Tokenomics Design

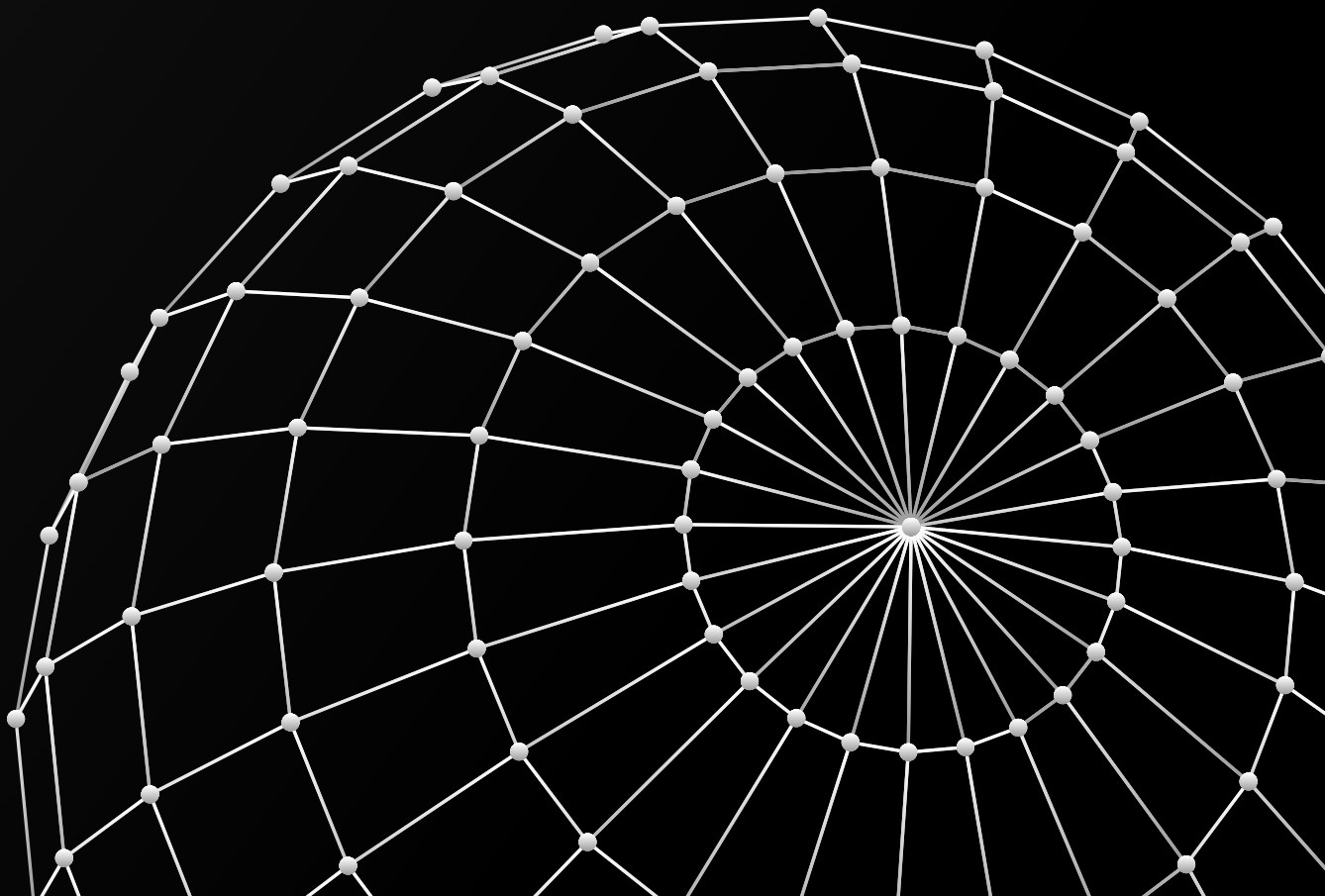
Founders Blueprint

A Step-by-Step Guide

June, 2025

This document aims to show clarity on our systematic process to designing tokenomics frameworks.

A Structured
Step-by-Step Guide



About

tokenomics.com

A specialized tokenomics firm for venture capitals, exchanges and web3 projects.

At tokenomics.com, we provide **an all-in-one solution for tokenomics.**

From economy design to incentive systems and simulations, we cover every aspect of tokenomics, including everything needed for our clients to raise capital from token sales.

We have also developed our own platform to simulate, audit and optimize tokenomics frameworks.

We focus on early-stage projects, where we directly support founders.

Over the past four years, we've proudly supported **83 clients** with two ranked in the top 30 by MCAP and several in the Top 100, and done **over 750+** tokenomics **audits**.

We are now extremely selective about whom we work with, maintaining our reputation of only working with the best.

We are a lean team of economists, data scientists, and simulation engineers.

Our **headquarters are in Lisbon, Portugal**, with our company registered in Hong Kong.

VCs
identify risks before they invest

Exchanges
flag issues before listings

Projects
optimize before TGE

Apply →

Foreword

By Andres G. Collado

Founder at Tokenomics.com

In this report, we delve into everything we design, from zero to one.

The supply and demand dynamics of tokens, the intricate aspects of our token design models, and some of the learnings of our past 5 years.

We aim to ensure our clients, project founders, grasp the significance of tokenomics, understand our technical process and why it matters, so they are able to engage in technical conversations when interacting with their community or pitching to investors.

While a strong product is crucial, tokenomics can make or break a crypto project. Even great products can struggle with weak tokenomics, while average ones can excel with the right token strategy.

Tokenomics is a **multifaceted concept.**

Many founders think tokenomics is just about:
- A token's max supply number
- A pie chart showing 10%–20% allocated to the team
- An emissions schedule
- An allocation distribution chart

While these are elements of a project's tokenomics, they don't capture the full picture.

A full tokenomics framework covers the following 6 core verticals:

1. Purpose and Utility of the Token

2. Economical Model (we cover token allocation, inflation, supply shocks and more)

3. Fundraising Setup (we cover the potential valuation, terms and conditions for investors, etc)

4. Value Flow (creation, capture and accrual) how the token ecosystem creates, captures and accrues back value to the token holders.

5. Incentives system (to direct users behaviour)

6. Modeling (what can happen and the relative probabilities of different outcomes)

7. Game Theory (how participants interact within the system, ensuring no one can exploit the design)

You then need to ensure that these elements work together to create a balanced, sustainable ecosystem, like a perfectly aligned **Rubik's Cube**. And just like every twist in the cube can disrupt its harmony, each design decision must be handled carefully to avoid destabilizing the model.

To determine whether a tokenomics model is balanced, it is essential to analyze all of these verticals together. This is why when we audit we use a multi-layer approach, ensuring that no single element is evaluated in isolation.

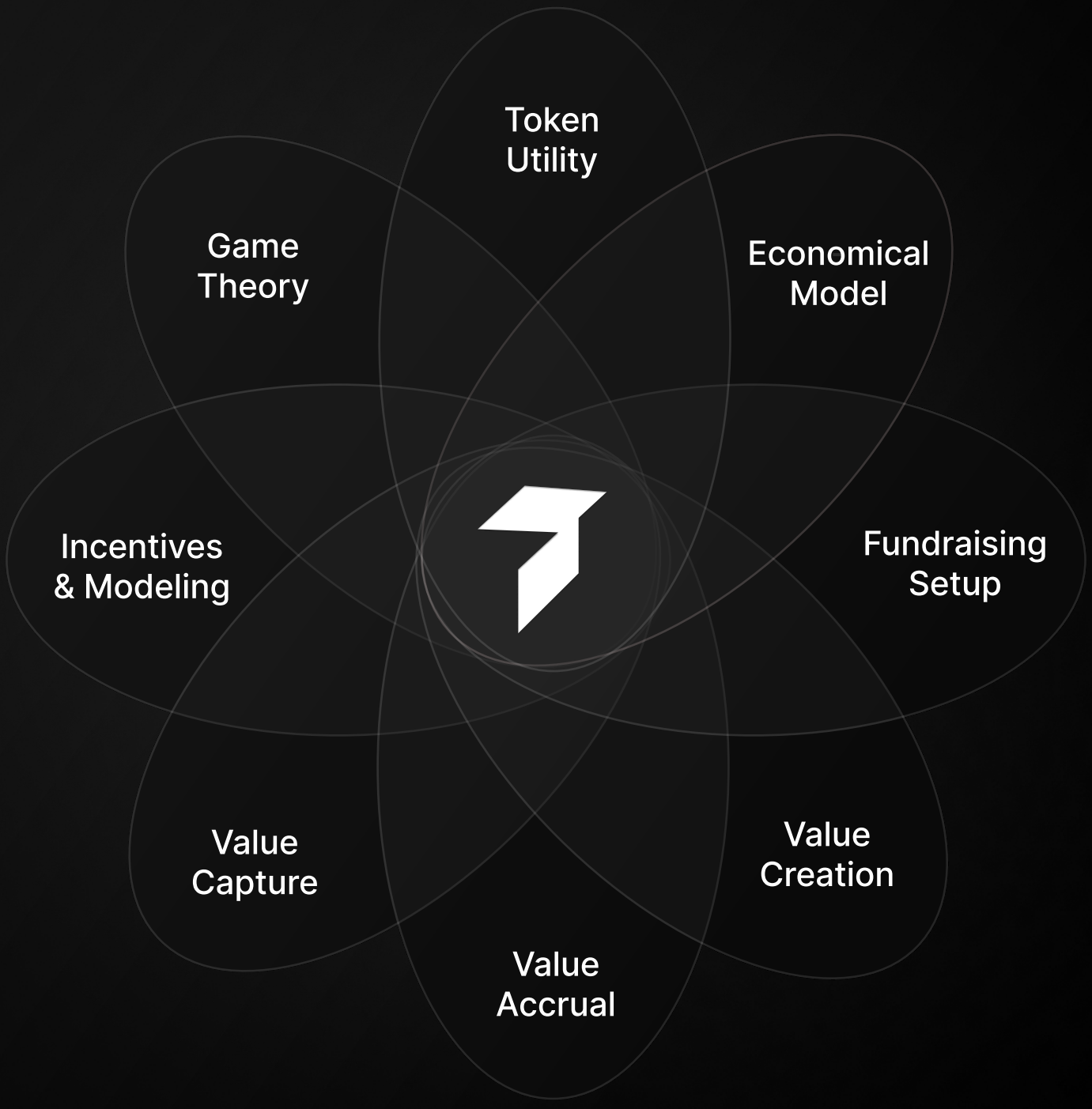
There is no such thing as a perfect tokenomics model, only balanced models. Tokenomics is a multidisciplinary field that blends **hard sciences** (math, physics), **soft sciences** (psychology, sociology, economics), and **applied sciences** (systems engineering).

Since human behavior plays a key role, **tokenomics rarely deals in absolutes**. There are no universally right or wrong answers, **only trade-offs that optimize for specific objectives within unique constraints**

For this reason, while quantitative techniques such as statistical analysis, user segmentation, agent-based modeling, and Monte Carlo simulations are highly relevant, **it is impossible to create a mathematical formula for the correct tokenomics design**. Every model is an evolving system that must be rigorously tested and iterated upon.

But what helps is to have a **data-driven approach**, specifically in the core economic parameters.

A tokenomics framework must cover the following core verticals:



Broken-down into 8 phases

Fundamentals

01

This is the **starting point where we gather all fundamental information** and key data necessary for the tokenomics design. This includes understanding the project's goals, hard caps, market conditions, stakeholder requirements, etc.

Economic Design

02

This is where the economics begin to take shape. Once the fundamentals are defined, we map out how supply is distributed (who gets what, when, and under what conditions).

The goal isn't just fairness. It's alignment.

Validation and Optimization

03

This process consists of **validating the key economical assumptions of the model** and iteratively testing through until all parameters have been optimized with respect to their constraints. (Inflation, supply shocks, fair distribution fairness, investors terms and conditions, monetary polices, liquidity, selling pressure, etc)

Documentation

04

Effective communication is vital. We produces documentation for both private investors and the community. **For investors**, materials emphasize valuation logic, risk management, and capital efficiency. **For communities**, the focus is on accessibility, transparency and clear explanation of the token's purpose and incentives.

Value Flow

05

This phase defines how value is **created**, **captured** by the protocol, and circled back (**accrued**) to the token holders. It ensures the token has exposure to real economic activity, and it's not just an instrument driven by speculation.

Incentive Systems

06

We view incentives as the core mechanism that drives **user behavior** within an ecosystem.

By carefully designing and aligning incentives, we ensure that users are motivated to act in ways that create value.

Modeling and Simulation

07

Using advanced simulation tools like **cadCAD** and **Machinations**, models are tested across a wide range of market conditions. These simulations incorporate agent-based behavior, stochastic variables, and real-world data.

Game Theory and Iterations

08

This phase analyzes how users behave within the system and tests for potential exploits. It ensures no participant can unfairly manipulate incentives or outcomes.

By refining the design through iterative stress-testing.

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Fundamentals

01

Every tokenomics model starts here.

- before numbers,
- before modeling,
- before incentives.

This is where we define the core fundamentals of the system.

Fundamentals

Too many founders skip this step and jump straight into token supply charts or fundraising targets. That's how you end up with an allocation that looks fine in Figma but collapses the moment it meets real demand.

This phase is critical for **defining the core problem** to be solved and **identifying** the **key stakeholders involved**. It's about understanding what holds value for each stakeholder and how that value is exchanged within the ecosystem.

This phase requires a deep comprehension of market dynamics and the project's broader context to ensure alignment with long-term objectives.

At this stage, we gather all essential data needed for the tokenomics framework.

This includes understanding the project's overarching goals, hard caps, market conditions, and specific stakeholder needs.

By identifying these key factors early, we set the foundation for a tailored and effective tokenomics design.

A crucial element in establishing the foundation of any new ecosystem is identifying key stakeholders and understanding **how value flows between them.**

Defining potential stakeholders and **distinguishing the different archetypes** within each group is essential for creating a **Taxonomy of Actors**. This step is vital for token design, as it not only helps justify and evaluate design parameters but also establishes a framework for testing and validating assumptions about user behavior.

Project Mission & Ecosystem Role
What is the product? What layer does it live in? Who needs this, and why?

Stakeholder Mapping
Founders, investors, users, validators, LPs, DAO contributors → who actually participates in the system?

Token Utility Scope
What is the token meant to do? Access, payments, staking, collateral, voting? We define this before deciding how much of it should exist.

Launch Strategy Dependencies
Is this token going public via an LBP, a CEX, an airdrop, or private deal?

Are you bootstrapping a network—or retrofitting a token onto a product that already works?

Competitive Landscape
We benchmark the design against the top 10 protocols in the same category—analyzing float, emissions, inflation, and utility across the board.

This step is not "discovery."

It's about building the intellectual foundation of the model, where every later decision ties back to clear assumptions.

Skip fundamentals, and every other phase becomes reactive.

You're not designing an economy. You're improvising one.

Problem Statement

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Go to the fundamentals framework →

1. What is the Objective of the Token?

• What primary purpose does the token serve in the ecosystem?

• Is the token meant to provide utility (e.g., governance, access to services) or act as a store of value?

• How does this token fit into the broader vision of the project?

2. What Problem is the Token Solving?

• What specific challenge within the ecosystem does the token address?

• How does the token create value for the participants, and how does it improve the functionality or growth of the ecosystem?

• What are alternative solutions (if any), and why is a tokenized solution superior?

3. What is the Project's Niche?

• Which sector or niche does the project target (e.g., DeFi, NFTs, gaming, infrastructure, etc.)?

• What differentiates this project from other projects within the same niche?

4. Who are the K

• What are the main g
developers, investors,

• How does each stak

• What are the roles a
For example:

• Users: What's their p

• Investors: What retu

• Developers: What in
platform?

• Validators or Miners
Who are the Key Stake

5. What are the To

• How does the token
the ecosystem?

• What mechanisms c
governance, transactio

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Economic Design

02

This is where the economics begin to take shape.

Once the fundamentals are defined, we map out how supply is distributed → who gets what, when, and under what conditions.

The goal isn't just fairness. It's alignment.

Economic Design

Once the fundamentals are defined, you need to map out how supply is distributed:

Who gets what, when, and under what conditions.

The goal isn't just fairness. It's alignment.

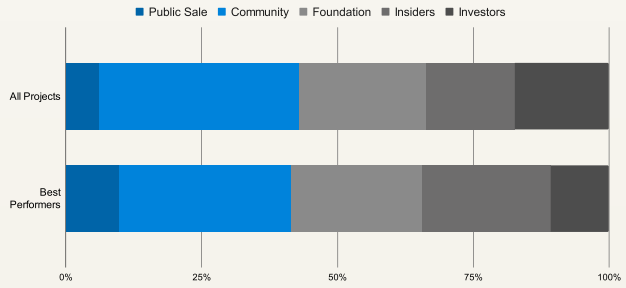
Our main recommendation here is to follow a data-driven approach.

Our database contains **over 1350 unique records** across various niches, from gaming, layer ones solutions (L1s), DePIN, artificial intelligence, and more.

If you want access to our database, contact someone from our team → here

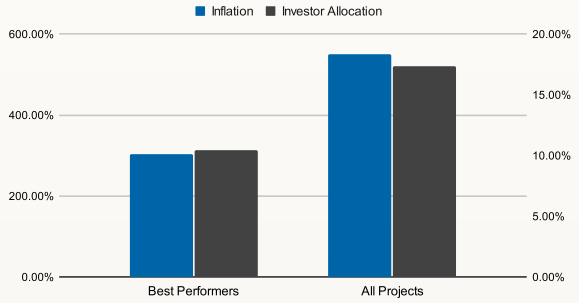
The two most important monetary policies to define are the allocation distribution and the vesting release schedule while keeping the economic parameters under control (inflation, supply shocks, risk of dilution, float, investor balance, etc)

Distribution Fairness
(Best Performers vs All Other Projects)



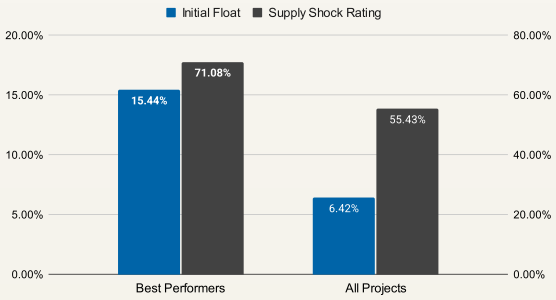
From the data analysis, it's clear that selected **"Best Performers"** allocate a smaller portion of their distribution to private investors **(10.49%)**, compared to **18.11%** as an average in all other projects.

