passes, a formal on-chain proposal is submitted. Requires minimum token threshold (e.g., 10,000 tokens).

Step 4 — On-chain vote:
Token holders vote for 3–7 days. Quorum typically 4–10% of supply. Supermajority (66%) often required.

Step 5 — Timelock:
24–72 hour delay before execution. Allows users to exit if they disagree.

Step 6 — Execution:
Smart contract executes the approved action automatically. No human intervention.



A DAO governance pipeline takes 10–21 days from idea to execution — slower than a CEO decision, but faster and more transparent than annual shareholder votes.

What can go wrong with DAOs — from the $50M hack to 3% voter turnout?

The DAO hack (June 2016):

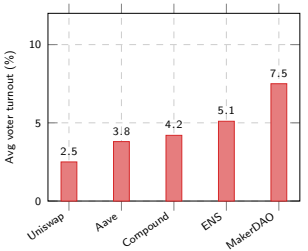
- "The DAO" raised $150 million in ETH — largest crowdfund ever
- Attacker exploited a **re-entrancy attack:** the attacker's contract calls the victim's withdrawal function repeatedly before the balance is updated — like an ATM dispensing cash before checking your account
- $50 million drained before community could react
- Ethereum hard-forked to reverse the hack (creating Ethereum Classic)
- Lesson: "code is law" until the code has a bug

Voter apathy:

- Average DAO voter turnout: 3–5% of token supply
- Most token holders never vote — they are speculators, not governors
- Low turnout means a small group can control outcomes

Other attack vectors & governance failures:

- **Flash loan attacks:** borrow tokens, vote, return tokens in one transaction
- **Whale dominance:** top 10 wallets often hold 40–60% of governance tokens
- **Governance capture (Mango Markets, Oct 2022):** A. Eisenberg drained $117M via oracle manipulation and voted his own governance



Turnout figures vary per proposal; source: DeepDAO governance trackers (deepdao.io). Even the best-governed DAOs rarely exceed 10% participation.

Comparison: US presidential elections see 60% turnout. Corporate shareholder votes average 70–80%. DAO governance participation is an order of magnitude lower.

Where are DAOs today — $25B in treasuries across thousands of organisations?

DAO ecosystem (early 2026; Source: DeepDAO, deepdao.io):

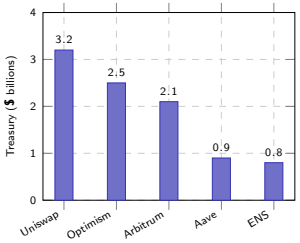
- ∼$20–25 billion in DAO treasuries globally
- Thousands of active DAOs across DeFi, NFTs, social, grants
- Largest: Uniswap ($3B+), Optimism ($2B+), Arbitrum ($2B+)

Major DAO categories:

- **Protocol DAOs:** Uniswap, Aave, Compound — govern DeFi protocols
- **Grant DAOs:** Gitcoin, Optimism RetroPGF — fund public goods
- **Social DAOs:** Friends with Benefits — membership communities
- **Investment DAOs:** The LAO, MetaCartel — collective investing
- **Service DAOs:** RaidGuild — decentralised agencies

Legal recognition:

- Wyoming (US): DAO LLC law (2021)
- Marshall Islands: DAO Act (2022)
- Switzerland: association structure used by many DAOs
- EU: no specific DAO framework yet



Treasury values fluctuate with token prices; source: DeepDAO (deepdao.io).

Trend: DAOs are increasingly funding real-world activities — grants for open-source software, legal defence funds, and even venture investing.

DAOs collectively manage $25B+ in treasuries — comparable to a mid-sized bank, but governed by token votes instead of a board of directors.

Do DAOs create democratic organisations or just a new form of plutocracy?

The democracy argument:

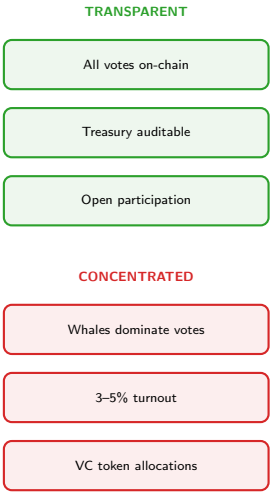
- Anyone can buy tokens and participate in governance
- Every proposal and vote is publicly recorded
- Treasury spending is transparent and auditable
- No insider deals — all decisions are on-chain

The plutocracy argument:

- 1 token = 1 vote means the wealthy dominate
- Top 10 wallets often hold 40–60% of governance power
- Founders and VCs receive large token allocations at launch
- Flash loans allow temporary "governance power" rentals
- 3–5% turnout means decisions are made by insiders

Emerging solutions:

- **Quadratic voting:** cost of votes increases quadratically (reduces whale power)
- **Delegation:** token holders delegate to active voters
- **Reputation-based:** voting power earned through participation
- **Time-weighted:** longer holding = more voting power



Key insight: DAOs are more transparent than corporations but not more democratic. Transparency and democracy are different properties.

DAOs prove that transparent governance is possible — but 1-token-1-vote replicates the wealth concentration problem it was designed to solve.

So what? One sentence to remember about DAOs

DAOs replace boards with on-chain voting —
but 3–5% turnout shows that decentralising power
does not automatically create engaged governance.

What DAOs solve	What DAOs do not solve	What comes next
Transparent treasury	Voter apathy	Quadratic voting
Public decision-making	Wealth concentration	Delegation systems
Global participation	Legal accountability	Legal frameworks
No insider control (in theory)	Fast crisis response	Hybrid DAO-corp models

DAOs are an experiment in organisational design — the transparency is real, but the governance challenge of motivating participation remains unsolved.

Your turn: design a DAO for your university student association

Discussion Question

Your university student association has 5,000 members and a €200,000 annual budget. You are tasked with designing a DAO to govern it.

Design decisions:

- How should governance tokens be distributed? One per student? By participation?
- What decisions require token votes vs delegation to elected representatives?
- How do you prevent a small group of active members from controlling all decisions?
- Should votes be anonymous or public? What are the trade-offs?

