Economics Design and Engineering for Robust DLT Ecosystems

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Abstract

Matching economic theories, the paper discusses the underlying fundamentals of token economics that exist within a token ecosystem. 3 design fundamentals that affect the soundness of token economics: 1) Market Design, 2) Mechanism Design and, 3) Token Design. Token ecosystems facilitate an exchange of goods and services between participants in the ecosystem. Concepts from matching theory, auction theory, monetary economics, allocation theory, network economics and game theory, can help better design strong incentives for participants, produce robust stable outcomes, reduce inefficient allocation and improve the efficiency of transaction within the ecosystem. This challenges existing systems that will open powerful potential for long-term sustainability of token ecosystems and overcoming existing challenges.

Keywords: token economics, token engineering, ecosystem architecture, systems design, market design, mechanism design, token design, decentralised governance, blockchain economics, network economics, allocation theory
JEL classification O31, O33, O39, Y20

1 Introduction

Token economics is the engineering of factors that affect, define and govern a digital ecosystem. The purpose is to understand and affect the decisions made by participants. It consists of both economics and engineering. It involves responsibility for detail to deal with externalities [25].

2016 saw a start using tokens as a way to raise funds for token ecosystems (aka blockchain project, ICO, crypto-project). By 2017, projects are popping up at every day, raising hundreds of millions of dollars, in hopes to capitalise on this booming technology. Towards mid-2018, people began to realise the importance of sound economics underlying each token ecosystem. As the boom in decentralised finance (DeFi) highlighted the secondary market use-cases for the token, it only highlights the importance of robust economics design.

Engineering is the optimisation machine to achieve the outcome, while economics is the oracle that dictates what to optimise, exactly . Together, they build the architecture for digital ecosystems.

Being the foundation of tokenised ecosystems, token economics designs the model used to influence the allocation and use of tokens in the decentralised ecosystem, through incentive mechanisms in a defined environment.

It looks at the long-term and short-term objectives and drivers of the ecosystem. Well-designed token economics, with rules and incentives, can define the long-term outcomes of token ecosystems. Poorly designed ecosystems can lead to the collapse of the ecosystem.

Token ecosystems require coordination within the network. Rules help to increase the coordination. Because tokens are digital, they can be programmed with certain rules. Those programmable rules can be used to define the activities the token network does or does not support. The assets and transactions obey the rules and there are no exceptions, unlike the physical world.

Incentives are a central part of economics and token ecosystems give new ways to design and build incentive systems. With programmable assets, it is possible to program incentives and influence users' behaviours.

1.1 Motivation

The main motivation of this paper is to build the foundational literature for the field of token economics. This is done by deconstructing existing economics principles and applying the core concepts to digital and decentralised economies.

Most papers focus on building the cryptography [4] [22], financial model for token valuation [12] [14], legal regulations [5], regulating ICOs [2] or basics of the economics for blockchain [13] [8]. This paper seeks to build the foundation to token economics, so as to develop further valuable research in this new and evolving field.

1.2 Outline

This paper relies on economic theory to explain the 3 fundamentals pillars of designing token ecosystems, to achieve sound economics with robust mechanisms, and to identify the factors that could affect the long-term sustainability. Token economics is more than just valuing the tokens. This paper presents a framework that considers endogenous factors to value, design and define the ecosystem.

The paper is organised accordingly: Section 2 starts with the theoretical back-

ground on the relevant economic principles. Section 3 shares the methodology for this theory building paper and Section 4 focuses on expanding the theories. Section 5 shares the results, with the token economics framework and its applications to token ecosystems. Section 6 and 7 concludes with discussions, limitations and further research topics.

2 Theoretical Background

Economists look at markets as given, trying to make predictions about the participant's behaviours and outcomes in the markets. Market design, in contrast, does not take markets as given. Instead, it combines insights from economics and game theory, together with lessons learned from empirical work and experimental analysis to aid in the design and implementation of actual markets [34].

Market design is a form of economic engineering [33], where formal rules govern the interactions of users within the market. It involves the specification of detailed rules, which are typically analysed using what used to be called "noncooperative" game theory. The analysis focuses on the incentives for individual behaviour in the particular environment considered and its consequences.

It invovles:

- Solving problems in existing marketplaces through incentives
- Making individual strategic decisions through interactions
- Organising and understanding markets through rules
- Considering behavioural economics in the interactions of users

Mechanism design defines the rules of the game [24] to govern actions of participants, e.g. to incentivise good actions, de-incentivise bad actions and ultimately influencing participants' behaviours. Good mechanism design directly affects the long-term sustainability of decentralised ecosystem. The desired outcomes in good mechanism design include Pareto efficiency, strategy-proof mechanisms [21], fairness, or more general goals represented by a Bergson-Samuelson social welfare function which allow trade-offs between efficiency and equality [24].