Inflation & Investor Allocation
(Best Performers vs. All Projects)

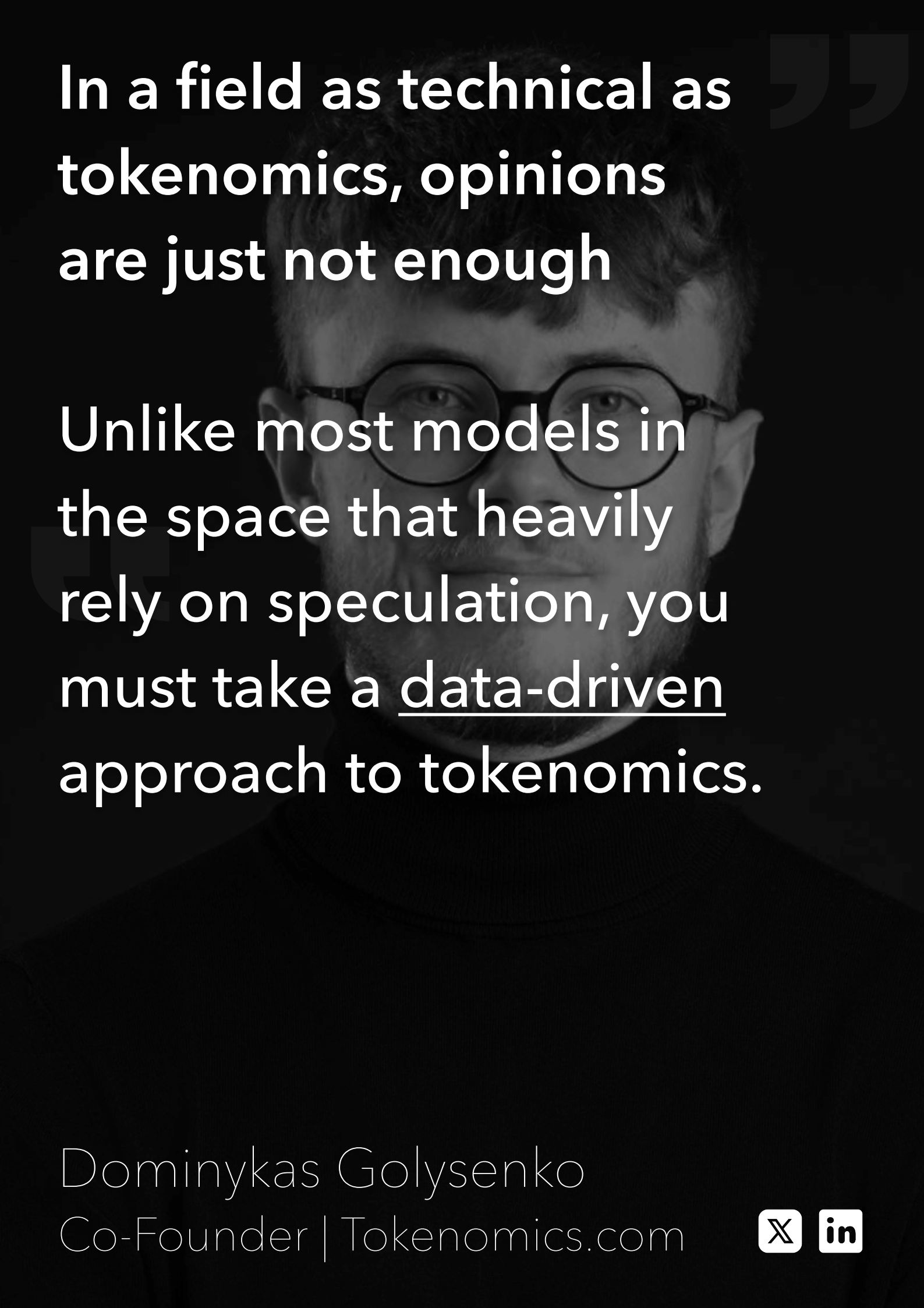


Year 1 Inflation Rate (Blue bar)
While **all other projects** experience a much higher inflation rate of **(≈ 500%)** in the first year, the most successful projects have a significantly lower inflation level of **(≈150%)**, which means that **Best Performers** have a more controlled token emission strategy, which is one of the factors that contributes to their long term success.

Supply Shock Rating & Initial Float
(Best Performers vs. All Projects)



Best Performers tend to launch with a higher initial float **(≈15%)** than the average of all the records in our database **(≈ 6.00%)**, reducing initial volatility, inflation future dilution and supply shocks, plus increasing the initial decentralization if done right



In a field as technical as tokenomics, opinions are just not enough

Unlike most models in the space that heavily rely on speculation, you must take a data-driven approach to tokenomics.

Dominykas Golysenko
Co-Founder | Tokenomics.com

Next, you need to focus on the: **Vesting release schedule**

The vesting release schedule isn't just a timeline. It's the mechanism that controls when new supply enters the market, who holds it, and how inflation accelerates.

At the heart of this process is super important to have a algorithm which balances different funding rounds by running multiple models to ensure fairness for every stakeholder.

we've audited over 750 tokenomics models and benchmarked more than 2,500.

One of most consistent failure point? Vesting structures copied from other projects without modeling their real impact on price, behavior, or supply dynamics.

And the worst part is always the same: **linear vesting**

It's the default for teams that want something "simple", and it's the reason so many tokens leak value steadily after launch.

It rewards time, not progress. It pays out regardless of traction. It turns token releases into background noise until the price breaks.

You don't need to evaluate vesting based on shape alone.

You need to simulate how it would behave under real market conditions, using historical data from comparable launches to test unlocking velocity, incentive alignment, float pressure, and market absorption.

Then flag what's fragile.

This policy has a direct impact on the project's inflation rate, potential supply shocks, and how fairly tokens are distributed among stakeholders.

Ultimately, it influences the entire economic balance within the ecosystem.

When it comes to vesting strategies, we use a range of approaches tailored to the needs and long-term goals of each project. These include S-Curve, TANH, Exponential, Linear, Logarithmic, and Logit models.

Each type of vesting curve plays a unique role in managing token distribution and circulation, ensuring the project's economic health and sustainability over time.

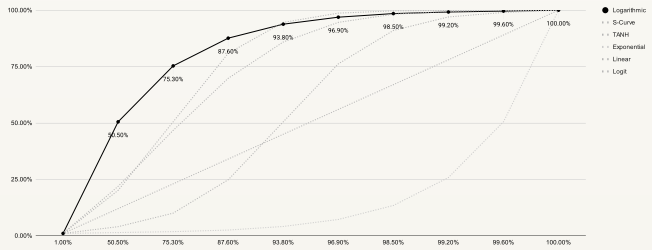
Every vesting curve is a release mechanism. It controls how fast tokens hit the market, how incentives flow, and how pressure builds or dissipates over time.

Linear is the most common. It's also the most fragile.

It unlocks supply whether the product is shipping or stalled. It rewards participation by time served, not value created. And it builds steady sell pressure without any feedback loop to adoption or utility.

We've modeled hundreds of variations. These are the ones that actually serve a purpose, when used intentionally:

Logarithmic Vesting
Logarithmic vesting can work when early growth is needed to generate momentum, accelerate network effects and chase critical mass. But without mechanisms to capture and hold value, the model can front-load emissions and damage long-term sustainability.

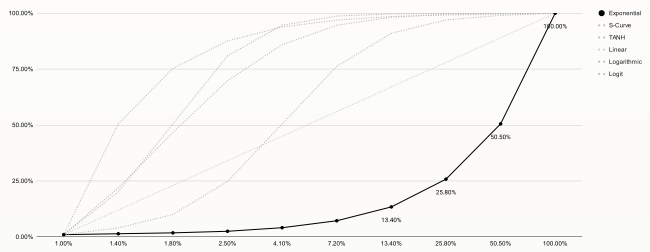


Best for: Early-stage protocols chasing fast network effects

Behavior: Starts fast, slows down over time

• Unlocks a larger portion of tokens early, then tapers
• Helps bootstrap contributors when they're needed most
• Risk: if incentives, value capture and accrual mechanisms are weak, early unlocks get dumped, and price will pop.

Exponential Vesting
This curve is ideal when token utility won't exist immediately. It gives teams time to build, launch, and test before real unlocks begin. It also provides holders with a longer path to price stability, which can strengthen confidence in the asset.



Best for: Low-float launches that require long runway

Behavior: Starts slow, accelerates as maturity grows

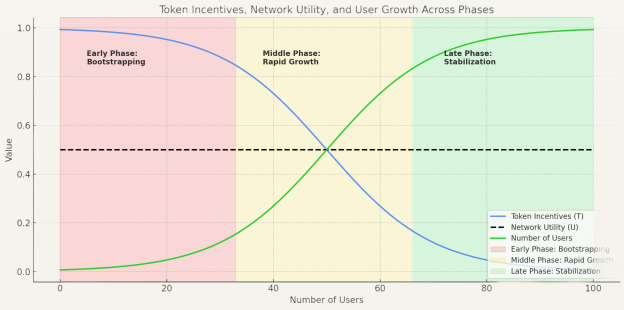
• Releases a small amount of tokens during initial phases

• Increases gradually as the product, demand, and utility catch up

• Reduces early dilution and creates a longer buffer for price discovery

S-Curve Vesting
This model mirrors how actual value creation works in early-stage ecosystems. (ideal for DePIN)

It creates alignment by delaying major investor unlocks until there is demonstrable traction, then tapers emissions as growth stabilizes. It's particularly effective for calming exchange and community concerns around short-term dumping.



Best for: DePIN and network effects, also for Investor allocations.
Behavior: Slow unlocks, mid-phase ramp, then taper
• Starts with conservative release rates
• Accelerates once project traction and valuation justify it
• Levels off to avoid oversupply in later stages

Adaptive KPI-Based Vesting
Among all vesting structures, this is the one that gets it right, when implemented properly, KPI-based vesting doesn't just control supply.

It ties token unlocks directly to real traction – user growth, network activity, protocol revenue.

It rewards value creation instead of time served.

Most projects never attempt this model.

Not because it doesn't work, but because it requires actual systems thinking – and accountability.

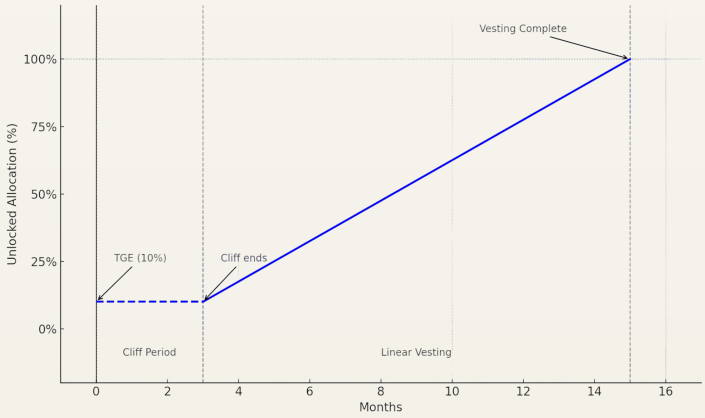
Best for: Protocols that want performance-aligned supply
Behavior: Unlocks are triggered by ecosystem milestones
• Token release is linked to metrics like active users, revenue, or liquidity
• Requires reliable oracles and a strong incentive framework
• Allows for true coordination between tokenomics and protocol growth

KPI-based vesting systems force every unlock to be justified.

If the protocol under-delivers, the supply stays locked. If the network grows, the contributors and stakeholders benefit.

It's the only model that scales supply in parallel with demand, not against it.

Final reminder:
Linear vesting is the parasite of tokenomics.
like a slow rug-pull, draining value steadily over time. rewarding mediocrity, not performance.



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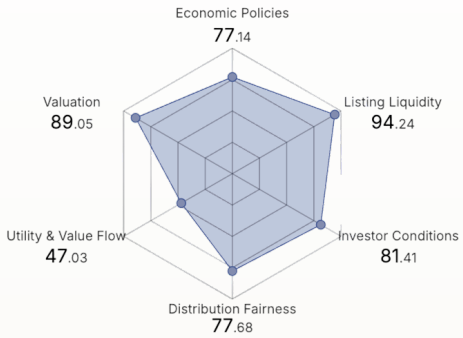
Audit, Validation and Optimization

03

We've built a comprehensive platform to audit tokenomics frameworks across six verticals.

Each vertical evaluates critical aspects of the tokenomics and compares them to the best performing industry projects.

Audit



We have developed our own platform to audit tokenomcis frameworks truly end to end and this are the six key verticals we focus on:

① - Distribution Fairness
This section focuses on how tokens are allocated across different stakeholder groups.
We analyze whether the distribution is balanced, how it compares to top-performing projects, and who actually controls the circulating supply over time (critical for governance purposes), especially in the early stages when it matters most.

② - Economic and Monetary Policies
This vertical breaks down the mechanics behind token issuance, how supply enters the market, and how it dilutes existing holders over time. We focus on four main areas: inflation, supply shocks, float, and dilution risk.

③ - Investor Conditions
In this vertical, we focus on everything that matters to public sale and private investors how the rounds are structured, what your payback looks like at TGE, how fairly the different rounds are balanced and the position exit risk.

We analyze each investor round in detail, mapping entry price, unlocks, vesting terms, and overall exposure. From that, we calculate which round offers the best terms, which one carries the most risk, and whether there's any structural conflict between rounds.

④ - Valuation and Performance
In this vertical, we make sure the project is not priced out of the market.

We first compare its FDV against the top five competitors, the last 15 launches, and all the launches in the past year (of the niche, like RWA).

On top of that, we include our Vesting Diluted Valuation Model, which calculates the market cap needed at each unlock event for investors to break even.
And finally we are able to point which is the best valued round for private investors (by both valuation models), whats the performance of the niche, and if the project is overvalued or undervalued in terms of relative comparison to the niche, and current state of the market.

Everything we've covered in this audit so far: distribution fairness, monetary policy, investor terms, valuation, and historical performance is critical to understanding a token's economic structure.
But structure alone is not enough.
Even a perfectly timed vesting schedule or a fairly priced listing can collapse if there's no actual demand for the token, or if that demand isn't directed in a way that retains value inside the ecosystem.

⑤ - Utility & Value Flow
This vertical examines whether the token has a reason to exist – and more importantly, a reason to be held.
We apply first-principles reasoning:

- What value does the system design create?
- Where does that value go?
- And how does the token participate in that flow?

We map three core layers of the token economy:

1. Value Creation: Is the protocol producing anything of economic or social value (transactions, compute, liquidity, data)?
2. Value Capture: Does the system retain part of that value inside the network/company/foundation, instead of letting it leak to external actors or intermediaries?
3. Value Accrual: Does the token itself absorb that captured value, through mechanisms like buybacks, burn, or fee redistribution?

⑤ - Listing & Liquidity
Where we analyze and audit the terms and conditions with the market maker, specifically when they are working under a loan option agreement, covering: the deal overview, the TGE liquidity exposure, liquidation controls, repayment terms & strike logic, performance terms (spread, depth, uptime)

and finally how strong the listing strategy is, and whether it supports the tokenomics design. How much market share they are capturing (both CEXs and DEXs), which exchanges they are listing on, and how those exchanges have performed over the past year.

Nillion

Summary | Tokenomics Information | Distribution Fairness | Monetary Policies | Investor Conditions | Valuation | Listing Liquidity | Token Utility

Skillful AI Info

Skillful AI's $SKAI tokenomics power an AI ecosystem for personalized assistants with blockchain data control, DePin integration, and NFT monetization.

Ticker	$SKAI
Listing Price	$0.025
Total Supply	1 000 000 000
Niche	AI, Infrastructure
TGE Date	2024-05-31
Website	https://www....ulai.io
Tokenomics Source	https://docs...3640150

Tier 3 Tokenomics | Tokenomics Audited | Investor Information

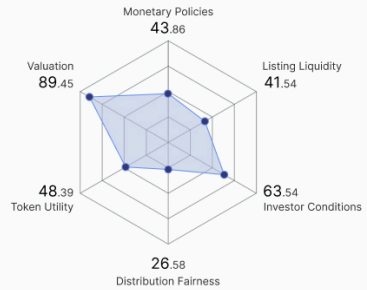
Tokenomics Rating

45.56 (B)

0 — 100

Rank	Percentile
#426	Top 31%

9 | 1 | 2



Tokenomics Information

Allocation Distribution Chart

Pool Name	Percentage	Vesting Information
Community Incentives	15.00%	2.0% at TGE, 6m Cliff, 30m Linear Vesting
Team	15.00%	12 Month Cliff, 30 Month Linear Vesting
Liquidity pool / MM	10.00%	15.0% at TGE , 1 Month Cliff, 3 Month Linear Vesting
Treasury	10.00%	0.1% at TGE, 12m Cliff, 36m Linear Vesting
Private	10.00%	5.0% at TGE , 6 Month Cliff, 18 Month Linear Vesting
Advisory	5.00%	12 Month Cliff, 30 Month Linear Vesting
Seed	5.00%	4.0% at TGE , 6 Month Cliff, 18 Month Linear Vesting

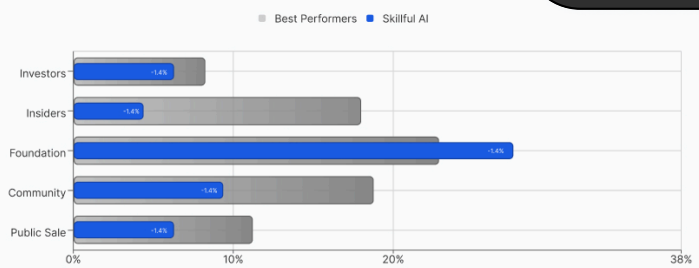
Showing 1-9 out of 16

Distribution Fairness

We have developed our own audit platform

Launch Platform →

Comparison Against Best Performers



Public Sale	-5.6%	Low Deviation
Community	-12.4%	High Deviation
Foundation	-2.4%	Low Deviation
Investors	-8.4%	Mid Deviation
Investors	-8.4%	Mid Deviation

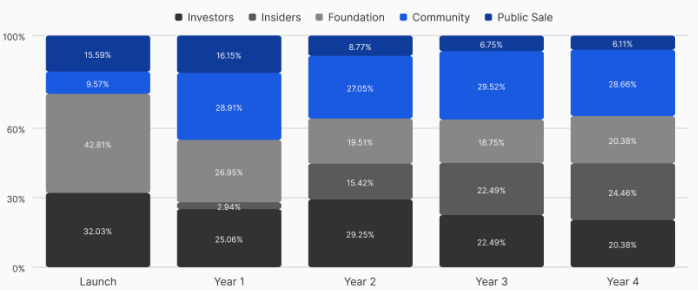
Comparison Against Best Performers

Here we analyze whether the distribution is balanced, how it compares to top-performing projects, and who actually controls the circulating supply over time Here we analyze whether the distribution is balanced, how it compares to top-performing projects, and who actually controls the circulating supply over time.