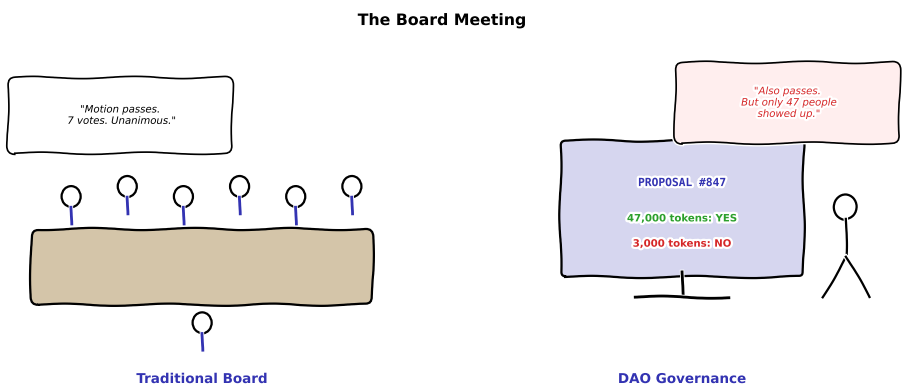
Further Reading

- DeepDAO analytics: `deepdao.io`
- Buterin (2021), "Moving beyond coin voting governance"
- El Faqir et al. (2020), "An Overview of Decentralized Autonomous Organizations on the Blockchain"

Reflection

The hardest problem in DAO design is not the technology — it is motivating people to participate in governance.

The Board Meeting



Traditional boards: 7 people decide for millions. DAOs: millions could decide, but few show up.

Learning Objectives

After completing this lecture, you will be able to:

1. **Explain** why traditional corporate governance concentrates power and creates information asymmetry [Understand]
2. **Describe** how DAOs (Decentralised Autonomous Organisations) replace managerial hierarchies with token-based voting and smart contracts [Understand]
3. **Trace** a governance proposal from forum discussion through on-chain execution [Apply]
4. **Compare** voting mechanisms (1-token-1-vote, quadratic, conviction, delegated) and their trade-offs [Analyze]
5. **Evaluate** whether DAOs with 3–5% voter turnout are more or less democratic than traditional corporations [Evaluate]

Bloom's levels: Understand → Apply → Analyze → Evaluate

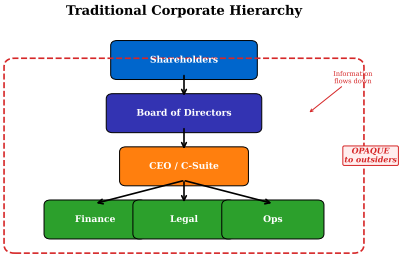
Objectives follow Bloom's taxonomy. We build from understanding DAOs to evaluating their democratic legitimacy.

Corporate Governance Has Failed — Repeatedly

Every major financial scandal had a board:

- **Enron (2001):** Board waived its own ethics code — twice
- **Wirecard (2020):** Supervisory board ignored €1.9B missing for years
- **FTX (2022):** Three-person board, no independent directors, $8B customer funds missing

Pattern: Small groups of insiders, opaque decision-making, shareholders informed last.



What you see: Four-layer hierarchy with a dashed red "opaque" box — shareholders sit outside the information flow.

Boards are supposed to represent shareholders. In practice, information asymmetry makes oversight difficult.

Corporate Governance by the Numbers

Board Size

7–12

Average directors on an S&P 500 board

Deciding for **millions** of shareholders

CEO Pay Ratio

272:1

CEO-to-median-worker pay ratio (2022)

Approved by boards shareholders rubber-stamp

Say-on-Pay

Non-binding

Shareholder votes on executive pay

Board can ignore the result entirely

S&P 500 boards: data from Spencer Stuart Board Index 2023. CEO pay ratio: Economic Policy Institute.

Three People Who Need a Better Way

Sarah — Zürich

Uniswap liquidity provider (LP). Earns fees on her capital but has **no say** in protocol fee changes.

"I provide $50K in liquidity but can't vote on the fee switch that affects my income."

Needs: Governance rights proportional to her stake.

Wei — Singapore

Open-source developer. Wants funding for a DeFi analytics tool — but VCs want 40% equity and board seats.

"I just want to build. Why do I need to give up control to get funded?"

Needs: Grant funding without equity dilution.

Amara — Lagos

Runs a cooperative of 200 farmers. Registering a company costs $2,000 and takes 6 months.

"My cooperative exists — it just doesn't exist on paper."

Needs: A legal-lite coordination structure.

These three represent real use cases: investor governance (Sarah), permissionless funding (Wei), and global access (Amara).

Have you ever voted in a shareholder meeting?

A) Yes, I actively vote on proposals

B) I own shares but never voted

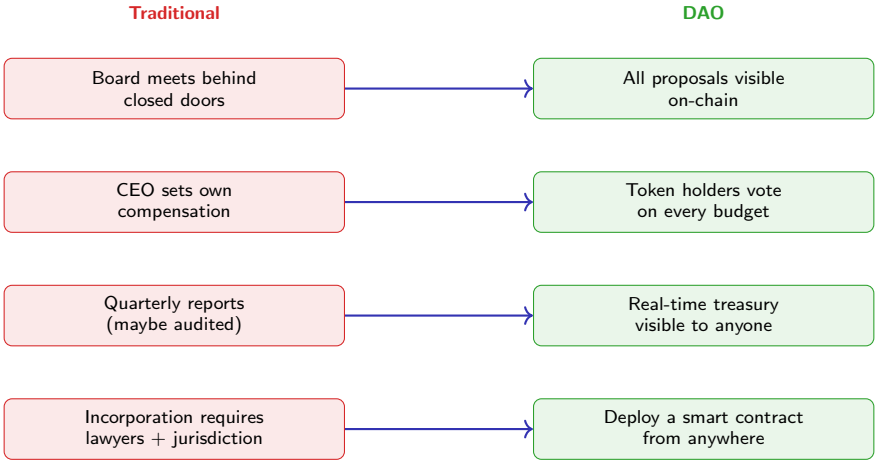
C) I don't own any shares

D) What's a shareholder meeting?

Most BSc students pick C or D — and that is exactly the point. Governance feels distant.

If you picked B, you are the norm: retail shareholders almost never vote. DAOs face the same problem.

What If Governance Were Transparent and Programmable?



DAOs don't just digitise governance — they make it transparent, programmable, and globally accessible.

What Is a DAO?

Definition: Decentralised Autonomous Organisation (DAO)

A **DAO** is an organisation represented by rules encoded as smart contracts on a blockchain, where decisions are made through **token-weighted voting** rather than managerial hierarchy.

Three defining properties:

1. **Decentralised:** No single point of control. Governance distributed across token holders.
2. **Autonomous:** Smart contracts execute decisions automatically once voting conditions are met.
3. **Organisation:** Coordinates people, capital, and resources toward a shared goal.

Key insight: A DAO replaces the CEO's judgment with collective voting and the accountant's ledger with a public blockchain.

The term "DAO" was coined by Daniel Larimer (2013) and popularised by Vitalik Buterin in the Ethereum whitepaper (2014).