Overall Deviation Status

Medium

Token Control (YoY)



Public Sale Allocation

45.24% | -12.4% High Deviation

Comparison Against Best Performers

Here we analyze whether the distribution is balanced, how it compares to top-performing projects, and who actually controls the circulating supply over time

Investor Allocation

15.24% | -2.4% Low Deviation

Insider Allocation

20.00% | +4.4% Mid Deviation

Foundation Allocation

14.23% | +12.4% High Deviation

Foundation Allocation

14.23% | +12.4% High Deviation

Monetary Policies

Validation and Optimization

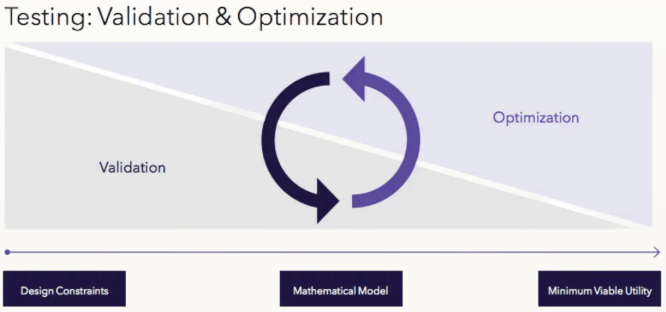
Once the tokenomics model is designed, audited, we transition to the **Validation and Optimization phase**, which is crucial for refining and perfecting the framework before it is fully deployed.

Validation is about comparing the model to market standards and competitor benchmarks using data-driven analysis. This step ensures that the model aligns with industry practices and is robust enough to withstand market dynamics. By simulating different scenarios, we validate how the model reacts to various market pressures like inflation, supply shocks, dilution risk, and distribution fairness. The objective is to identify any weaknesses in the design and adjust accordingly.

After validation, the process moves into **Optimization**, where we ensure that the tokenomics model operates within the set parameters and aligns with the project's long-term goals. During optimization, we focus on areas such as investor balance, inflation control, and other critical supply metrics. The goal is to refine the design, ensuring that it supports sustainable growth, avoids excessive inflation, and maintains fair distribution among stakeholders.

The visual above demonstrates the flow from Validation to Optimization, emphasizing that these two phases are iterative and interconnected. The model is validated against constraints, then refined based on mathematical models, and optimized to reach a Minimum Viable Utility—the point where the tokenomics framework is robust, functional, and aligned with project objectives.

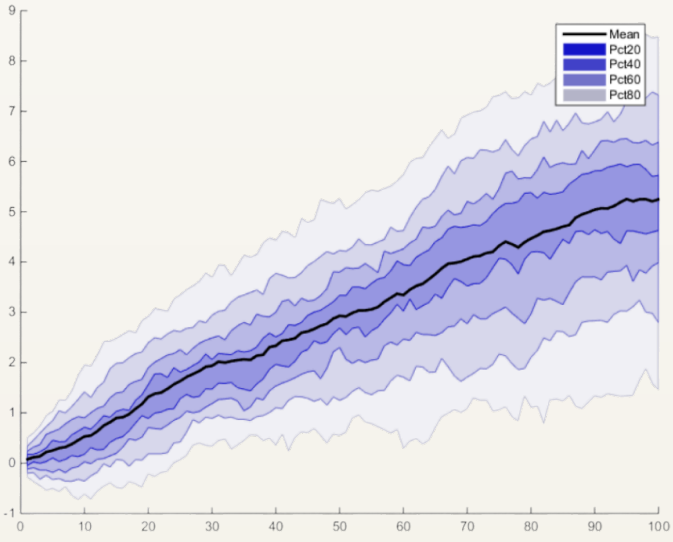
By cycling through validation and optimization, we ensure that the tokenomics model is not only technically sound but also practical and efficient for real-world deployment.



General flow moving from Validation to Optimization

Our validation and optimization phases follow an iterative feedback loop.

After each round of validation, the model is adjusted based on performance and feedback, ensuring continuous refinement until the tokenomics framework reaches its most efficient and balanced state.



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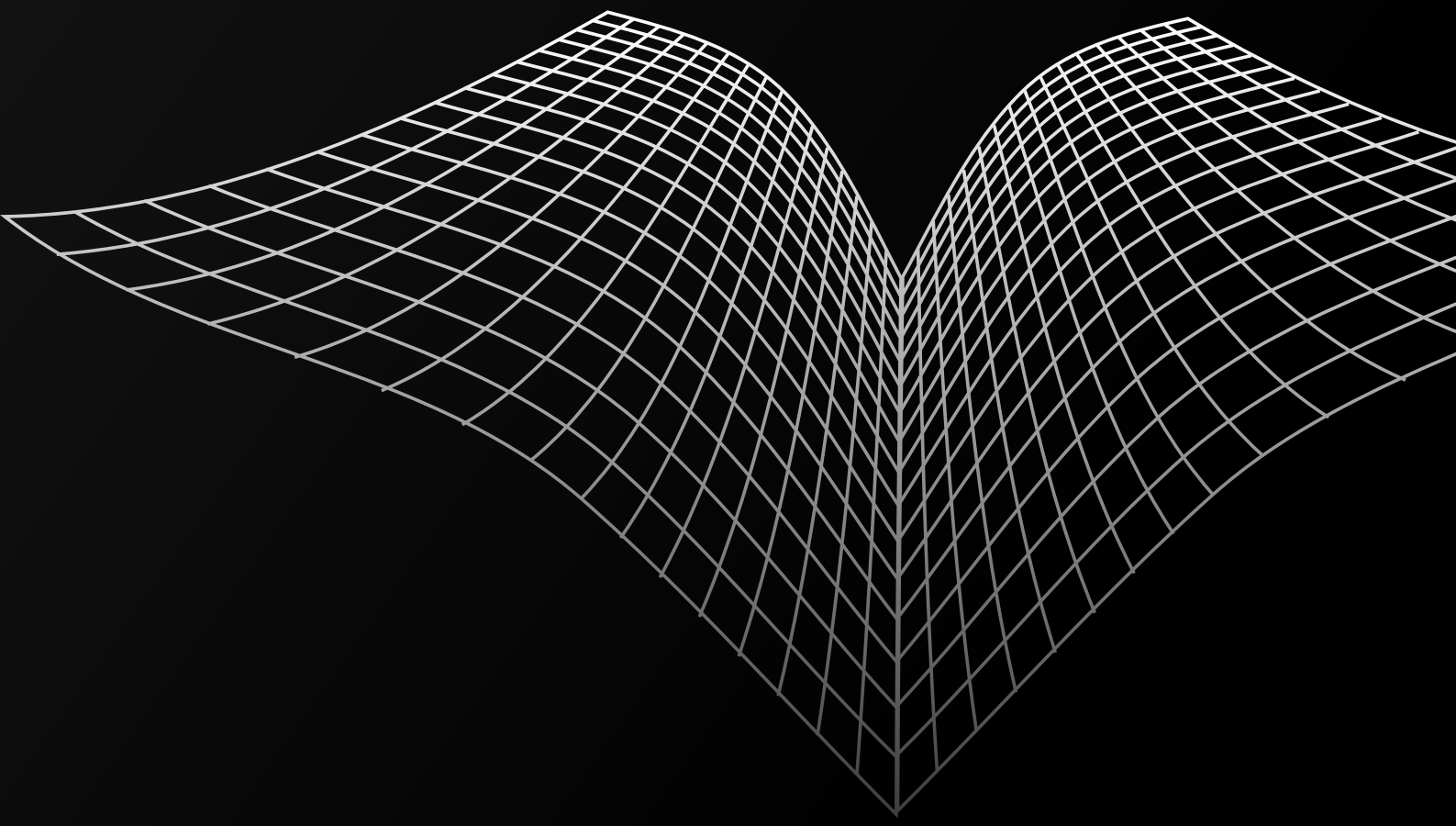
Documentation

04

We understand that it's not enough to have the right numbers; you also need to present them in a way that truly resonates with investors.

We build the public tokenomics documentation, with a broad community centric approach, and the investors documentation with a technical incentive approach.



Documentation

When it comes to private investor-focused documentation, our goal is to highlight the investment opportunity and the financial potential of the tokenomics model.

Investors care about the bottom line: how their investment will grow, what risks are involved, and how the model safeguards their capital.

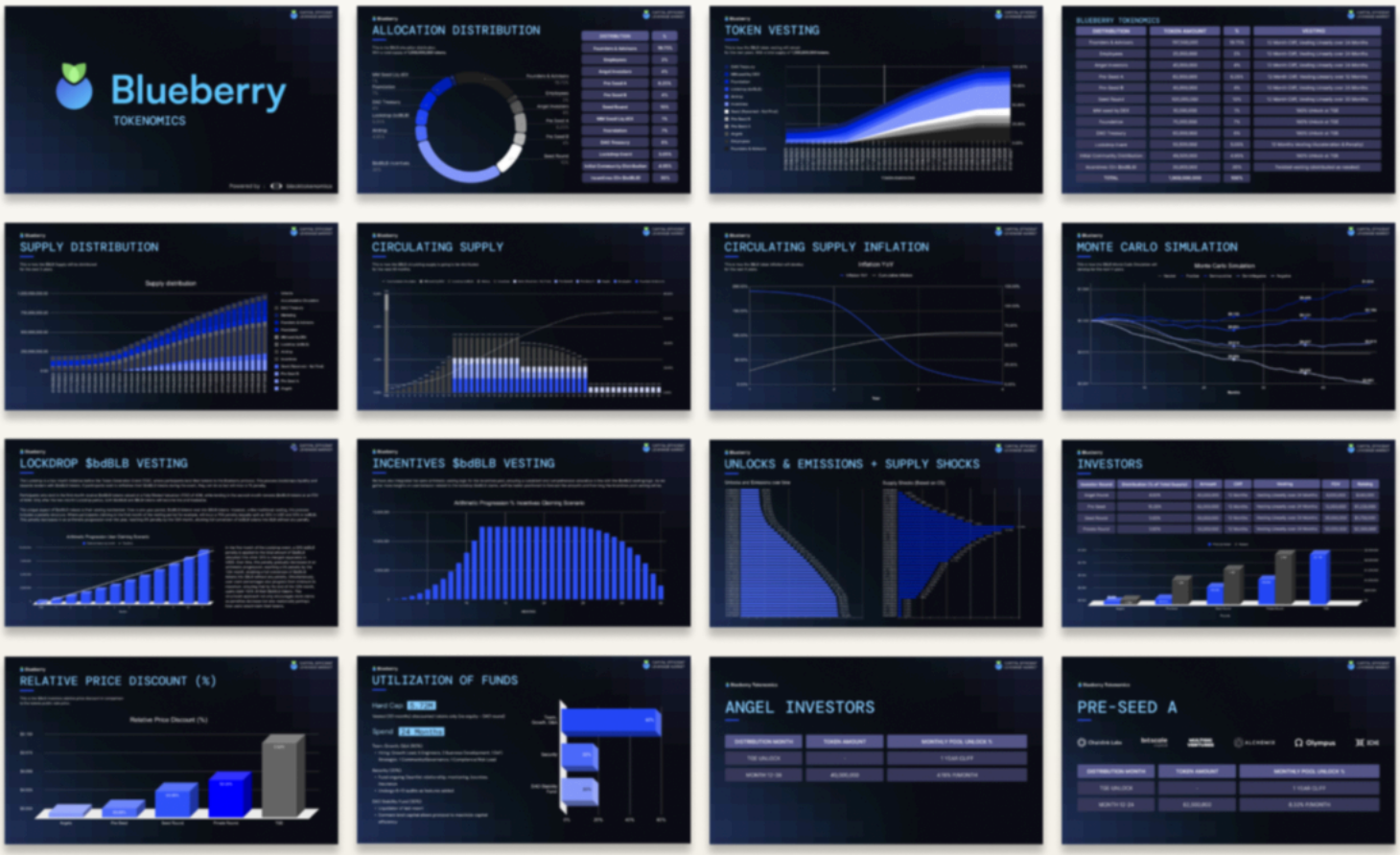
So, we don't just present raw data; we explain why it matters.

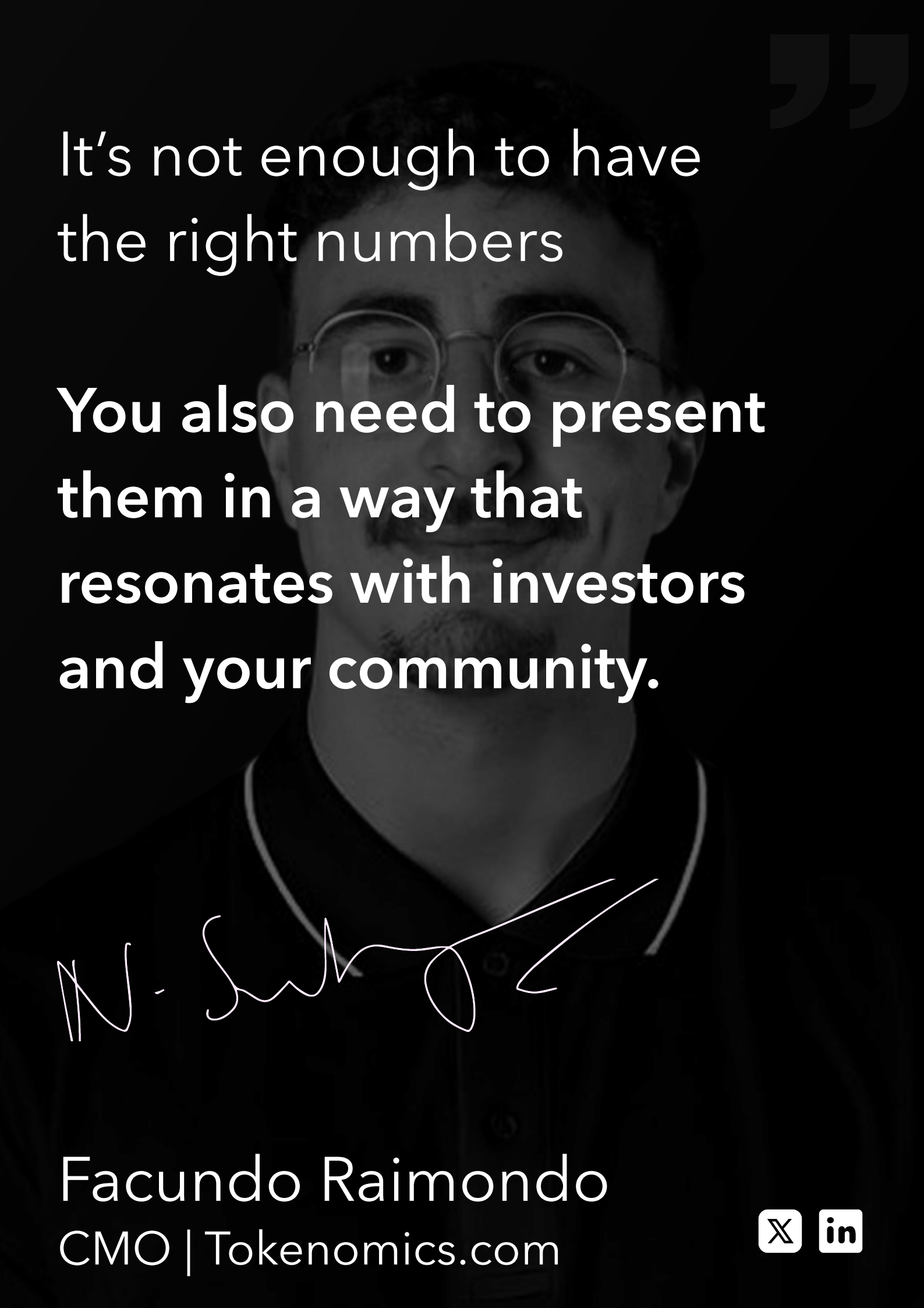
You need to break down the token allocation and vesting schedules not just as numbers on a page, but as part of a broader financial narrative.

We make sure investors can clearly see how the model ensures growth while mitigating risks like dilution or inflation.

We focus on: why we chose this tokenomics model, how it compares to competitors, and how the value flows within the ecosystem, and part of what is being captured, flows back into the token via value accrual mechanisms.

Finally we also create the tokenomics slides for your deck, designed to effectively communicate the investment opportunity to potential investors.





It’s not enough to have the right numbers

You also need to present them in a way that resonates with investors and your community.

Facundo Raimondo
CMO | Tokenomics.com

Documentation

On the other hand for the community documentation, the approach shifts to a broader, community-focused perspective. The community isn't necessarily looking for ROI metrics, they want to know how the token will work for them.

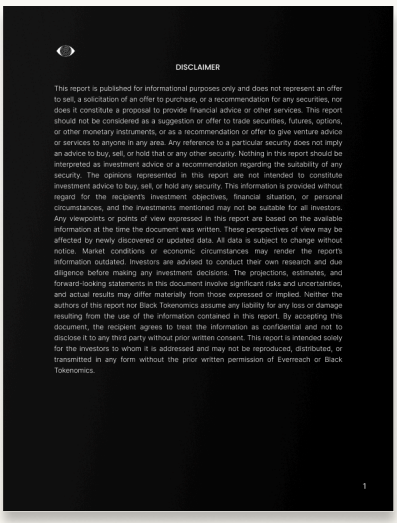
So we put the spotlight on utility flows and incentives. We break down how the token operates within the ecosystem, whether it's for staking, governance, or rewards so that every participant, from the most experienced user to someone just getting involved, can clearly see where they fit in.

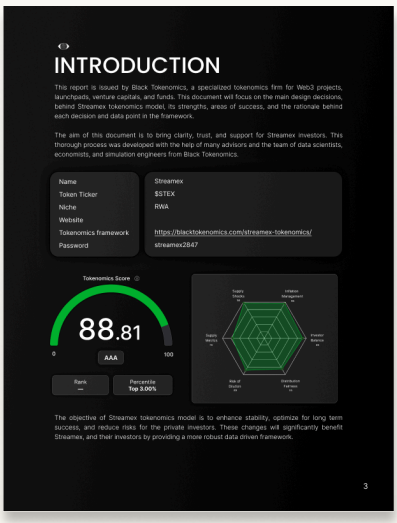
The documentation here is less about the technical economics and supply mechanics and more about engaging the community, building trust, and showing how everyone benefits from long-term participation.

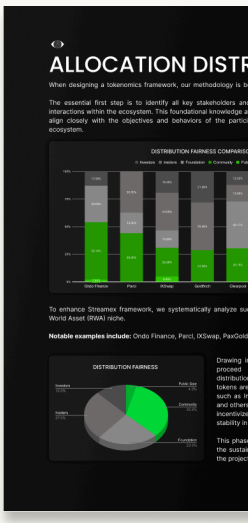
The aim is to show that the tokenomics is designed not just to create value but to align with the needs and behaviors of all ecosystem participants. It's about ensuring that the community understands how their participation fuels the project's success and, in turn, how they are rewarded for it.