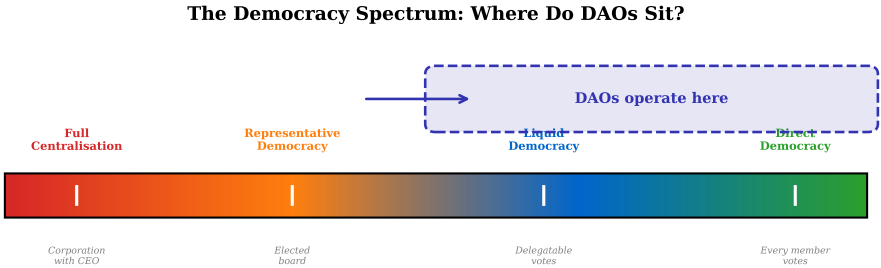
DAO vs. Traditional Corporation

Dimension	Traditional Corporation	DAO
Decision-making	Board + CEO (7–12 people)	Token holders (thousands+)
Transparency	Quarterly reports, audited annually	Real-time, on-chain, public
Joining	Application, interview, contract	Buy or earn tokens
Jurisdiction	Registered in one country	Borderless (code-native)
Execution	Managers implement decisions	Smart contracts auto-execute
Treasury	CFO controls bank accounts	Multi-sig wallet, on-chain
Exit	Sell shares (often restricted)	Sell tokens on open market
Liability	Limited (LLC/AG/GmbH)	Unclear in most jurisdictions

Warning: "Borderless" and "no liability framework" are not always advantages.

DAOs trade familiar legal protections for transparency and programmability. Neither model is universally superior.

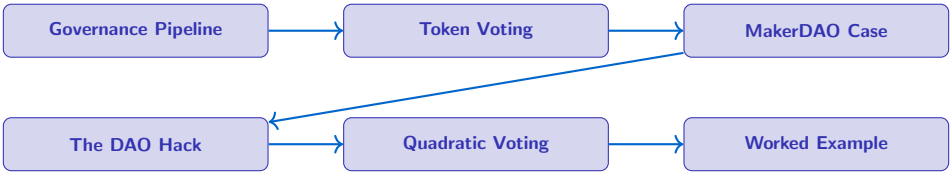
Where Do DAOs Sit on the Democracy Spectrum?



What you see: A horizontal gradient from full centralisation (red) to direct democracy (green). The dashed purple box marks where DAOs typically operate — in the liquid-to-direct democracy range. Most corporations cluster on the left.

DAOs enable direct democracy in theory. In practice, delegation (liquid democracy) is more common because most holders don't vote.

ACT 2: The Mechanics



We will trace a single proposal from forum post to on-chain execution, then study the largest DAO in production.

Act 2 covers mechanics: how proposals move, how votes are counted, and what happens when things go wrong.

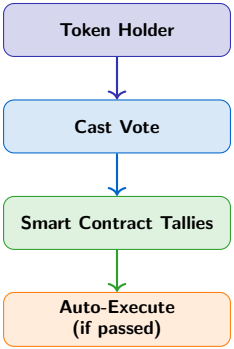
Token Voting: The Engine of DAO Governance

Core mechanism:

- Each governance token = one vote (default model)
- Tokens are **ERC-20** contracts on Ethereum (or equivalent on other chains)
- Holding tokens does not require identity — pseudonymous governance

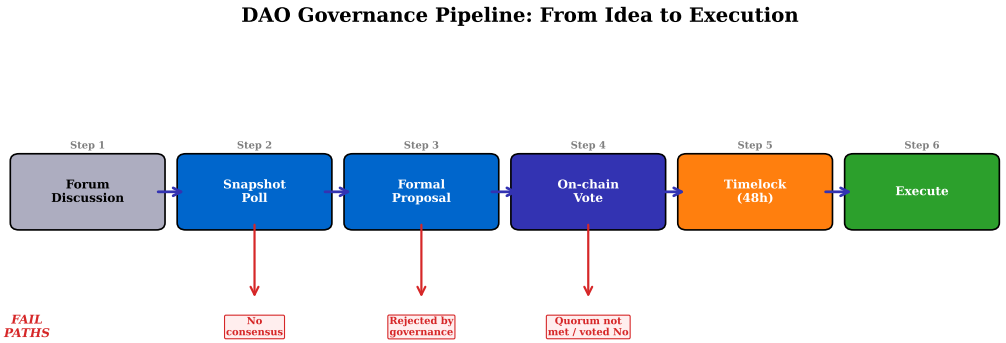
Voting parameters (set by each DAO):

- **Quorum:** Minimum participation (e.g., 4% of tokens must vote)
- **Threshold:** Majority needed (e.g., >50% or >66%)
- **Voting period:** Typically 3–7 days
- **Timelock:** Delay before execution (24–48h)



Token voting is simple but powerful: no intermediary counts votes. The smart contract is both ballot box and executor.

The Governance Pipeline: 6 Steps from Idea to Action



What you see: Six boxes tracing a proposal from Forum Discussion to Execute. Red fail paths branch downward at Steps 2, 3, and 4 — most proposals die before reaching on-chain voting.

Key statistic: In mature DAOs, only 10–20% of forum discussions become formal proposals, and 60–80% of formal proposals pass.

The pipeline acts as a filter: social consensus (Steps 1–2) matters as much as token voting (Step 4).

Pipeline Deep-Dive: What Happens at Each Step

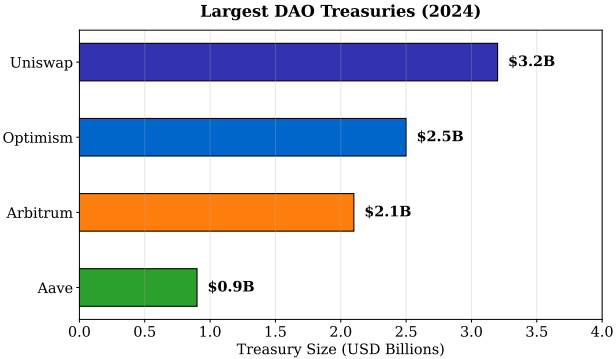
Step	Where	Who Decides	Failure Mode
1. Forum	Discourse / Discord	Community	No interest → thread dies
2. Snapshot	snapshot.org (off-chain)	Token holders	No quorum → abandoned
3. Formal	Governance portal	Delegates / core team	Rejected as not feasible
4. On-chain	Governor contract	All token holders	Quorum not met / voted No
5. Timelock	Timelock contract	Automatic (24–48h wait)	Emergency veto possible
6. Execute	Target contract	Automatic	Reverts if state changed

Why the 6-step pipeline?

- On-chain votes cost gas ($5–50 per voter) — so DAOs pre-filter off-chain
- Snapshot polls are gasless (signed messages, not transactions)
- The timelock gives the community a "last chance" to detect malicious proposals

Gas costs explain why DAOs use off-chain temperature checks (Steps 1–2) before committing to on-chain votes (Step 4).