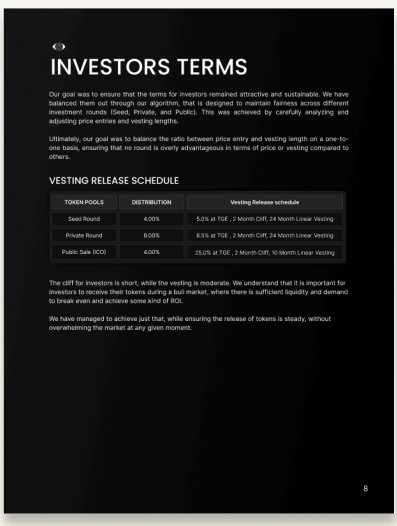
Ultimately, the difference in approach is clear: for investors, it's about presenting the investment opportunity ensuring that the tokenomics resonates by showing financial growth, minimizing risk, and providing clear return strategies. For the community, it's about focusing on utility, incentive alignment, and making sure the broader ecosystem works in harmony to drive long-term participation and value creation.

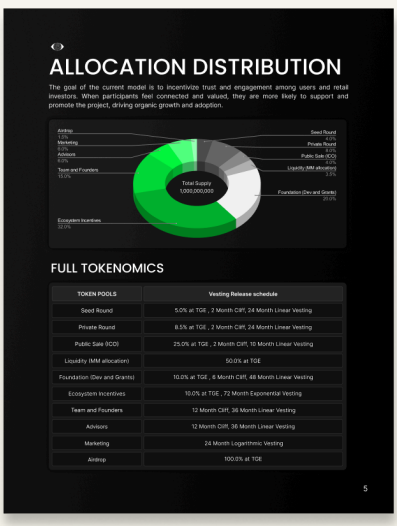
Each audience requires a tailored approach that not only presents the right numbers but also tells a story that truly resonates with their specific concerns and interests.

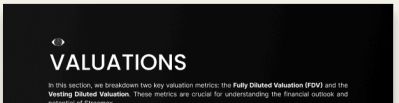


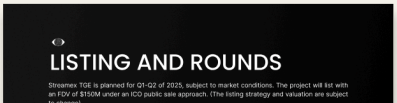












Everything we've covered so far is critical for the token's economic structure → **But structure alone is not enough.**

Even a perfectly timed vesting schedule or a fairly priced listing can collapse if there's no actual demand for the token, or if that demand isn't directed in a way that retains value inside the ecosystem.

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Value Flow

05

The tokenomics value flow is probably **the most important** vertical of a tokenomics framework.

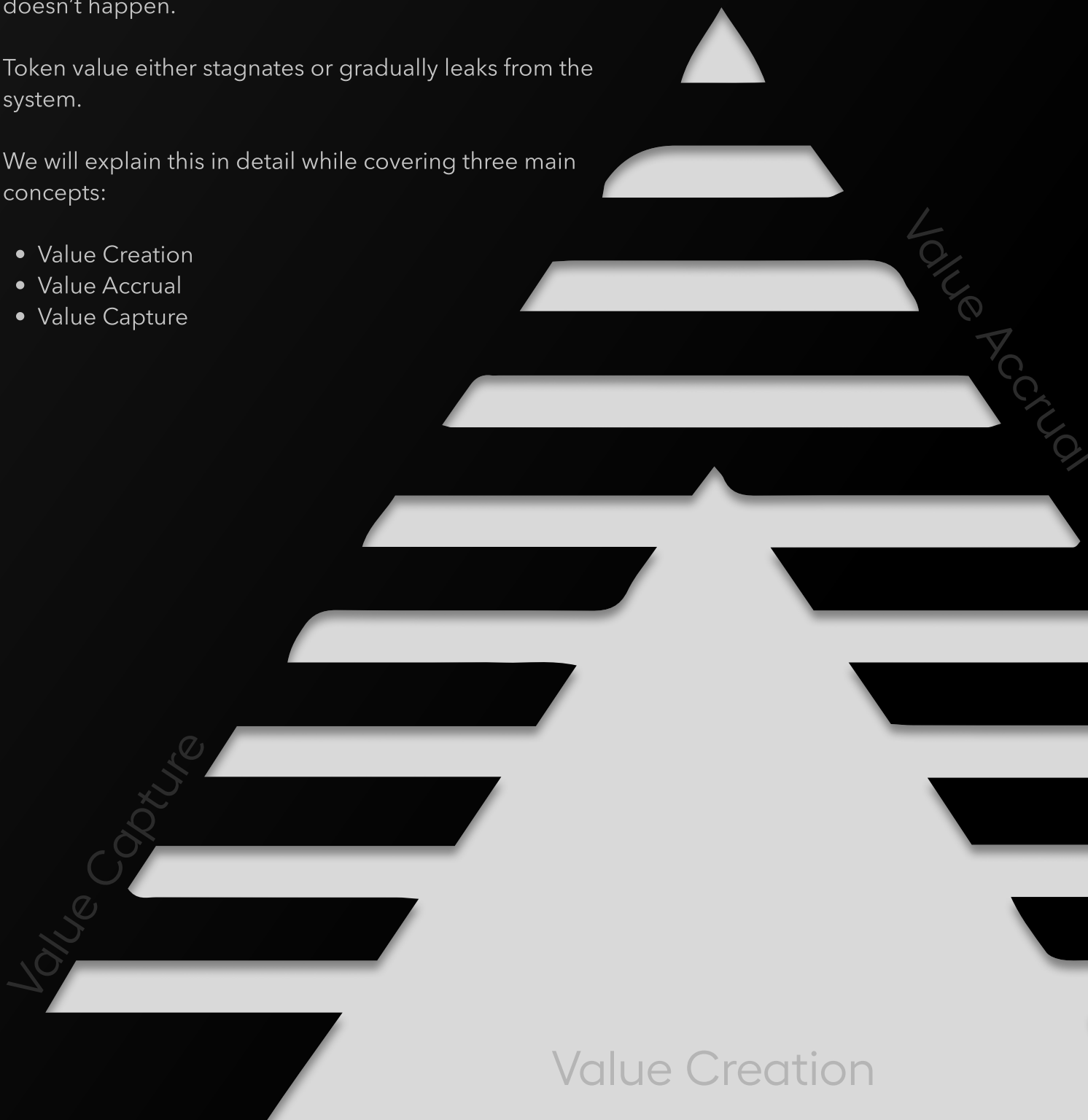
Founders build great products but assume that having lots of users will automatically drive token value.

But without the right mechanisms in place, this simply doesn't happen.

Token value either stagnates or gradually leaks from the system.

We will explain this in detail while covering three main concepts:

- Value Creation
- Value Accrual
- Value Capture



Value Flow

Most protocols aren't failing because they create no value.

They fail because they can't capture it , or worse, they try to capture too much, too early, and lose defensibility in the process.

This section of the document outlines the importance of token value flow: a framework we use at Tokenomics.com to understand how different mechanisms create (and retain) economic power within a system.

And more importantly, we'll show why defensibility is your cap. It's the real limit on how much value you get to keep.

Value Capture vs Value Accrual
Before we get into models, let's get one thing straight:
Value capture is protocol-level.
Value accrual is token-level.

- Value Capture is how much economic activity the system retains. Fees, margins, protocol-owned assets—this is what stays inside the machine.

- Value Accrual is how much of that captured value flows back to the token. Buybacks, burns, staking rewards, governance power, this is what gives the token actual relevance.

We separate them in every audit. Because if the protocol captures value but the token doesn't accrue it, the token becomes irrelevant.

Tokenomic Leverage
Not all value capture is created equal.

It's not just about whether you retain value, it's about how efficiently you do it.

Tokenomic leverage is the ratio between value captured and value created.

• A protocol with high leverage retains a large portion of the value it generates

• A low-leverage protocol creates value that immediately leaks out to users, arbitrage, or competitors

Think of it like operating margin for decentralized systems.

High tokenomic leverage sounds good on paper.

But in practice, it only works if your protocol is defensible.

Because if your system captures too much, and your moat is weak, someone will fork the code, cut the fees, and siphon your users.

In essence, the more value a protocol captures, the less defensible it is.

Utility and value capture have tradeoffs because of their interdependence.

The maximum value you can capture is the total value you create. As more value is captured, less is left for users/ consumers.

A token doesn’t just need **a reason to exist**.

It needs a reason to be **used**. A reason to be **held**.

And a system that rewards both actions.

Value Flow

Defensibility
Defensibility is the competitive advantage of a protocol. It's what keeps consumers from going to your competitors.

In short, moats.

It describes how much value can be sustainably captured before comparable utility is offered by a competitor. The more defensible a protocol, the more value it can capture, and the more overtly it can do so.

Maximizing defensibility results in a monopoly.

In Peter Thiel's famous talk at Stanford, he describes why you want to have a monopoly in your industry as monopolies can capture nearly all of the value they create.

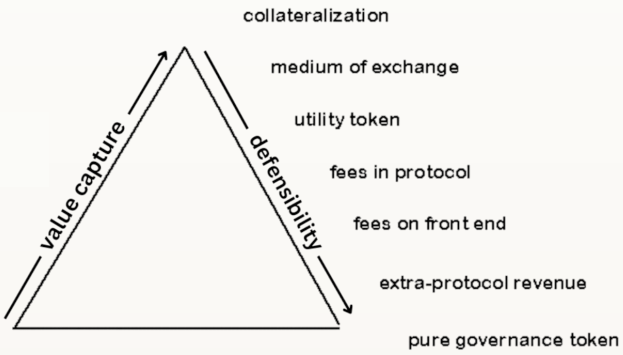
It's difficult to have a monopoly in crypto, as it's hard to build defensibility in open source

Still, there are various ways to build defensibility, and the more defensibility you have, the more value you can capture.

There are many reasons to build defensibility into your crypto protocol, and there are five moats, concrete ways of doing so.

These are:

Network effect •Lindy effect •Documentation •Brand •Gas efficiency.



At Tokenomics.com, we define tokenomic leverage as the ratio of value captured to value created.

It's how you measure whether your system is just spinning activity, or actually retaining economic power.

• High tokenomic leverage means you're keeping more of what you create

• Low tokenomic leverage means the value leaks out, usually to users, arbitrage, or protocol inefficiencies

Higher tokenomics leverage in a tokenomic mechanism or protocol overall is analogous to higher profit margins in a traditional business.

Examples:

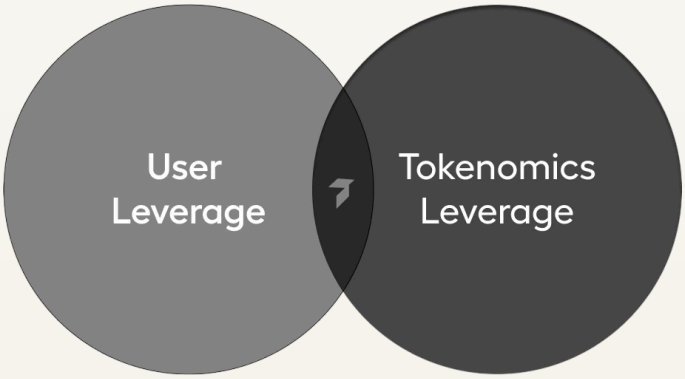
• A DEX with fees routed to staking contracts has higher tokenomic leverage than one with zero-fee trading

• A protocol that collects protocol-owned liquidity retains more than one reliant on mercenary LPs

But tokenomic leverage alone isn't enough.

If you over-optimize for capture, you build a closed loop, extracting more from users than they're willing to give.

That's where user leverage comes in.



User Leverage
If tokenomic leverage is how much value the system can retain, user leverage is how much influence users have over that system.

The most sustainable protocols don't just extract, they give users a way to move the needle.

User leverage can take different forms:

• Governance power (e.g. Curve vote escrow)
• Liquidity control (Uniswap LPs choosing exposure)
• Usage-based influence (gas fee rebates, tiered access)
• Arbitrage positioning (MEV-aware strategies)

It's not about generosity. It's about alignment.

When users feel like they can benefit and influence outcomes, they stick around.

When they can't, or when their input is ignored, they farm the system, dump the token, and move on.

If users have too much power and the protocol captures nothing, you end up with a public good no one can afford to maintain.

If the protocol captures too much and users have no power, they leave, because there's nothing in it for them.

Strong tokenomics give both sides skin in the game.

Most protocols optimize for tokenomic leverage (how much value they can extract per unit of utility), but the best ones also consider user leverage (how much control a user has over the value they're helping to create)

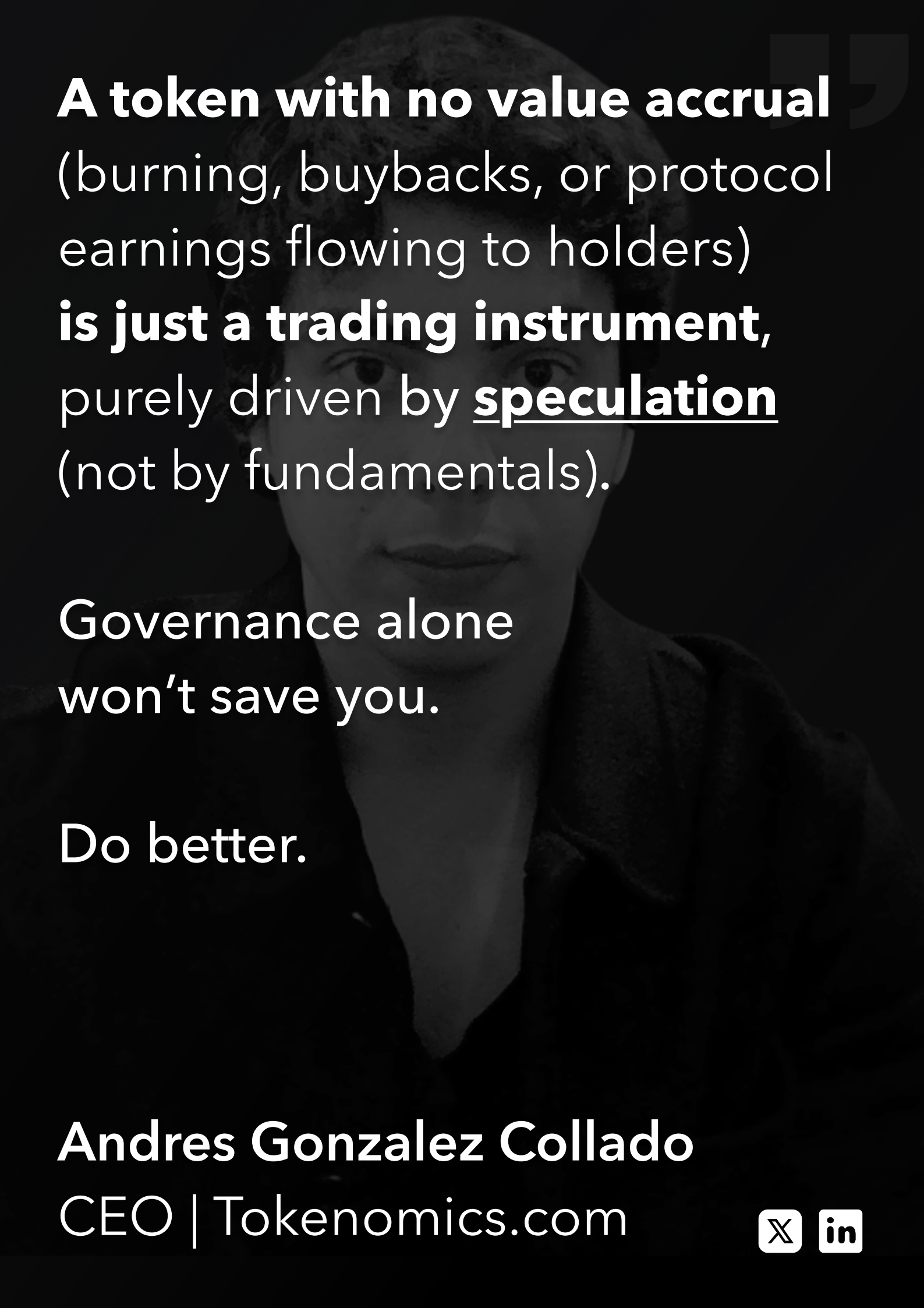
To reiterate the difference:

• Tokenomic Leverage measures how much value stays inside the system. (Protocols can dial this up with fees, burns, buybacks, and taxes)

• User Leverage measures how much users can influence outcomes. (This can be through delegation, LP positioning, governance, MEV strategies, or usage volume)

SAVE THIS SEED IN YOUR BRAIN → If tokenomic leverage gets too high and user leverage drops too low, users leave.

No one wants to play a game they can't win.



A token with no value accrual (burning, buybacks, or protocol earnings flowing to holders) **is just a trading instrument**, purely driven by **speculation** (not by fundamentals).

Governance alone won't save you.

Do better.

Andres Gonzalez Collado
CEO | Tokenomics.com

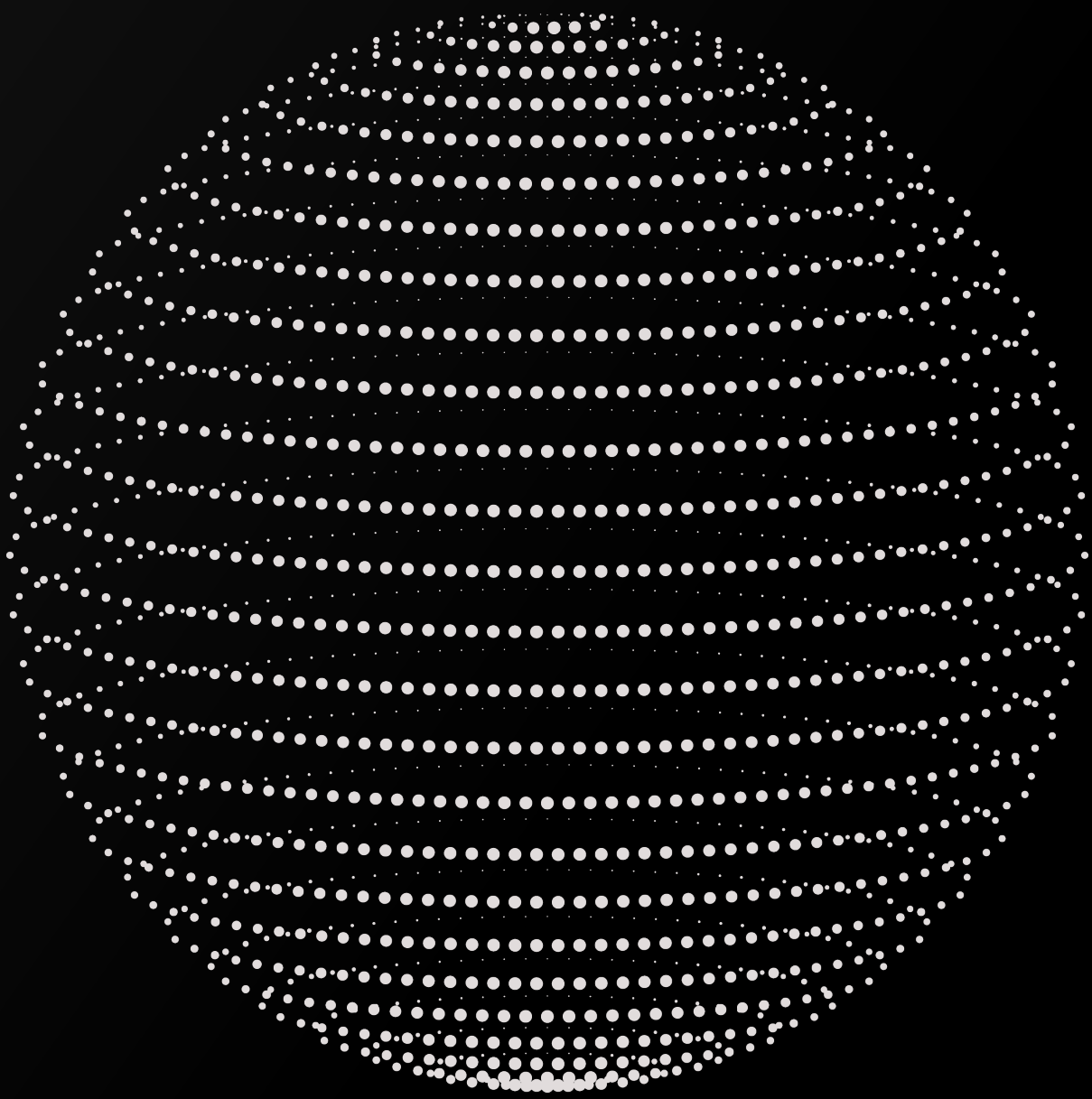
tokenomics.com

Incentive Systems

06

Show me the incentive
and I will show you the outcome.