DAO Treasuries: Billions Without a CFO



What you see: Horizontal bars showing four DAO treasuries. Uniswap leads at $3.2B — larger than the GDP of 20+ countries.

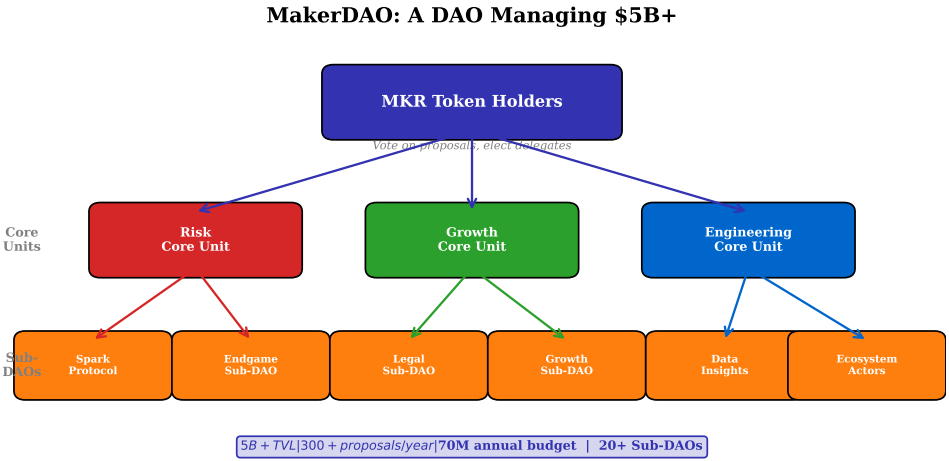
How are these treasuries governed?

- **Multi-signature wallets:** 3-of-5 or 4-of-7 signers
- **On-chain votes:** Any spending requires token holder approval
- **Streaming payments:** Sablier/Superfluid for salaries
- **Full transparency:** Anyone can audit the treasury address

Risk: Multi-sig holders are known attack targets. Social engineering and key compromise remain threats.

DAO treasuries are public by default. Compare: you cannot look up Apple's bank balance. You can check Uniswap's treasury in real time.

Case Study: MakerDAO — The Largest DAO in Production



What you see: MKR token holders at the top, governing three Core Units (Risk, Growth, Engineering), each overseeing multiple Sub-DAOs. Stats: $5B+ TVL,

MakerDAO: How $5B Is Governed by Code + Votes

Key governance statistics:

- **Protocol:** DAI stablecoin (pegged to $1)
- **TVL (Total Value Locked):** $5B+
- **Governance token:** MKR (~$1.5B market cap)
- **Proposals per year:** 300+
- **Annual budget:** $70M (approved by MKR voters)
- **Sub-DAOs:** 20+ specialised units

What does MakerDAO actually decide?

- Collateral types accepted (ETH, USDC, RWA)
- Stability fees (interest rates)
- Risk parameters per vault type
- Core Unit budgets and hiring
- Protocol upgrades and migrations

Endgame Plan (2023): Restructuring into autonomous Sub-DAOs — each with its own token and governance.

MakerDAO shows that DAOs can manage complex financial systems. It also shows the coordination overhead: 300+ proposals per year.

Worked Example: $50K Marketing Proposal

Scenario

Wei submits a proposal to fund a $50K marketing campaign from the DAO treasury. Walk through the full governance pipeline.

Step	Stage	What Happens	Outcome
1	Forum	Wei posts proposal + budget breakdown	47 replies, 80% supportive
2	Snapshot	Off-chain poll: 12,000 tokens vote Yes, 3,000 No	80% approval, proceeds
3	Formal	Core team reviews feasibility + legal	Approved with minor edits
4	On-chain	5-day vote: 45,000 Yes / 5,000 No	Quorum met (4%), passes
5	Timelock	48-hour delay, no veto triggered	Awaiting execution
6	Execute	Smart contract transfers $50K USDC to Wei's address	**Done**

Total time: ∼3 weeks from forum post to funds received.
Total cost: ∼$200 in gas fees for on-chain vote + execution.

Compare corporate budget approval: multiple sign-offs, budget committee, CFO, potentially board. A DAO does this with code + votes.

What If the Proposal Fails?

Scenario A: Quorum not met

- Only 2% of tokens vote (below 4% quorum)
- Proposal expires automatically
- Wei can resubmit after community outreach
- **Root cause:** Voter apathy (the most common failure)

Scenario B: Voted down

- 60% vote No — community disagrees on strategy
- Wei revises the proposal based on feedback
- Resubmits with a smaller budget ($25K)
- **Root cause:** Legitimate disagreement

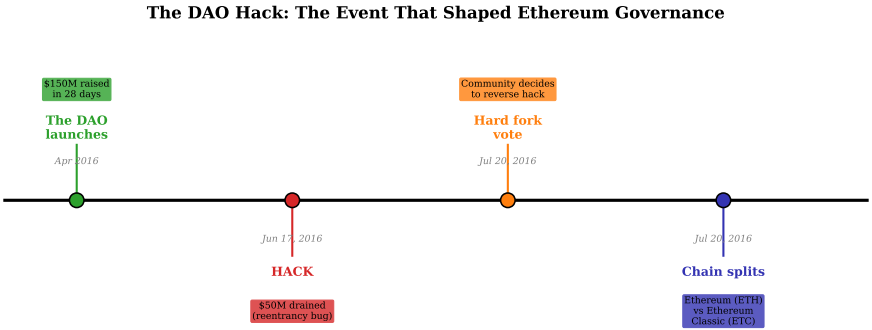
Scenario C: Emergency veto

- Proposal passes on-chain vote
- During 48h timelock, security team discovers Wei's wallet is compromised
- Guardian multi-sig vetoes execution
- **Root cause:** Security concern detected post-vote

Key insight: The pipeline has multiple checkpoints. Failure at any step prevents fund disbursement — unlike a single CEO who can authorise spending unilaterally.

DAOs fail safely: no single point of failure means no single point of fraud. But voter apathy can make the quorum checkpoint meaningless.

The DAO Hack (2016): The Event That Changed Everything



What you see: A four-event timeline. Green: **$**150M raised in April 2016. Red: **$**50M hacked in June. Orange: hard fork vote in July. Purple: Ethereum splits into ETH and Ethereum Classic (ETC).

"The DAO" (capital T) was a specific investment fund on Ethereum. It raised 14% of all ETH in existence and was hacked 72 days later.

The Reentrancy Bug: An ATM Analogy

Normal ATM withdrawal:

1. You request $100
2. ATM checks balance ($500) — OK
3. ATM dispenses $100
4. ATM updates balance to $400

Reentrancy attack:

1. Attacker requests $100
2. ATM checks balance ($500) — OK
3. ATM dispenses $100
4. **Before updating balance**, attacker requests again
5. ATM checks balance ($500 — not yet updated!) — OK
6. ATM dispenses another $100
7. Repeat until empty

The Bug

The DAO's smart contract sent ETH **before** updating the internal balance. The attacker's contract had a fallback function that **re-called** the withdrawal function before the balance update.

`withdraw()` → `send ETH` → `fallback()` → `withdraw()` → `send ETH` → ...

The Fix (Now Standard)

Checks-Effects-Interactions pattern:
1. Check conditions
2. Update state (effects)
3. Then interact (send ETH)

The DAO hack was not a governance failure — it was a code bug. But the governance response (hard fork vs. no fork) split the Ethereum community in two.

The Hard Fork Debate: Code Is Law vs. Social Consensus

Pro Fork (Ethereum)

- $50M stolen from 11,000 investors
- "The attacker exploited a bug, not a feature"
- Community voted 87% in favour
- Pragmatism: fix the damage, move on

Result: Ethereum (ETH) — reversed the hack.

Anti Fork (Ethereum Classic)

- "Code is law" — the contract worked as written
- Reversal sets a dangerous precedent
- Who decides which hacks get reversed?
- Immutability is the whole point

Result: Ethereum Classic (ETC) — kept the hack.

This remains the most important governance debate in blockchain history.

Both sides had valid arguments. The fork succeeded technically but revealed that "decentralised" systems still rely on social consensus.

ETH is now worth ∼$400B. ETC is worth ∼$3B. The market chose pragmatism over ideology — but the debate is not settled.

Four Voting Mechanisms for DAOs

DAO Voting Mechanisms Compared

Mechanism	1-Token 1-Vote	Quadratic Voting	Conviction Voting	Delegated Voting
How It Works	More tokens = more votes	Cost = votes² (sqrt influence)	Votes accrue over time	Delegate to experts
Strength	Simple, transparent	Reduces whale dominance	Resists flash loan attacks	Expertise matching
Weakness	Plutocratic: whales dominate	Sybil attack vulnerable	Slow decision making	Delegate apathy risk
Used By	MakerDAO, Compound	Gitcoin Grants	1Hive, Gardens	Aave, ENS

What you see: Four columns comparing 1-token-1-vote, Quadratic, Conviction, and Delegated voting. Each row shows how it works, its strength, weakness, and which DAOs use it.

No voting mechanism is perfect. Most mature DAOs combine multiple mechanisms: delegated voting for routine decisions, quadratic for grants.

Quadratic Voting: Making Small Voices Louder

The problem with 1-token-1-vote:
A whale with 1,000,000 tokens has 1,000,000× the influence of someone with 1 token.

Quadratic voting formula:

$$\text{Cost} = (\text{votes})^2$$

Votes	Cost (tokens)	Marginal cost
1	1	1
2	4	3
3	9	5
10	100	19
100	10,000	199

Effect: Each additional vote costs more, so whales pay quadratically more to dominate.

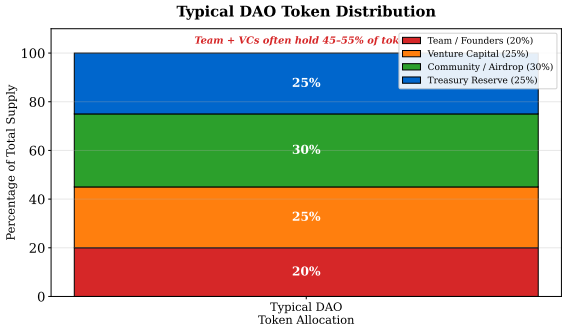
Example — Gitcoin Grants:

- 100 people donate \$1 each = strong signal (100 unique supporters)
- 1 whale donates \$100 = weak signal (1 supporter)
- Matching pool amplifies the 100-donor project

Vulnerability: Sybil attacks. One person creates 100 wallets to get 100 "unique" votes at linear cost. Requires identity verification to prevent.

Quadratic voting was proposed by Glen Weyl and Eric Posner (2018). It balances intensity of preference with breadth of support.

Who Actually Holds the Tokens?



What you see: Stacked bar showing a typical allocation: Team 20%, VCs 25%, Community 30%, Treasury 25%. Team + VCs hold 45% of tokens.

The plutocracy problem:

- Team + VCs often control 45–55% of tokens
- Vesting schedules (2–4 years) delay but don't solve concentration
- After vesting, insiders can dominate governance votes

Mitigation strategies:

- Airdrops to active users (Uniswap: 400 UNI per user)
- Progressive decentralisation (start centralised, gradually distribute)
- Reputation-based voting (not just token weight)

"Decentralised" governance with 45% insider tokens is governance theatre. True decentralisation requires genuine token distribution.

Think-Pair-Share: Design a DAO for Your Student Association

Exercise (5 minutes)

Scenario: Your student association wants to become a DAO. Design the governance:

1. **Token distribution:** How do you allocate governance tokens? (Tenure? Course credits? Activity?)
2. **Voting mechanism:** 1-token-1-vote, quadratic, or delegated? Why?
3. **Quorum:** What percentage of members must vote for a decision to count?
4. **Treasury:** Who controls the multi-sig? How many signers?

Discussion prompts:

- Should graduating students lose their tokens?
- How do you prevent the president from accumulating too many tokens?
- What if only 5% of members vote on a €10,000 budget decision?

The best way to understand DAO governance is to design one yourself. You will immediately encounter the trade-offs discussed in this lecture.

How Do DAOs Help Sarah, Wei, and Amara?

Sarah

Problem: No governance rights as LP.

DAO solution: UNI token gives her voting power. She can delegate to an expert or vote directly on fee proposals.

But: Her 500 UNI is 0.00005% of supply. Her vote barely matters.

Wei

Problem: VCs want 40% equity.

DAO solution: Submit a grant proposal. Community votes. Funded with no equity dilution.

But: Grant process takes 3 weeks. No guaranteed follow-up funding.

Amara

Problem: Can't register a company.

DAO solution: Deploy a multi-sig + governance contract. Her cooperative coordinates and manages funds on-chain.

But: Nigerian law doesn't recognise DAOs. Liability is unclear.

Pattern: DAOs solve real problems — but each solution introduces new trade-offs. The "but" matters.

DAOs are not a panacea. They trade one set of problems (centralisation, access barriers) for another (voter apathy, legal uncertainty).