Charlie Munger



Incentives

We view incentives as the core mechanism that drives user behavior within an ecosystem.

By carefully designing and aligning incentives, we ensure that users are motivated to act in ways that create value and support the health of the network.

Our Circle Model breaks down the fundamental layers of creating an effective incentive system. [Displayed in the next page]

We follow a structured, step-by-step approach focused on aligning incentives with desired behaviors within the ecosystem.

The first step is to identify who are the participants in your network and what tasks they perform.

Understanding these roles gives us a solid foundation for knowing how different types of users interact with the product.

Whether they are validators, liquidity providers, etc or regular users, each group has distinct tasks and contributions that need to be addressed in the incentive design.

Once we've understood the participants and their motivations, we move on to how users create value for the project.

Whether it's through staking, providing liquidity, or contributing in other ways, each action should add value to the ecosystem.

The tokenomics incentive system must be designed to reward these actions appropriately.

From there, we focus on the actual incentive design. by identifying what behaviors we want to encourage and what actions we want to discourage.

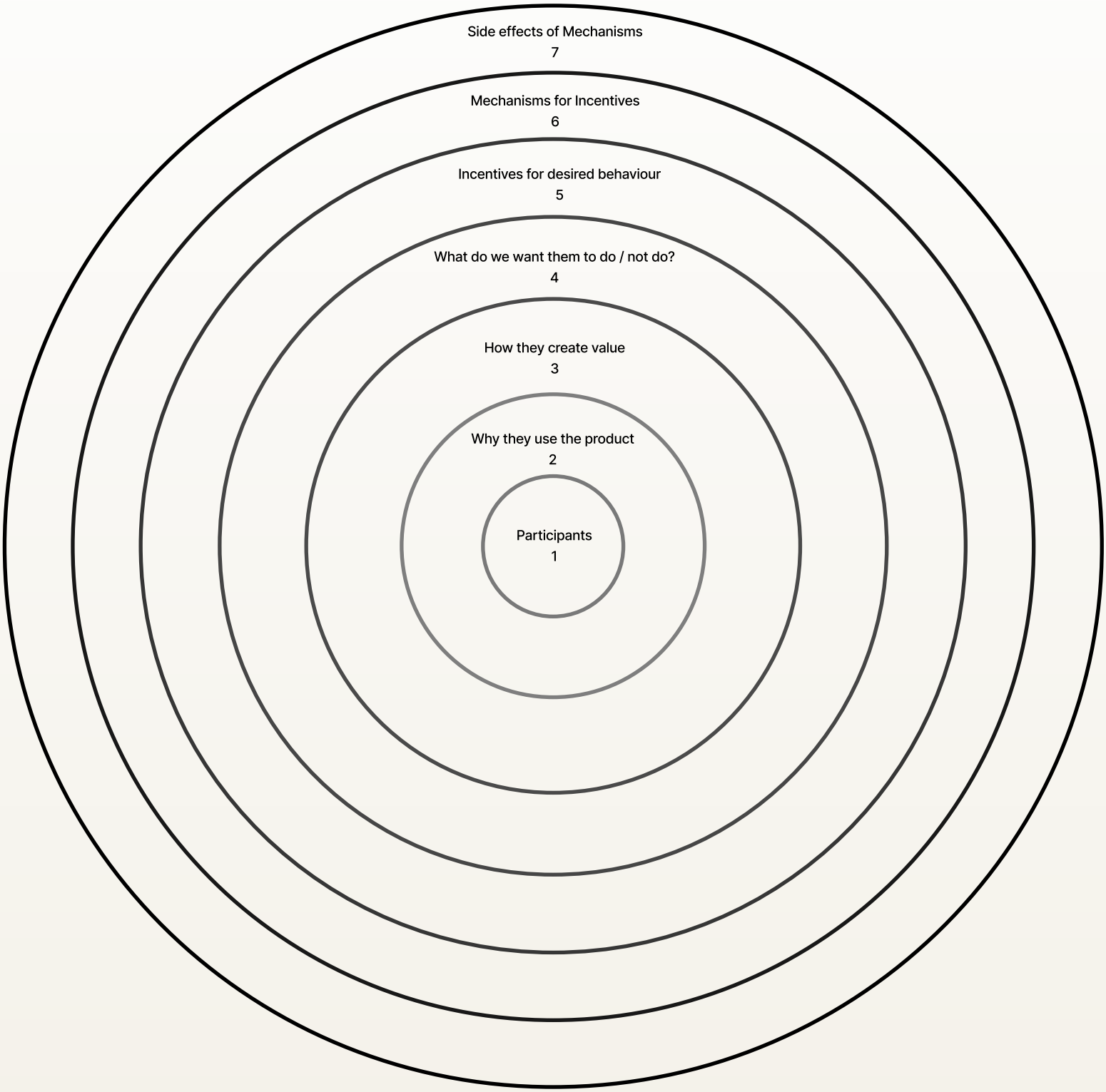
This includes setting up rewards (carrots) for desired actions and penalties (sticks) for behaviors that could harm the ecosystem.

After determining the incentives, the next step is translating them into mechanisms that can be coded into the system.

These mechanisms ensure that the incentives are consistently applied and that users are automatically rewarded or penalized based on their actions.

At this stage, we also consider the side effects of the mechanisms, running tests to ensure they don't backfire or lead to unintended behaviors.

Finally, we map out the full incentive system, visualizing how all mechanisms interact with each other and ensuring that they align with the project's overall goals.


Side effects of Mechanisms
7
Mechanisms for Incentives
6
Incentives for desired behaviour
5
What do we want them to do / not do?
4
How they create value
3
Why they use the product
2
Participants
1

Step-by-Step Guide

In order to create an effective tokenomic system you need to understand who the different types of users are and what tasks they're performing. This may not seem important, but it is the foundation upon which your incentives will lie.

Create a circle map for each user in your project and the tasks they perform. You can copy/paste the map for all your users.

Participants

1. Participants (*Who and What)*

Ask yourself:
Who are the users of your project and what tasks do they do?

In 3.1 you looked at who will be using your product and what they will be doing. Now its time to think about why they use your product and what their underlying motivations for using your product are.

Why they use the product

2. Why and Motivation?

Ask yourself:
Why will they use your product?

Not everyone is motivated by the same thing, it is important to understand what motivates your users to use your product. Behavioural insights help us to get a better understanding of users motivations. Think about what the core motivator behind your users actions is.

Bonus

3.1 *Behavioural Insights*

Think about what the core motivator behind your users actions is.

Now that you know who will be using your product and why, it's time to think about how they create value for the product

How they create value

3.2 *Value Created*

Ask yourself:
1- How do they create value for the product?
2- How can we capture part of that value?
3- How can we use the value captured? should we accrue part of it to the token holders?

How we can use the captured value to increase holdability?

Taking our defined users as an input, this section deals with the behaviours, incentives and mechanisms you want to put in place to get users to do what adds value to the project. Essentially, how do you get users to do you what you want?

The token is the tool to drive your users to certain behaviours. To get the incentives right, you need to define what you want them to do.

Add to your circle diagram what you want your users to be doing and things you don't want them to be doing.

What do we want them to do / not do?

4.1. Behaviour Framework

Ask yourself:
1. What do you want the user to do?

2. What do you not want the user to do?

Now that you know what you want your users to do and not do, you can expand upon this by thinking of carrots (reward) and sticks (punishment).

Incentive can be anything that could be used to get people to do what you want them to do.

For each user and their desired behaviour, you want to define the incentives that can ensure users are motivated to do what you'd like them to do.

Incentives for desired behaviour

5. Incentive Design
Ask yourself:

1- How do we incentive our desired behaviour's?

So far, you have brainstormed on your mechanisms per user. It makes sense to now flesh them out in detail.

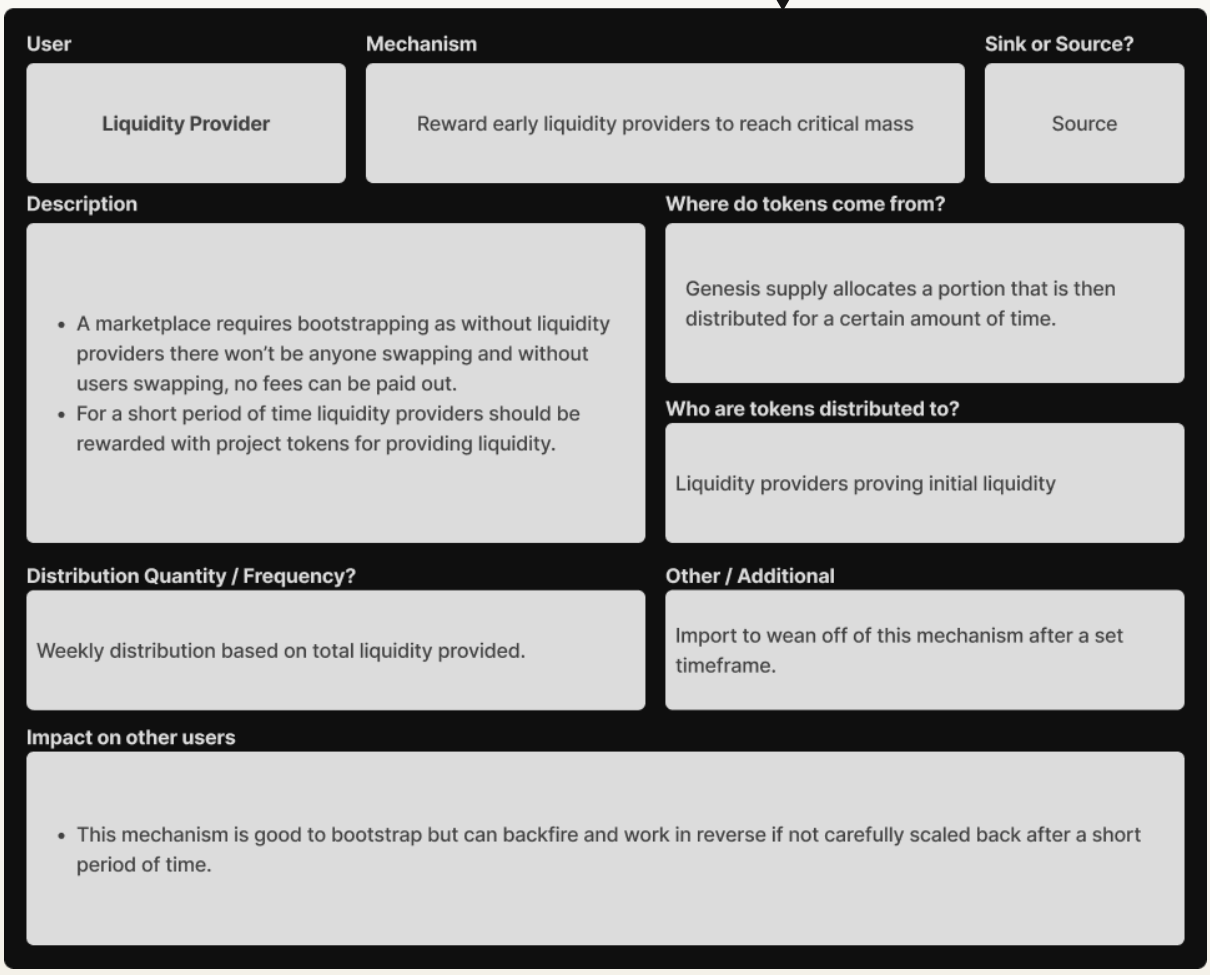
This should also give a clear understanding of which mechanisms introduce tokens into circulation (sources) and which take them out of circulation (sinks).

Mechanisms for Incentives

6. Core Mechanism

Ask yourself:

1. Based on the mechanisms you determined in #4.4, explain each one in detail.



Take all mechanisms, users and components and create a diagram.

It will be a great representation of your ecosystem and will give you a fresh perspective.

6.2 Mapping Mechanism

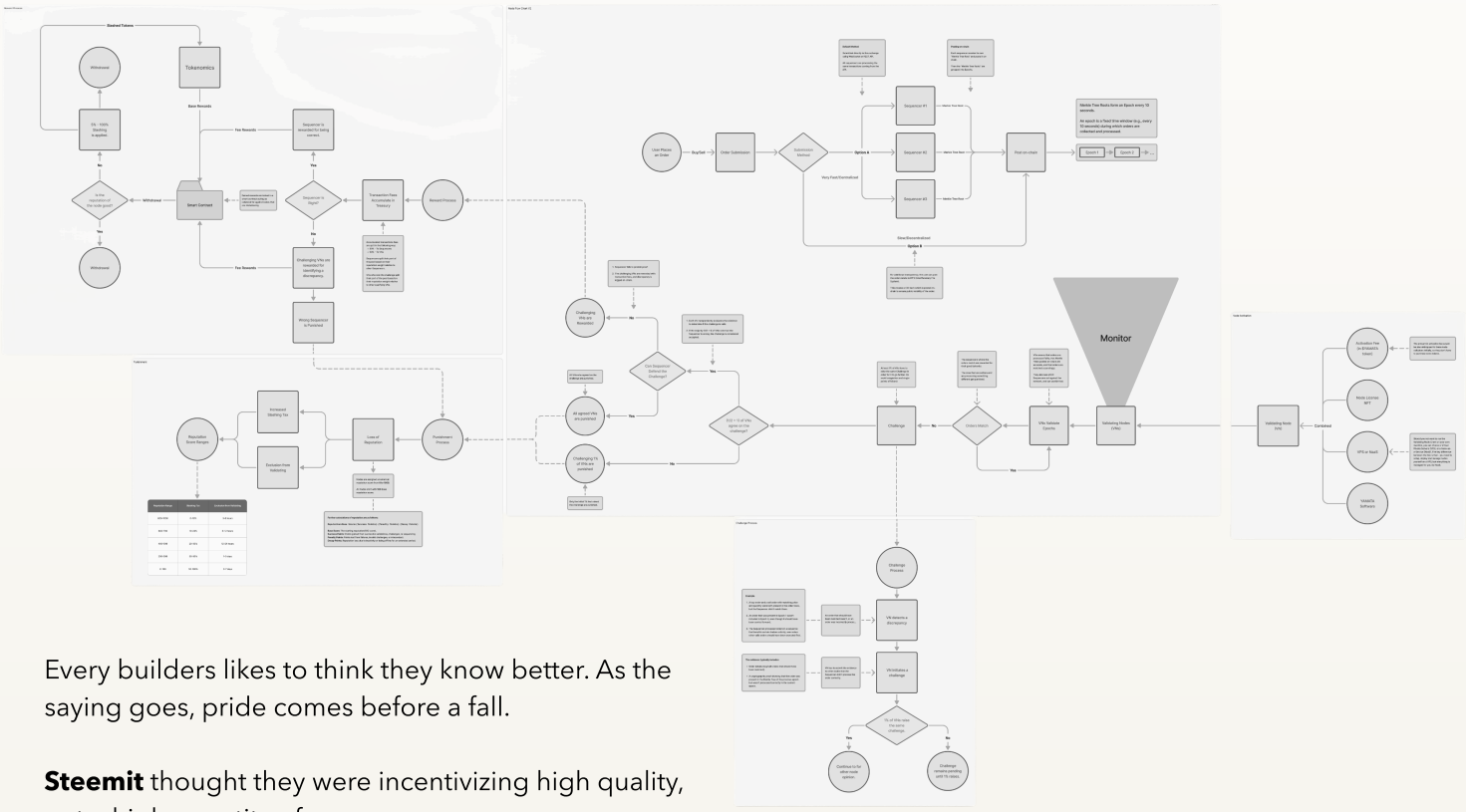
Ask yourself:
1 -How does it all look when put together?

Mechanisms for Incentives

The first step in avoiding misaligned incentives is to clearly identify all relevant user behaviors and the corresponding incentives in your product, then systematically ensure those incentives are aligned.

When considering each incentive, ask yourself: What could go wrong? How could I abuse this to make a profit, or to sabotage things if I wanted it to fail?

It's important to remember that malicious actors or other individuals attempting to exploit your incentives may not always be profit-driven.



Every builders likes to think they know better. As the saying goes, pride comes before a fall.

Steemit thought they were incentivizing high quality, not a high quantity of spam

STPEN and **Axie Infinity** thought they were incentivizing sustainable growth, not about to hyperinflate their token supply

Mango Markets thought they were incentivizing fee generating user activity, not creating a $116mm economic vulnerability

Even brilliant business minds like Satoshi Nakamoto (Bitcoin) and Jeff Bezos (Amazon) have made missteps with incentives leading to unintended or emergent user behavior.

If you're wise enough to be reading this, I'm sure you're an extremely smart and talented individual - but please:

Do not underestimate the nuance and difficulty involved in designing properly balanced incentives. It's OK to need help. In fact it's outright foolish not to get help.

If your incentives allow for undesired actions, such as sending direct messages without any cost, it's only a matter of time before someone abuses this by repeatedly performing the action, not because it benefits them financially, but because there's no penalty for doing so.

This is yet another reason why designing incentives is so difficult - there's always someone smarter than you out there (whether human or AI), and the more complicated your incentives are, the easier it is for them to find an exploit you overlooked.

When designing and testing your incentives, there are two key points to consider:

1. Keep it simple
Simpler systems are easier to test and harder to exploit. Bitcoin is a good example—though it's limited in functionality compared to fully programmable smart contracts, its simplicity is considered a security feature because it reduces potential vulnerabilities.

2. Modeling and simulations are essential
Even if your incentives are straightforward, stress-testing through models and simulations is crucial to identify potential weaknesses. Teams that don't prioritize risk management and scenario modeling are more likely to face critical vulnerabilities and struggle to attract investors.

As discussed earlier, it's crucial to consider not just who and what they reward, but also how much. Offering excessive rewards that are out of proportion to the value created can be wasteful and lead to short-term distortions in the ecosystem. This can result in increased price volatility, attract the wrong user base (such as bots or mercenary participants), and ultimately hinder the long-term adoption of the product.

A common example of this is protocols that aim to maximize the rate of return on their rewards to attract users at any cost. While this may increase short-term participation, the reward emissions often end up much higher than necessary to attract genuine users. The result is a surge in bots and mercenary capital—users who participate only to extract rewards, without contributing to the project's long-term value. This leads to higher inflation and little to no growth in organic user engagement.

Let's set blockchain products aside for a moment. Think of tradition web3 networks: Uber, Airbnb, YouTube.

What do they have in common?

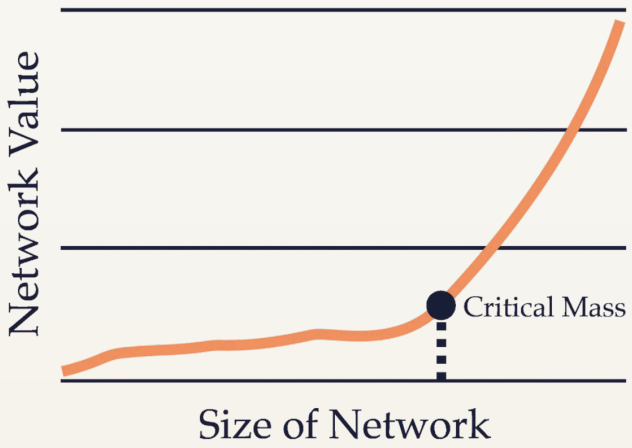
They're all two-sided marketplaces:
Uber pairs riders with drivers
Airbnb coordinates hosts and travelers
YouTube helps viewers find content creators

Like all two-sided marketplaces, when they first launched they each faced the "bootstrapping problem" or "cold start problem".

In simpler terms, a "chicken or egg" situation - which came first?
Uber is only useful to riders if there are already lots of drivers providing rides
But… Uber is only useful to drivers if there are lots of riders already requesting rides

The bootstrapping problem affects every marketplace business. And it's a big problem for any new product because it's difficult to compete with existing big players.

To see why, let's visualize how valuable Uber is to users in the aggregate (network value) compared to the total number of users in the network (size of the network):



Notice that network value drastically increases per unit of size beyond the point of critical mass.

Once Uber amasses enough drivers and riders, each new rider and driver not only inherits a high amount of existing value in the network but also adds significant marginal value.

New entrants trying to compete start at the very left of the chart. Uber's network already has (much) more value, and to make matters worse, Uber's value grows at a faster rate for each new user acquired.

This network effect makes it extremely difficult and expensive for new competitors to gain market share once a handful of large companies have already reached critical mass.

As a result, tech industries tend to exhibit winner-take-all (or at least winner-take-most) dynamics:

- Amazon and Shopify dominate e-commerce
- Facebook and TikTok dominate social media
- Google dominates web search
- Airbnb dominates hosting
- Uber dominates ride sharing

None of these are blockchain products though, so why should we care? Because…

Network effects also apply to blockchain products. Nearly every blockchain product is an n-sided marketplace business - even centralized ones like Binance.

What do you need to consider on network Tokenomics?

First you need to think of the token as a medium of incentives.

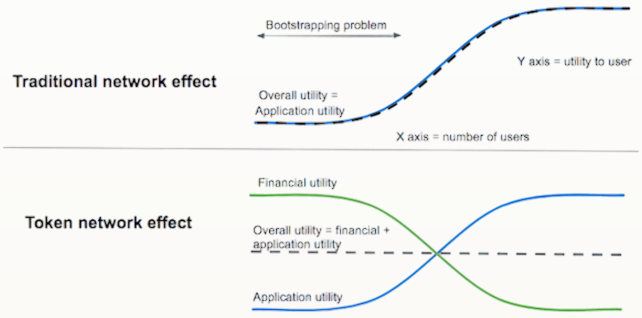
Lets analyze a real word example: FileCoin

When Filecoin was first launching, network utility was effectively zero - there was no reason for new supply-side users or new demand-side users to join.

This chart of Filecoin's network utility (above) is essentially the "traditional network effect" portion of the chart below. Tokens come in as the green line, smoothing out total network utility so that when Filecoin first launches, there is a draw for users to adopt the network even though the application itself has little utility.

The basic idea is: early on during the bootstrapping phase when network effects haven't kicked in..

provide users with financial utility via token rewards to make up for the lack of native utility.



While the product is the driving force of token's demand, incentives play an important role in fulfilling the product's unique selling proposition (USP).

Well though Incentives attach a reward to a desired behavior that increases the product's value.

As we just mentioned, tokens are a way to incentivize early network participants and avoid the "cold start chicken and egg problem".

Tokens can be an effective way to bootstrap networks that need passive user participation, but they can be counterproductive for those that need active participation

Tokens can be an effective way to bootstrap networks that need **passive user participation**, but they can be counterproductive for those that need **active participation.**

Passive vs Active Participation

Passive Participation
(When Incentives Work)

Let me explain this with a few DePIN examples:

a) **Helium**, a decentralized network that provides cheap, easy internet access to IoT devices "in the wild" like e-scooters and sensors. Hosts can join the Helium network by buying its "hotspot" and connecting it to their WiFi. Once they do that, the hotspot provides internet access to end-users (or owners of the aforementioned IoT devices) – and rewards hosts tokens.

b) **Arweave**, which is described as a decentralized, censorship-resistant storage network. Miners hook up their unused hard drive space to the Arweave network, which can then be used by end-users to store any type of data. Miners are compensated with tokens as long as data is hosted on their hard drives.

Filecoin and **Storj** are other, somewhat similar examples.

c) **Compound**, a lending network. Lenders deposit their crypto assets into a lending pool for borrowers to access. Lenders then earn interest on their deposited assets and are rewarded with COMP tokens for providing liquidity to the network.

In each of these cases, the financial upside of the token was a strong incentive for early users to sign up and increase the utility of the network.

But have you noticed the one facet that these networks have in common? **They all require passive participation from users.**

Once users connect their assets or resources to the network – whether that is bandwidth (Helium), storage (Arweave), or crypto assets (Compound), they continue to earn tokens.

Active Participation
(Doomed for Failure)

One of the most important principles of bootstrapping a network is to start with the most underserved users.

Acquiring users is not enough to reach liquidity. You also need the right type of users, i.e. those who feel the problem most deeply and would put up with any amount of friction to engage with your network.

the type of user is what matters:
An Uber driver who only provides rides when surge pricing hits 4x does not add as much value to Uber's network as a driver who provides rides as their full-time job.

Play-to-earn game **Axie Infinity's** highly inflationary tokenomics helped amass millions of daily active players. But unlike the value-add players of games like WoW, EVE Online, CS:GO, or Dota 2, most Axie Infinity players weren't playing the game for enjoyment. Token rewards accelerated the adoption curve by amassing a high number of profit-motivated "value-extracting" players. The result? When token price momentum eventually stalled, daily active players fell by >50% from its peak, creating a feedback loop and crash of >95% in the price of AXS.

Maker DAO's tokenomics aligned MKR holders with the success and adoption of DAI, which helped amass a small but dedicated audience committed to being vocal and loyal, value-add users of DAI years before DAI itself was even launched.

Despite building network capacity with FIL emissions, Filecoin only 5%-10% of the network storage capacity is currently used. Additional demand-side users are relatively much more valuable to the network than additional supply-side users - at least for the time being. These conditions are dynamic and change over the product life cycle.

Tokens can attract the wrong type of users – those drawn to financial incentives, and not the near-term utility of the network

Another well known example here is Looksrare – a decentralized NFT marketplace that launched in January 2022. It was meant to be a decentralized alternative to Opensea, which dominates the space

Looksrare executed a "vampire attack" on Opensea, by distributing (or "airdropped") tokens for free to high volume Opensea users.

It also rewarded users with tokens for trading certain NFT collections on Looksrare. This go-to-market (GTM) approach should have been enough for Looksrare to beat the cold start problem and scale its network.

Unfortunately, financial incentives led to user behaviors that weren't aligned with network utility.

After filtering out "wash trading", i.e. the same NFTs traded back and forth between the same wallets to earn more token rewards.

Interestingly, genuine trade volumes began to collapse as token payouts normalized.

In essence, users were there to earn and speculate on tokens, not to engage with the network.

Conclusions

Tokenomics is vital to DePIN because:
It's one of the most powerful tools to direct user behaviors

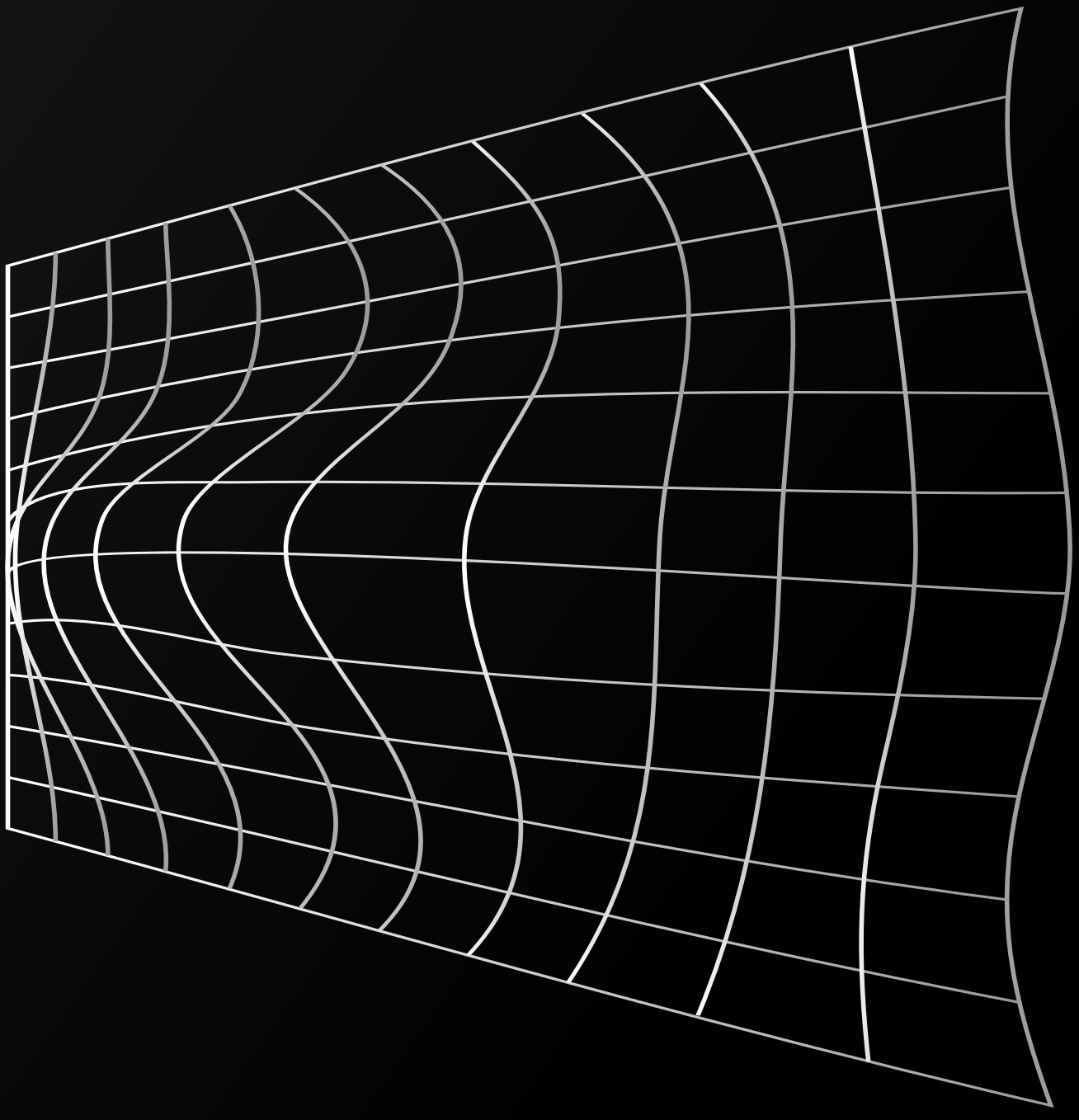
- It can play a crucial role in overcoming the "cold start problem" to reaching critical mass
- The right tokenomics can help you reach critical mass. The wrong tokenomics can lead to collapse.
- Network effects are built by reaching a critical mass before competitors
- In incentives design → Passive > Active
- When going for passive participation, reward the actions that are critical for the project and increase the product value.
- Well-thought-out incentives attach a reward to a desired behavior that increases the product's value.
- Tokens are a way to incentivize early network participants and avoid the "cold start chicken and egg problem."
- Your opportunity for the positive spiral effect is at the beginning of the network, and you have in most cases only one chance.
- You need the right type of users, those who feel the problem most deeply.

tokenomics.com

Modeling and Simulations

01

In this vertical we go through our simulation systems including liquidity modeling, demand forecasting, and selling pressure scenarios, to prepare for different outcomes, while also validating the tokenomics design using Machinations + cadCad stochastic modeling.



Modeling

Modeling allows designers to quantify risks, identify key assumptions, and optimize system design to strike the best risk-to-reward balance for their use case and avoid catastrophic events before they happen.

When most people think of modeling, their first thought is spreadsheets.

Excel. Google Sheets. Rows. Cells. Formulas. That's modeling, right?
That's one kind of modeling, but that's not all there is to it.

This kind of modeling is very useful, especially for quick drafts, simple thought exercises, less complex systems, one subcomponent of a larger system, systems with less randomness or uncontrollable variables, less mission-critical use cases, and for creating interactive calculators that are more friendly for non-technical team members and users.

These kind of models are less useful when it requires analyzing systems with multiple moving pieces that recursively influence each other, or analyzing the relative probabilities of a large or open ended range of possibilities.

The more complex a system, the more important modeling becomes.

A simple spreadsheet with one field for each of these factors, for example a cell for "how much did collateral assets fall", clearly can not achieve this - it does not represent any randomness or path dependency over time.

In mathematics, computer science and physics, a **deterministic system** is a system in which no randomness is involved in the development of future states of the system. A deterministic model will thus always produce the same output from a given starting condition or initial state.

We can change the inputs to the cells, but each time we use the same inputs and "run" the model, we get the same output - it is a deterministic model.

Deterministic models are very powerful tools - but they are generally not the right tool for conducting robust risk analysis.

This brings us to **stochastic modeling**.
Stochastic" means being or having a random variable. A stochastic model is a tool for estimating probability distributions of potential outcomes by allowing for random variation in one or more inputs over time.

A common method used in stochastic modeling is Monte Carlo simulations.

Most models, both stochastic and deterministic, are conducted in an "aggregated" manner.

Agent based modeling can be either deterministic, stochastic, or a combination of both.

For example, imagine a simple two-agent simulation of "rock, paper, scissors". A deterministic approach would be to hardcode each agent's behavior such as "always play what your opponent played last round". No matter how many times the model is run, the exact same series of events will play out.

What beginners fail to understand, is that modeling is not useful for predicting outcomes, it's useful for **analyzing risks**.

In other words, modeling is not about understanding what will happen, it's about understanding what can happen and the relative probabilities of different outcomes.

No matter which approaches to modeling you're taking, deterministic, stochastic, or agent based, all of them can benefit from basing your inputs and assumptions in real world data.

Your **deterministic** models' inputs should be realistic based on those of comparable projects.

Your **stochastic** models' degree of randomness and volatility should be realistic based on the fluctuations in data for comparable projects.

Your **agent based models**' agent behaviors and motivations should be realistic based on the behaviors of users of comparable projects, and the proportion of different user types such as speculative mercenary capital vs organic users vs bull market users vs bear market users, etc.

Your models will almost always be more useful when incorporating real world data wherever possible. But this doesn't mean you should run analysis that only considers "normal" real world situations, which brings us to…

While real world data is useful, certain risks, such as tail risks (black swan events), do not always show up in historical data because they happen so infrequently. You can and should incorporate real world data as much as possible - but you should always run analysis that is more conservative, and considers real world data from specific scenarios.

For example, you may run your stochastic model assuming a volatility rate observed during a bear market, compared to a flat market, compared to a bull market. You may even further exaggerate the parameters to be worse than the worst bear market even seen to date.

You should also feed in "artificial" boundary data - essentially asking: "What would happen if this parameter/input approached its highest or lowest possible value?"

This type of boundary analysis is simple but effective for detecting risks that have gone overlooked because the situations necessary for them to appear happen very rarely.

The results will describe situations that are very unlikely to occur, but which can occur (specially on crypto), which is the entire benefit of modeling in the first place.

You get a chance to fix and optimize things before they matter because once live, it's only a matter of time until a rare event inevitably occurs - you don't want the entire product to collapse when it does due to an oversight.

If you're making use of an oracle - how do you know that oracle is correct? Does your system assume the oracle is right 100% of the time?

At Tokenomics.com, we treat modelling as an optimisation function. The goal is not to predict the future but to optimize specific variables—whether that's minimizing risk, maximizing adoption, or finding the "sweet spot" between various factors like adoption per unit of risk.

Too often, builders jump into modeling without a clear understanding of what they're trying to achieve. We take a more deliberate approach, focusing on what needs to be optimized to achieve the best outcome for the project, ensuring every model serves a specific purpose.

There is no such thing as "the best approach" or "the best tokenomics" for every situation. Every design decision is a tradeoff, and the right design for your context depends on what you are optimizing, maximizing, or minimizing.

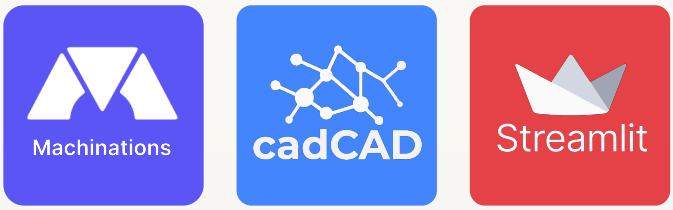
"All models are wrong, but some are useful." - George E. P. Box

Stochastic Modeling

To start with stochastic modeling, we employ industry-standard tools like **Machinations**, used to map out the entire token flow, providing a visual representation of how the economy functions.

cadCAD, a complex, adaptive, dynamic, computer-aided design tool, taking the Machinations flow and elevating it to a whole other level.