ACT 3: Risks and Limitations

Voter Apathy

Plutocracy

Flash Loans

Legal Gaps

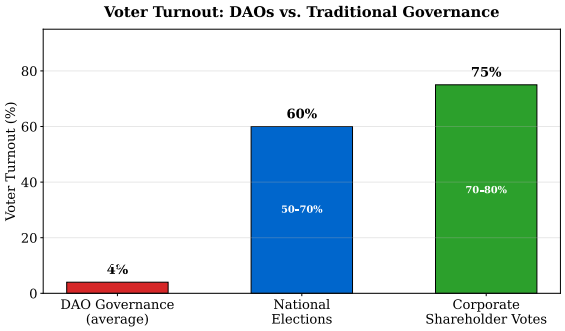
Token Inequality

Coordination Cost

DAOs solve governance centralisation — but they introduce six new categories of risk.

Every governance innovation creates new failure modes. Understanding them is as important as understanding the promise.

Voter Apathy: The DAO's Biggest Enemy



What you see: Three bars comparing voter turnout. DAOs average 3–5%, dwarfed by national elections (∼60%) and corporate shareholder votes (70–80%).

Why don't token holders vote?

- **Rational ignorance:** Cost of researching proposals exceeds individual impact
- **Gas costs:** On-chain voting costs $5–50
- **Proposal fatigue:** 300+ proposals/year (MakerDAO)
- **Speculation:** Many holders buy tokens to trade, not to govern

Consequences:

- Low quorum → small groups control outcomes
- Decisions lack democratic legitimacy
- "Decentralised" becomes "decided by 47 wallets"

3–5% voter turnout means 95% of token holders are passive. A DAO with 100,000 holders but 47 active voters is not meaningfully decentralised.

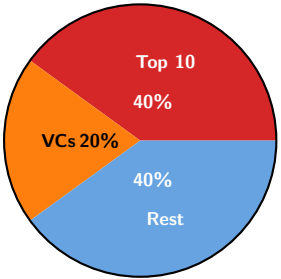
Plutocracy: When Whales Rule

The concentration problem:

- Top 10 Uniswap addresses hold >40% of UNI supply
- a16z (venture capital) alone holds enough UNI to veto any proposal
- 1-token-1-vote = 1-dollar-1-vote in practice

Real example — Uniswap fee switch:

- Community wanted to activate protocol fees
- a16z voted against (it would reduce LP returns on their investments)
- Proposal failed despite broad community support



UNI Token Distribution

Irony: DAOs were designed to prevent concentrated power. Token distribution often recreates it.

Plutocracy in DAOs mirrors the corporate problem DAOs were designed to solve. Wealth concentration persists regardless of organisational form.

Flash Loan Governance Attacks

What is a flash loan?
Borrow millions in tokens, use them, repay — all in one transaction. Cost: gas fees only (∼$50).

Attack vector:

1. Borrow 10M governance tokens via flash loan
2. Vote on a proposal (e.g., "drain treasury to my address")
3. Repay the loan
4. Total cost: $50 in gas
5. Profit: millions from treasury

Real attack — Beanstalk (April 2022):
Attacker borrowed $1B in tokens via flash loan, passed a governance proposal, and drained $182M from the protocol.

Defences:

- **Timelock:** Delay execution by 24–48h (attacker can't hold flash loan that long)
- **Vote locking:** Tokens must be locked before a vote starts (prevents borrowing during vote)
- **Snapshot block:** Vote power measured at a past block, not current
- **Quadratic voting:** Reduces impact of large token accumulation

Lesson

If governance power can be rented for one transaction, it can be exploited. Token locking and timelocks are minimum viable defences.

Flash loan attacks exploit the gap between economic power (tokens) and commitment (time). Locking requirements force skin in the game.

Legal Landscape: Where Can a DAO Exist Legally?

DAO Legal Landscape by Jurisdiction

	Wyoming (USA)	Marshall Islands	Switzerland	EU (MiCA)
Legal Status	DAO LLC (since 2021)	DAO LLC (since 2022)	Association (Verein)	No specific framework yet
Liability	Limited liability	Limited liability	Unlimited for members	Unclear / general partner
Tax	Pass-through taxation	No income tax	Cantonal rates apply	Varies by member state
Examples	CityDAO, TributeDAO	MIDAO framework	Aragon association	Pending regulation

Status as of 2024 -- regulatory landscape evolving rapidly

What you see: A matrix of four jurisdictions (Wyoming, Marshall Islands, Switzerland, EU) against four legal dimensions (status, liability, tax, examples). Wyoming and the Marshall Islands offer DAO-specific LLC structures. The EU has no DAO-specific framework yet.

Wyoming passed the first DAO LLC law in July 2021. Most jurisdictions still treat DAOs as general partnerships — meaning unlimited personal liability.

Wyoming DAO LLC: The First Legal Framework for DAOs

What Wyoming offers (since July 2021):

- **Legal entity recognition:** DAO LLC is a real LLC under Wyoming law
- **Limited liability:** Members not personally liable for DAO debts
- **Smart contract as operating agreement:** Code can replace legal documents
- **No physical office required**

Requirements:

- At least one member in Wyoming (registered agent)
- Articles of Organisation filed with Secretary of State
- Annual report and $60 filing fee

Limitations:

- Only recognised in Wyoming (and states with reciprocal LLC recognition)
- International members face uncertain tax obligations
- Smart contract bugs $\neq$ legal defences
- Difficult to sue or be sued (who is "the DAO"?)

Notable DAO LLCs:

- CityDAO (first DAO to own real land in Wyoming)
- TributeDAO
- American CryptoFed DAO

Trend: Tennessee, Utah, and Vermont have followed with similar laws.

Wyoming's law is a legal experiment. It gives DAOs limited liability but leaves many questions unanswered (tax, international enforcement, dispute resolution).

Token Distribution: The Gini Coefficient of DAOs

How unequal are DAO token distributions?

- VCs typically receive 25–50% of tokens at launch
- Vesting periods (2–4 years) delay but don't prevent concentration
- After vesting, insiders can sell to retail **or** accumulate governance power

Gini coefficients (token wealth):

Entity	Gini Coefficient
Sweden (income)	0.28
USA (income)	0.39
Uniswap (UNI tokens)	$\sim$0.92
Bitcoin (BTC holdings)	$\sim$0.88

Why this matters for governance:

In a 1-token-1-vote system, extreme token inequality means extreme governance inequality.

Uncomfortable Question

If the Gini coefficient for UNI tokens (0.92) is higher than the most unequal country on Earth, is DAO governance truly "decentralised"?

Token distribution Gini data from Chainalysis (2023). DAOs often have more extreme wealth concentration than the economies they aim to replace.