Finally, **Streamlit**, a Python-based visualization library, that connects to cadCAD simulation inputs and gives a user friendly interface where simulation parameters can be easily adjusted.



Machinations
We first start with the process of machinations where we take the flow that we designed in **phase 5** and transform it into an interactive and working version.

The important part here is that before machinations, we just have a theoretical flow with no actionable inputs or conclusions. The logic just exists here, but we do not know how much we will capture or accrue, or what are the exact amounts of tokens to burn, LP, or reward the node validators with.

After the machinations implementation, we have an interactive and actually functioning flow with the primary inputs and conclusions inside of it, where the logic and initial parameters already exist.

We know a fair estimate of how much we can capture or accrue, and since we went through a few iterations, we already understand what percentage of the tokens should be burned, taken as revenue, or accrued back to token holders.

After this step, we have the initial parameters, and we have the initial phase of the stochastic modeling done, but it still requires further testing and more in-depth simulations in cadCAD.

cadCAD
Using cadCAD, we enhance the initial stochastic modeling done on Machinations, delving deeper into complexities that Machinations alone cannot handle.

We break down the entire Machinations flow into smaller, more manageable pieces, where for each value capture and accrual mechanism, we define unique agents, behaviours, mechanisms, and states.

By first modelling each of these elements separately, we ensure that they can operate independently without any errors before integrating them into the final cadCAD simulation.

Streamlit
The final simulation is presented through Streamlit, where users can view and interact with the entire modelling process, and adjust the needed policies when needed.

This allows them to simulate different scenarios, offering flexibility and adaptability. If any aspect of the protocol changes in the future, the dashboard has easy adjustments to account for these new probabilities, maintaining the model's relevance and accuracy.

Machinations

Before diving into cadCAD, we first incorporate the designed incentive systems and value flow mechanisms into a Machinations simulation.

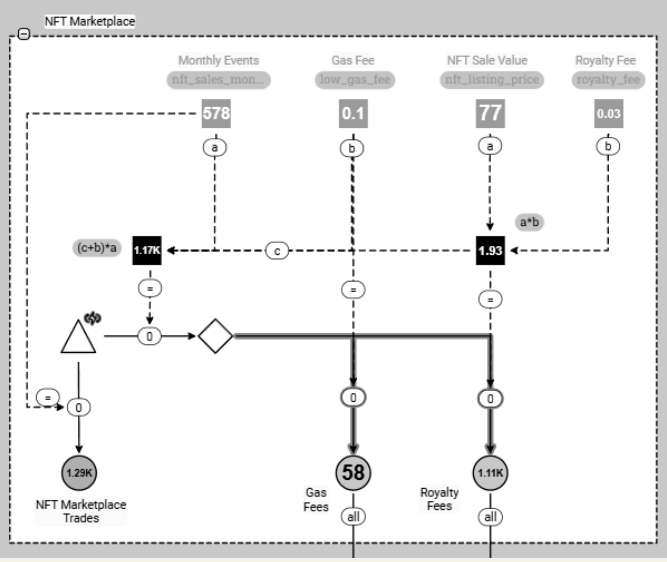
This step helps us to map out the entire token flow before goin into its specific parts with cadCAD.

With Machinations, we can directly observe how tokens from tokenomics emissions flow to different users as incentives for the behaviours we want to encourage and how these participants then use the tokens within the ecosystem.

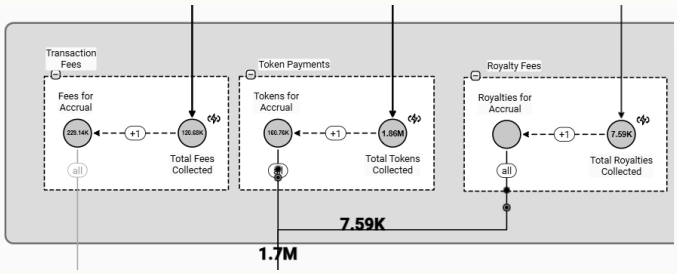
We define the user profiles, and how they will spend their tokens for different utilities, how these utilities will capture the value, and how this captured value will accrue back into the token.

More specifically we can model and see how much value will accrue back to the token, how much value will be captured by the business as revenue, and how much tokens we will release for incentives as rewards.

If we put this into perspective and imagine a blockchain where the **token is used for:**
- Gas Fees
- Payments for Features
- Medium of Exchange

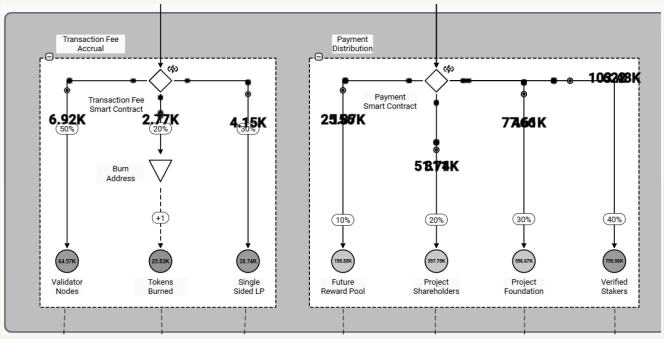


We would capture value in the form of:
- Transaction Fees
- Token Payments
- Royalty Fees



The key part here is modeling how much we capture out of each transaction and interaction with the token, which token utilities bring the most value, so we then know the exact use cases that we want to incentivize the most, for maximum efficiency.

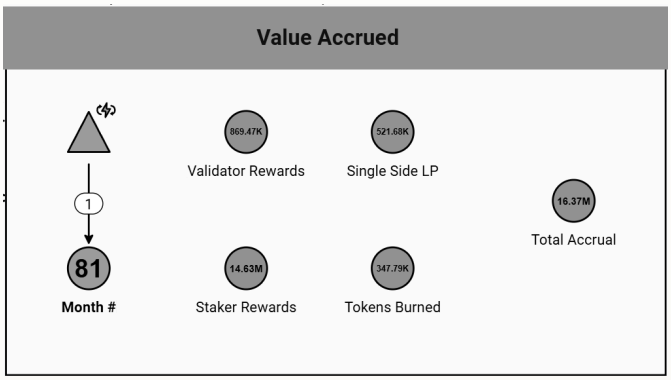
After the value is captured, we proceed with implementing **value accrual modules:**
- Token Burns
- Adding Token Liquidity
- Rewards for Validators
- Rewards for VE Stakers



The key part here is understanding the amount of tokens we should redirect to **burning**, **liquidity pools**, and as **rewards** to node validators making sure that validators are adequately rewarded, that we burn enough tokens to have a significant impact on token price over the long term and that we LP a sizable amount that actually reduces volatility over time.

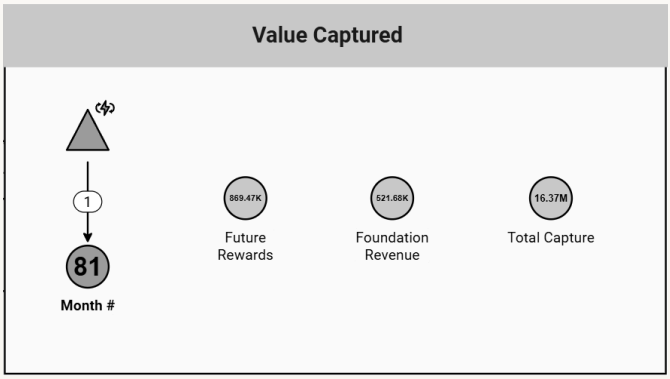
At the end, with the machinations flow, we end up looking at two different screens, one for value accrued, the second one for value that we captured.

The amount of value we can accrue



What it tells us is the amount of value that we can accrue, and how this accrued value compounds throughout the months after the project is listed.

The amount of value we can capture

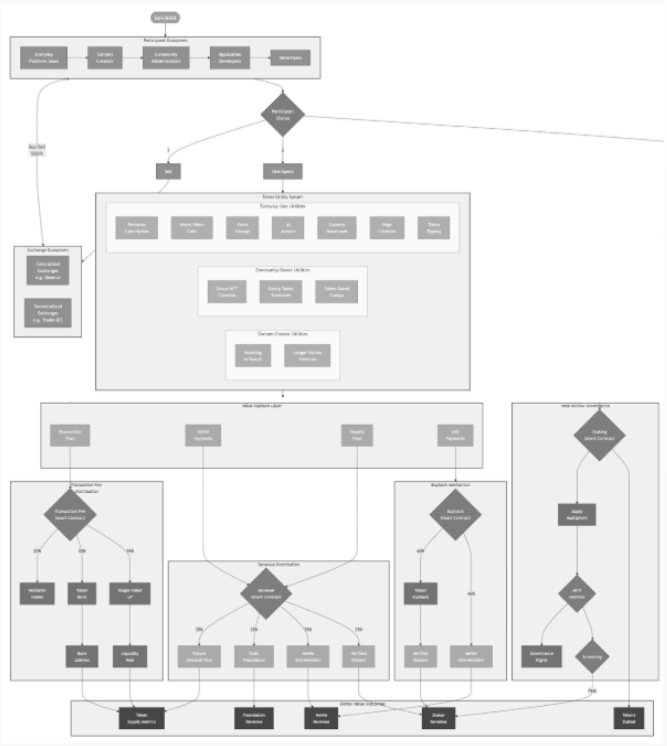


Is the amount of value we can capture, and how this captured value is distributed across the future rewards pools, the actual revenue for the company, and other needs.

All of this process so far, was to make sure the value flow we designed in **Phase 5** is now interactive, transforming the static flow into a proper flow on machinations where we can see where each token is used, how it's captured, how it accrues, and ends up back in the system again.

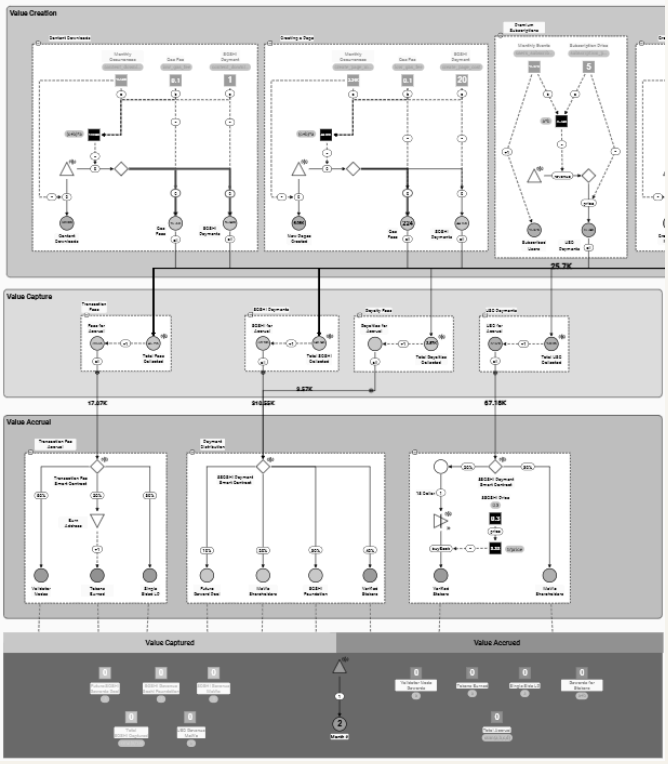
After the value flow is modelled, and we have fair estimates and the initial system policies, we can then start taking the individual value capture and value accrual modules, and continue our stress testing more in depth on cadCAD.

Before Machinations



Static theoretical flow, with no inputs or actionable conclusions. The logic exists, but we do not know how much we will capture or accrue.

Inside Machinations



Interactive and functioning flow, with primary inputs and conclusions. The logic and initial parameters exist, but but still require further testing in cadCAD.

CadCAD (Stochastic)

cadCAD (Complex Adaptive Dynamics Computer-Aided Design) is a powerful open-source modeling framework that allows us to create, simulate, and analyze complex tokenomics systems. cadCAD is widely used for Blockchain and DeFi token economy models, where systems are interconnected and evolve dynamically.

cadCAD flexibility allows us to build comprehensive simulations to test various scenarios and understand how specific changes might affect the whole system.

To model and stress test tokenomics in cadCAD, we start by breaking down the entire tokenomics flow into smaller, manageable components. This process involves detailed mapping of each interaction and dynamic within the token ecosystem.

By isolating each component, we can define specific parameters and behaviors in a modular way, making the model adaptable to changes and easier to understand.

Step 1: Breaking Down the Model

First, we divide the entire token flow into smaller pieces, this disaggregation helps us focus on the individual factors that influence the token's behavior, such as user actions, economic incentives, and external market conditions.

These components are classified into two main categories:

1. **Exogenous Processes**

These are external factors that influence the system but are not controlled within it. They are often stochastic, meaning they may involve randomness or uncertainty. In tokenomics, exogenous processes might include market volatility, macroeconomic trends, and regulatory changes. They act as forces that impact the system from outside, creating fluctuations or pressures on token value and user behavior.

2. **Agent Actions**

These represent the choices and behaviors of participants within the system. For tokenomics, agent actions are activities like buying or selling tokens, staking, participating in governance, or voting on proposals. These actions directly impact the token's value and supply within the ecosystem.

Step 2: Defining Behaviors, Mechanisms, and States

After identifying exogenous processes and agent actions, we structure the model into:

Behaviors

These are the emergent patterns that result from exogenous processes and agent actions. For instance, users have an option to either buy or sell tokens at any given time, and the behavior is token holders choice.

Mechanisms

Think of mechanisms as rules or internal processes that define how user behaviors interact with each other to produce specific outcomes.

If "token holders choice" is a behavior, then the two mechanisms emerging from this are his decision to "buy on market" or "sell on market".

States

Represent the current values or conditions of key variables within the system at any given time. They capture the immediate outcome of the mechanisms and provide a snapshot of the system's health.

If "token holders choice" is a behavior and "buy on market" or "sell on market" are the mechanisms the "future token price" would be the state.

States are continuously updated through interactions between behaviors and mechanisms, reflecting the system's response to user actions and external factors. States is the output we stress test and optimize.

CadCAD (Mechanism Flow)

Step 3: Creating an "Model Mechanism Flow"
A mechanism flow helps to visualize the interdependencies between various states, agent actions, and exogenous processes. For instance:

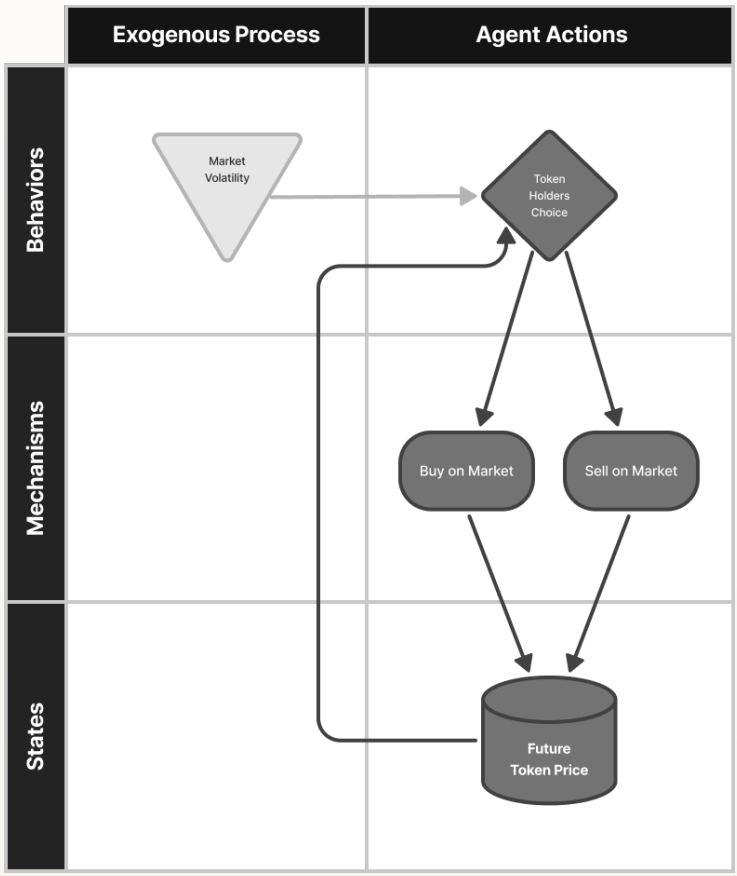
Behaviour's
Market Volatility, external influence that introduces randomness.
Token Holder's Choice, who are influenced by market conditions.

Mechanisms
Buy on Market: Action increasing demand based on holder's choice.
Sell on Market: Action decreasing demand, potentially lowering token price.

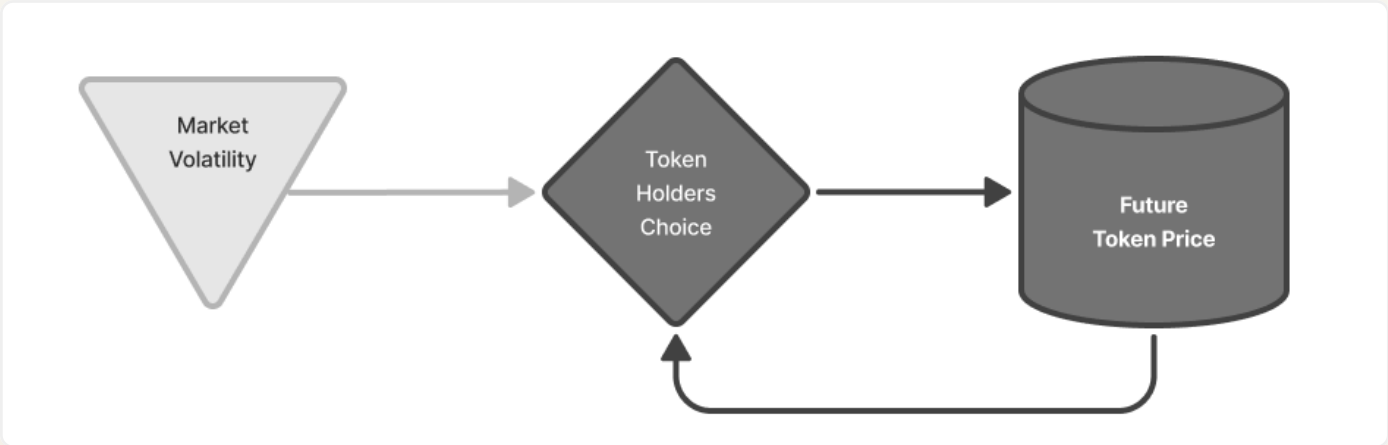
States
Future Token Price: Reflects current token value, updated by buy and sell actions in response to market conditions.