The Hidden Cost: Coordination Overhead

MakerDAO's coordination burden:

- 300+ proposals per year
- Each proposal: 2–3 weeks of discussion
- Core contributors spend 40–60% of time on governance
- "Governance fatigue" is a leading cause of contributor burnout

The efficiency paradox:

- A CEO decides in minutes
- A DAO takes weeks for the same decision
- Speed vs. legitimacy is a real trade-off

Attempted solutions:

- **Delegation:** Voters delegate to experts (Aave, ENS)
- **Sub-DAOs:** Split into specialised units (MakerDAO Endgame)
- **Optimistic governance:** Proposals pass unless vetoed (Optimism)
- **Working groups:** Small teams with pre-approved budgets

Coase's insight: Organisations exist because markets have transaction costs. DAOs replace managerial costs with **governance costs**. The question is which is lower.

Ronald Coase (1937): firms exist to reduce transaction costs. DAOs reduce trust costs but increase coordination costs. The net effect is not always positive.

Regulatory Risk: The SEC and DAO Tokens

The Howey Test (SEC):
A token is a security if it involves:

1. Investment of money
2. In a common enterprise
3. With expectation of profits
4. Derived from the efforts of others

Most governance tokens fail this test:

- Investors buy tokens expecting price appreciation
- The "common enterprise" is the protocol
- Profits derive from the core team's efforts
- Governance rights don't change the analysis

Recent enforcement:

- **SEC vs. LBRY (2022):** LBC token ruled a security
- **Ooki DAO (2022):** CFTC sued a DAO directly — first time a regulator treated a DAO as an entity
- **MiCA (EU, 2024):** New framework for crypto-assets, but no DAO-specific provisions

Key Risk

If governance tokens are classified as securities, DAOs must register with regulators — undermining their permissionless nature.

The CFTC's Ooki DAO case (2022) established that DAO token holders can be held liable as a group. This has chilling effects on governance participation.

DAO Risk Matrix: Six Failure Modes

Risk	What Goes Wrong	Real Example	Mitigation
Voter apathy	3–5% turnout; minority rules	Most DAOs	Delegation, incentives
Plutocracy	Whale dominance	Uniswap fee switch	Quadratic voting
Flash loans	Borrow tokens, pass proposal	Beanstalk ($182M)	Timelocks, vote locking
Legal void	No liability protection	Ooki DAO (CFTC)	DAO LLC (Wyoming)
Token inequality	Gini > 0.90	Most token launches	Fair launch, airdrops
Coordination cost	Governance fatigue	MakerDAO burnout	Sub-DAOs, delegation

Pattern: Every DAO risk is a mirror image of a corporate governance problem:

- Corporate: too few people decide. DAO: too few people *bother* to decide.
- Corporate: insiders control information. DAO: insiders control tokens.
- Corporate: boards ignore shareholders. DAO: whales ignore the community.

DAOs don't eliminate governance problems — they transform them. The question is whether transparent problems are better than hidden ones.

Discussion: Which Risk Matters Most?

Rank these risks from most to least dangerous:

1. **Voter apathy:** Decisions made by 47 wallets
2. **Plutocracy:** VCs control the outcome
3. **Flash loan attacks:** Treasury drained in one transaction
4. **Legal uncertainty:** Members personally liable
5. **Token inequality:** Gini coefficient of 0.92
6. **Coordination cost:** Takes 3 weeks to approve a $50K proposal

Consider:

- Which risks are **existential** (can kill the DAO)?
- Which are **chronic** (always present, slowly eroding trust)?
- Which are **solvable** with technology vs. requiring social/legal change?

Hint: Flash loan attacks are dramatic but solvable (timelocks). Voter apathy is mundane but may be structural.

There is no correct ranking — the exercise forces you to think about risk severity, probability, and mitigability.

Key Takeaways

1. **DAOs replace managerial hierarchies** with token-based voting and smart contract execution. Governance becomes transparent and programmable.
2. **The governance pipeline** (Forum $\rightarrow$ Snapshot $\rightarrow$ Formal $\rightarrow$ On-chain $\rightarrow$ Timelock $\rightarrow$ Execute) filters proposals through social and technical consensus.
3. **MakerDAO** demonstrates that DAOs can manage \$5B+ protocols with 300+ proposals per year — but at significant coordination cost.
4. **The DAO hack (2016)** remains the defining governance crisis: "code is law" vs. social consensus led to Ethereum splitting in two.
5. **Voter apathy (3–5%)** and **token inequality (Gini $>$ 0.90)** mean that DAOs often replicate the power concentration they were designed to eliminate.
6. **Legal frameworks** are emerging (Wyoming DAO LLC, Marshall Islands) but most jurisdictions still treat DAO members as general partners with unlimited liability.

DAOs are governance experiments, not governance solutions. They make trade-offs visible rather than eliminating them.

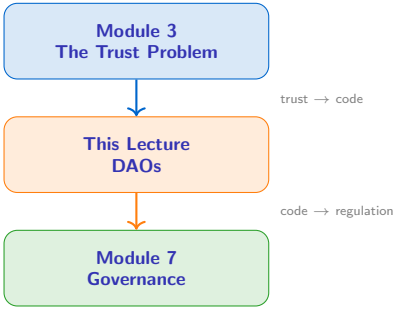
Bridge: From DAOs to Module 7 (Governance and Regulation)

What we covered today:

- How DAOs organise governance
- Token voting mechanics
- Risks: apathy, plutocracy, legal gaps

What Module 7 will cover:

- How **regulators** respond to DAOs
- MiCA framework (EU) and its impact
- On-chain vs. off-chain governance models
- Governance of Layer 1 protocols (Bitcoin, Ethereum)



Module 3 asks "can we replace trust?" This lecture answers with DAOs. Module 7 asks "who governs the governors?"

Discussion: The Big Question

Is a DAO with 3% voter turnout
more democratic than a corporation
with a 7-person board?

Yes — at least anyone *can* vote

No — democracy requires participation

For: The right to vote exists even if unused. Transparency matters. Anyone can verify.
Against: A right exercised by 3% is not meaningful democracy. Decisions lack legitimacy.
Nuance: Maybe we need a new word — "open oligarchy"? "Transparent plutocracy"?

This question has no correct answer. It reveals whether you value access (right to participate) or participation (actual engagement) as the core of democracy.

Further Reading and Resources

Academic:

- Buterin, V. (2014). "A Next-Generation Smart Contract and Decentralized Application Platform." Ethereum Whitepaper.
- Weyl, E.G. & Posner, E. (2018). *Radical Markets*. Ch. 2: Quadratic Voting.
- El Faqir et al. (2020). "An Overview of Decentralized Autonomous Organizations." *CSCW Companion*.
- Coase, R. (1937). "The Nature of the Firm." *Economica*.

Practitioner:

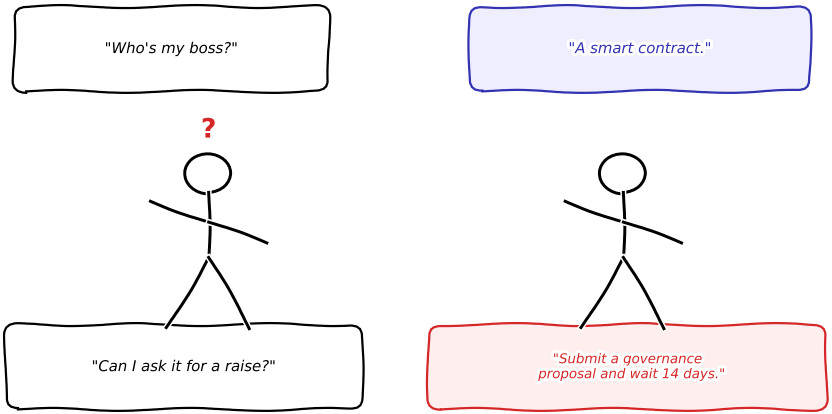
- DeepDAO.io — real-time DAO analytics
- Tally.xyz — governance dashboards
- Snapshot.org — off-chain voting tool
- MakerDAO forum (forum.makerdao.com)

Tools to explore:

- Aragon — DAO creation platform
- Gnosis Safe — multi-sig wallet
- OpenZeppelin Governor — governance contracts

Start with DeepDAO.io to see real DAO statistics: treasury sizes, voter turnout, proposal activity across 2,000+ DAOs.

Employee Reviews in a DAO



When your boss is a smart contract, HR becomes governance — and your annual review is a token vote. See you in Module 7.

Appendix A: Governance Capture — When Voting Becomes a Weapon

The Slide 6 story ("code is law until the code has a bug") is only half. Even when the code works, the voting process itself has been exploited at scale.

Three canonical capture incidents

- **Mango Markets (Oct 2022):** Avraham Eisenberg manipulated the MNGO oracle to drain $117M (*Mango Markets / Chainalysis forensic report 2022*, 2022), then *voted his own governance tokens* to legitimise keeping $67M as a "bug bounty." Subsequently arrested and convicted (Apr 2024) on fraud/market-manipulation charges in SDNY.
- **Build Finance DAO (Feb 2022):** a single attacker accumulated enough BUILD governance tokens to pass a proposal granting themselves minting authority and drained the $470K treasury (*Build Finance incident report / rekt.news 2022*, 2022). No code bug — the governance worked exactly as designed.
- **Tribe DAO / Rari Fuse (Apr 2022):** after an $80M hack of Rari Fuse pools, Tribe DAO voted **against** full repayment to affected users; the exploit victims were stiffed by majority vote. Core contributors resigned; the DAO unwound in 2022–23.

The pattern: in all three cases the code was correct, the votes were "legitimate" by the rules — and the result was theft or refusal to make victims whole. Token-weighted voting is *exactly* one-dollar-one-vote with no fiduciary, no regulator, and no court of appeal.

Mango Markets ruling: S.D.N.Y., U.S. v. Eisenberg, conviction April 2024 on commodities fraud + manipulation. The first successful criminal prosecution for an on-chain governance exploit. Cite: DOJ press release, April 18 2024.

Appendix B: Plutocracy and Apathy — The Structural Problem

Even without attackers, typical DAO governance looks much more like a coin-weighted oligarchy with low participation than a civic republic.

Plutocracy: the Arbitrum AIP-1 episode

- March 2023: Arbitrum Foundation posted AIP-1 for community vote (ratify governance constitution + treasury allocation)
- **Before the vote concluded,** the foundation *had already sold / allocated* ∼50M ARB (*ArbitrumDAO forum post, Arbitrum Foundation admission, April 2023*, 2023) for "operational funding" — citing an AIP-1 clause that had not yet passed
- Community rejected AIP-1; foundation apologised and split proposal into AIP-1.1 / 1.2. Governance was **retroactive theatre** for a decision already taken.

Other cautionary tales

- **Wonderland / Sifu (Jan 2022):** treasurer anon "Sifu" revealed as Michael Patryn, co-founder of collapsed QuadrigaCX; $700M+ TVL (*DeFiLlama Wonderland TVL snapshot Jan 2022*, 2022) evaporated
- **Juno Network (Mar 2022):** Proposition 20 aimed to revoke ∼3M JUNO (*Juno Network forum / Cointelegraph 2022*, 2022) from a whale; a voter miscounted decimals; the wrong amount was burned
- **OlympusDAO OHM:** (3,3) game-theory meme backed by treasury; price collapsed >99% from peak; no governance mechanism prevented the design flaw

Apathy: the base rate

- Median DAO voter turnout: <10% of circulating tokens (*DeepDAO governance tracker, Chainalysis State of Web3 2024*, 2024); most DAOs run <5%
- **Delegate concentration:** in many major DAOs, the top 10 delegates control >50% of voting weight (*Messari DAO Governance Report 2024*, 2024)
- Governance is **part-time, unpaid, in public** — adverse selection toward whales, insiders, and the very online

The comparative frame

- US presidential elections: ∼60% turnout
- Public-company shareholder votes: ∼70–80% of eligible shares
- DAO governance: 3–10%, and usually decided by the top 10 wallets

Appendix C: Coordination Has Costs — The Constitution DAO Reality

When a DAO is an answer, the question is usually "can we coordinate capital without a corporation?" Here is the cleanest natural experiment.

ConstitutionDAO / PeopleDAO — Nov 2021

- Goal: buy an original print of the US Constitution at Sotheby's auction
- Raised $47M in ETH (*ConstitutionDAO public contribution address; Etherscan, Nov 2021*, 2021) from ∼17,000 contributors in < 1 week — genuinely remarkable coordination
- **Outcome:** outbid by Ken Griffin (Citadel) for $43.2M; PeopleDAO failed to win the asset
- **Refund process:** contributors had to individually claim ETH refunds on-chain; gas costs for small contributors often exceeded the refund itself
- Estimated gas burned on refunds: $1M+ in fees (*Dune Analytics dashboards; PeopleDAO refund post-mortem 2021*, 2021) — a dead-weight loss of the coordination mechanism

What it proved

- Rapid pseudonymous capital formation is real
- Transparency and auditability at scale is real
- Global inclusion of contributors (no broker required) is real

What it also proved

- Coordination *still costs money* — gas is the new legal fee
- A well-capitalised individual bidder beat $47M of crowd capital
- The PEOPLE token — issued as a coordination artefact — traded speculatively for years, unrelated to the failed auction

The honest comparison is not DAO-vs-nothing — it is DAO-vs-LLC. An LLC can wire $47M by 10am the next day with a board vote; a DAO can do the same in 36 hours with 17,000 votes and 8-figure gas bills. Different tradeoffs, not strict improvements.