By mapping these flows, we can simulate how each part of the token system influences others, allowing us to observe feedback loops and dependencies within the tokenomics model.

cadCAD Model Mechanism Flow



cadCAD Model Mechanism Flow (Simplified)



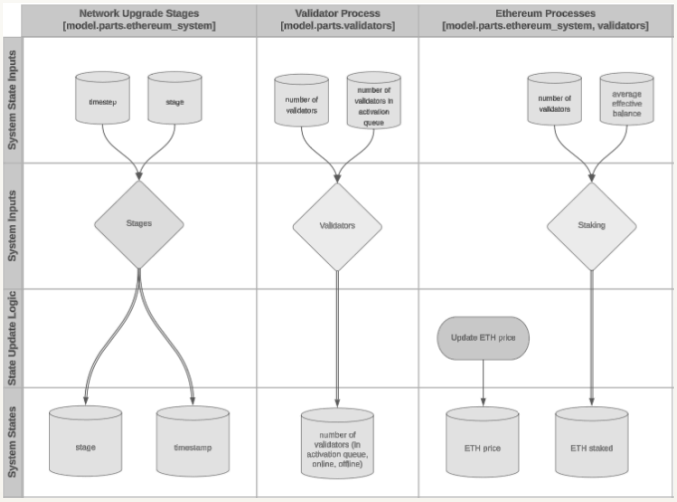
CadCAD (Streamlit)

To create a proper mechanism flow we first have to deconstruct the whole token flow into smaller, more isolated modules, where each piece is independently mapped and tested.

Each piece of the flow, such as **vote escrow**, **staking**, or **buyback** modules, are first modeled in isolation, as they all have their own specific agents, behaviors, and mechanisms.

By optimizing each of them separately we first ensure they can function independently on their own, with no errors, before assembling them into the complete, combined cadCAD simulation.

Seperated cadCAD Mechanism Flow Pieces

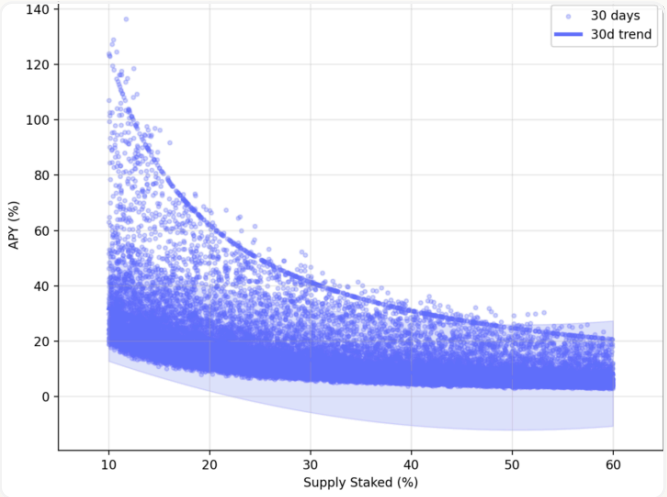


For example, we could start by modeling the staking system module, where we would analyze how various user staking behaviors would impact the APY distribution among different staking durations.

This is particularly useful when discussing **dynamic APYs**, which fluctuate based on the number of users staking, the token supply being staked, and the various staking durations available. These variables directly influence the APY, making it uncertain what the effective APY will be once the system is live.

Therefore, it's crucial to incorporate this system into a separate mechanism flow before plugging it into cadCAD with stochastic inputs, agent actions, and exogenous processes. This allows us to understand how these factors affect the APY distribution across different scenarios.

APY Distribution vs Percentage of Supply Staked



Once the mechanism flow is integrated into the cadCAD model, we generate an output which shows us an APY distribution versus the percentage of token supply staked.

Each blue dot represents 1 outcome from over 1000 individual **Monte Carlo** simulation runs, and the trend reveals an inverse relationship, where as more of the supply is staked, APYs tend to decrease. Most simulations cluster in the 10–25% APY range, indicating the most statistically likely outcome.

The distribution also features a long tail of higher APYs when staking participation is low, sometimes exceeding 100%.

These outliers represent edge cases where few participants capture a large share of rewards. While less likely, they highlight the importance of accounting for volatility and black swan events that can sometimes occur.

In the end, we model to understand the probabilities of different APYs based on varying **exogenous processes** and **agent actions**.

Once we have the probabilities and enough **Monte Carlo** simulations executed, we can account for extreme edge case scenarios that effect the staking system, making sure we do not over reward the users, when the network participation is low, or vice versa.

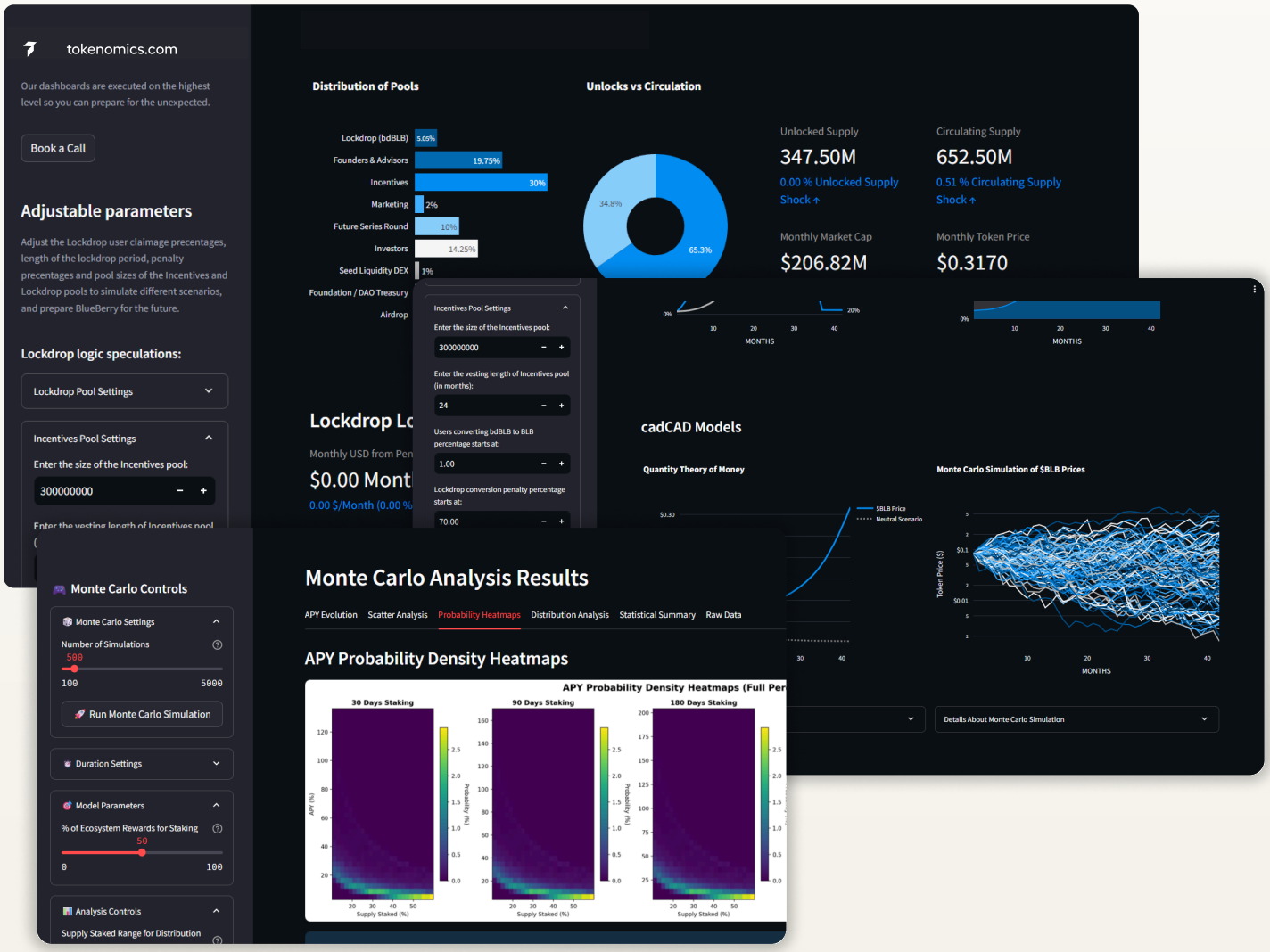
Once **staking cadCAD** is complete, the focus shifts to modelling other systems like **governance**, **buyback**, or **revenue sharing**. These other systems have their own differences and are modelled accordingly to account for different probabilities and outcomes.

Once each individual piece is finished we combine them into one final cadCAD simulation, connecting all components for a final stress test.

This approach ensures that the system not only functions well within individual modules but also allows these modules to cooperate and interact within a single economic framework.

This process leads us to the final phase with cadCAD, where we establish effective policies for key system decision variables, like the amount of tokens to allocate for staking incentives, the amount to slash the users whenever they are un-staking early, or the amount each user should pay in gas fees for different transactions on the network, etc.

All this information is integrated into a final Streamlit dashboard, which comes pre-loaded with the most balanced policies. The client can then adjust inputs on the sidebar to simulate different scenarios, making the model dynamic for future adjustments.



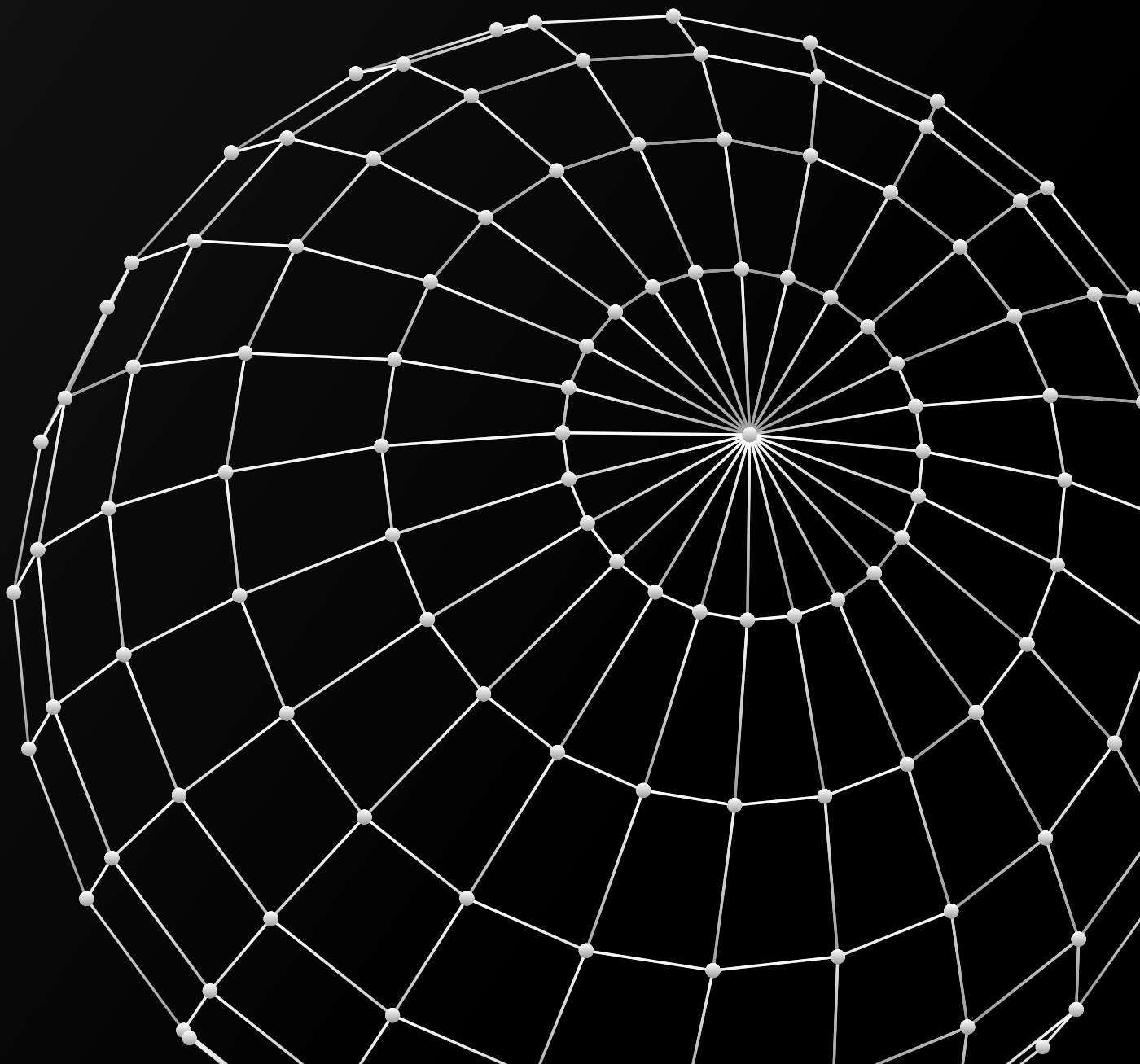
Iterations and Game Theory

08

We use game theory to test how rational participants behave once incentives are in place.

Execute simulations on whether they are likely to hold, contribute, or exploit the system.

Our goal is to make sure the most rewarding strategy for users is also the healthiest for the protocol, creating a stable, self-reinforcing equilibrium.

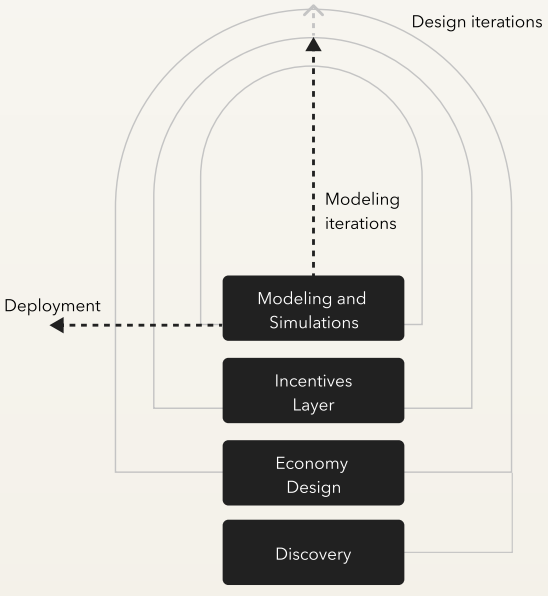


Iterations

After analyzing the results from modeling, we revisit key parameters, recalibrate inputs, and address any weaknesses revealed. This step ensures that each component aligns with the project's objectives and that the design stays adaptable to changing market conditions or user behaviors.

Modeling-Based Iterations allow us to put the refined design through a series of simulations, stress-testing it in various scenarios, including extreme conditions. These iterations are crucial for assessing the resilience of the tokenomics framework under different circumstances, helping us pinpoint any areas that may still require adjustments. By running these iterative cycles, we can preemptively address potential vulnerabilities and optimize for the best possible risk-reward balance.

Each iteration cycle enhances the tokenomics framework, transforming it from a theoretical model into a robust, data-informed system. This iterative approach ensures that when the tokenomics design goes live, it's prepared to handle real-world complexities with stability and resilience.

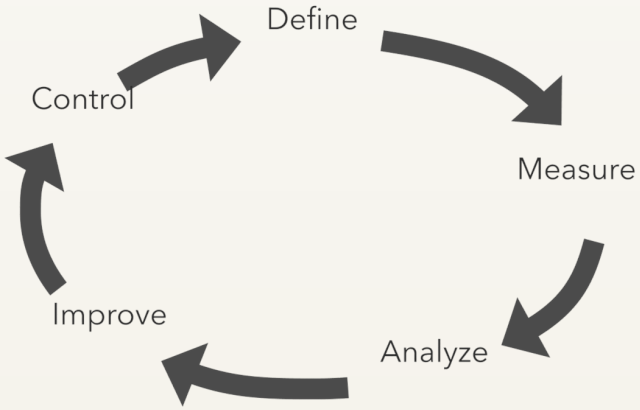


Token design is a multidisciplinary process that pulls learnings from many fields.

While the Modeling Phase provides a foundational understanding, it's the iterative process that refines the model for greater accuracy in predicting performance across various scenarios. Each iteration allows us to fine-tune key parameters, ensuring the framework can handle a broad range of potential outcomes and market behaviors.

For example, incentive structures require careful balancing to promote positive behaviors while discouraging unwanted actions. Iterations offer an opportunity to review and adjust incentive alignment, ensuring that the system consistently rewards actions that drive ecosystem growth.

We also apply iterations to crucial economic variables such as token release schedules, supply shocks, and inflation rates, which can significantly impact a project's stability. These cycles allow us to test different configurations of these levers, finding the optimal balance that maximizes growth while minimizing risks like dilution and excessive volatility.



Game Theory

While modeling iterations allow us to test economic configurations under a wide range of scenarios, the final layer of this process involves evaluating how rational participants behave within the system.

This is where **game theory** enters.

Once incentives are defined and mechanisms are in place, we must assume that users: whether investors, validators, contributors, or external agents will seek to maximize their own outcomes within the rules provided.

Game theory gives us a framework to test these behaviors. Instead of relying on assumptions of ideal usage, we ask:

- What happens when users behave strategically?
- Are there dominant strategies that lead to short-term extraction or systemic risk?
- Can small groups coordinate to manipulate outcomes, extract value, or destabilize participation?

These are the questions that must be answered before any tokenomics model can be considered resilient.

At this stage, we run adversarial simulations to identify whether the equilibrium behaviors (those where no participant can unilaterally do better) are also aligned with the health of the ecosystem.

If the optimal strategy for users is to hold, contribute, and remain active, the system is in balance.

If the optimal path is to exit early, extract value, or bypass intended mechanisms, we return to the model and refine.

The purpose of this phase is not to assume the best from participants, it is to prepare for the worst. By testing the system against strategic actors, we ensure that once live, the protocol encourages behaviors that are not only rewarded, but sustainable.

One of the most important principles we apply at this stage is the concept of **Nash equilibrium**.

In practical terms, it represents a scenario where no participant can improve their outcome by changing their strategy unilaterally, assuming others keep theirs unchanged.

In tokenomics, this means designing systems where the most beneficial action for each user, whether it is staking, holding, providing liquidity, or participating in governance, is also the most beneficial one for the protocol (value creation).

When users are rewarded for behavior that aligns with long-term network growth, the equilibrium is stable.

When users are incentivized to exit early, coordinate against the system, or act opportunistically, the model becomes vulnerable.

Our objective is to design toward equilibria that make aligned participation the most rational and defensible strategy. Once the desired equilibrium behaviors are defined, the next step is to test whether those behaviors hold when participants act strategically or even adversarially.

This involves simulating edge cases where users seek to extract maximum value with minimal participation.

For example, we assess whether early investors can benefit disproportionately by exiting at token generation, whether whales can coordinate to dominate governance outcomes, or whether validators can collude to reduce competition.

We also examine coordination risks, which are especially relevant in systems that rely on collective action.

Mechanisms like quorum voting, liquidity provisioning, or multi-party validation are only effective when enough participants act simultaneously.

If the structure is too complex, or if incentives are not clearly aligned, the result can be inaction, fragmentation, or systemic underperformance.

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