Sometimes referred to as token engineering, token design directly relates to the token in the ecosystem. Based on the token's function, type, and purpose, the design of the token varies differently. Tokens, being a core incentive driver, can take on different functions: securities, utilities or currencies. This greatly affects the design of the tokens and the domains in economics.

2.1 Research Question

This paper proposes that, to build a robust digital and distributed ecosystem, one has to consider the factors within the 3 main pillars in token economics:

market design, mechanism design and token design.
Together, they build the underlying architecture of the ecosystem, which can be engineered to optimise the specific objectives of the ecosystem.

3 Methodology

The research is built through reviewing literature in the different domains and fields of economics. Then, deconstruct them to understand the core economic principles, which are lastly applied to build the model for token ecosystems.

The core economic principles are focused around market design, mechanism design and token design. The domains of reference includes market design, auction theory, systems designs, allocation mechanisms, property rights, monetary economics, game theory, principle-agent theory, voting and property rights.

3.1 Market Design

Market design defines the environment which users and the token co-exists so that markets are operated and governed efficiently [29]. It is important because a successful market design will encourage users to participate in the network, increasing the value of the token ecosystem.

In token economics, creators can design more efficient networks and platforms to provide greater value for participants through sound economics. Market design achieves this by qualifying the environment that the tokens and participants co-exist.

Market design shares insights about the market institutions (token ecosystem) and the general tasks markets have to perform (transactions, validations). Challenges and difficulties in market design factors are often the roots of market failures that call for new market designs.

Cheap and ubiquitous [26] technology allow for the creation of "smart markets". These markets aggregate complex inputs to determine the best outcome possible. Markets have to attract enough participation to reach suitable adoption level and reduce congestion when transaction occurs. In addition, markets need to convey information (e.g. eBay needs to share information about sellers and products) to make it safe for participation.

3.2 Mechanism Design

Mechanism design provides a coherent framework for analysing this great variety of institutions [11], with a focus on the problems associated with incentives and private information. Mechanism design shows which mechanisms are optimal for different participant.

The theory of mechanism design [17] takes a systematic look at the design of institutions and how these affect the outcomes of interactions, to satisfy certain objectives, assuming that the individuals interacting through the institution will act strategically and may hold private information that is relevant to the decision at hand.

3.3 Token Design

Depending on the distributed ledger technology (DLT) system, permissioned or permission-less, some of the factors in token design may not be relevant.

These token design rules are coded or embedded into the decentralised system, sometimes with a smart contract. Token design is important to ensure that participants follow the rules of the tokenised economy. Since token economies are decentralised, it is important to establish certain rules of the tokens into the programmable code.

Since token design is engineering the token as a core incentive for participants in the ecosystem, a significant factor that affects the design is the function of the token. It could be a security, utility or currency. Depending on the functions, the design can differ greatly under the various economic domains. E.g. monetary economics, financial economics, property rights.

4 Theory

The theory is built from deconstructing the various economic domains and applying them to the new decentralised digital ecosystems.

4.1 Market Design

Market design focuses on the environment in which the participants will interact with each other. Good market design allows trust to develop within the token ecosystem. This is a type of trust, where participants are able to communicate their priorities easily [33]. It can only develop if users reasonably believe that the agents (e.g. other users or users with authority) they use are at least as good at achieving their goals as they do it themselves.

4.1.1 Factors in Market Design

To work well, marketplaces need to [27]

1. Provide thickness
2. Overcome congestion
3. Make it safe to participate in the eocsystem

   (a) As opposed to transacting outside the marketplace
   (b) As opposed to engaging in strategic behaviour that reduces overall welfare
4. Consider repugnance in some transactions
5. Run experiments to diagnose and understand market failures and successes

Thickness A market provides thickness when it makes many potential transactions available at the same time so that relevant offers can be compared. They need to attract a sufficient proportion of potential market participants to come togehter to transact. The main issue with thickness lies in the network externalities and other economies of scope [27].

Ease of Congestion A market is congested if there is insufficient time or resources to fully evaluate all the potentially available transactions. Congestion is a particular problem of markets with many heterogeneous silimar opportunities. When individuals are faced with congestion, they may react in ways that damage other properties of the market. Overcoming congestion can be done by providing sufficient time for consideratoin or making transactions fast enough, so that market participants can consider enough alternative possible transactions to arrive at satisfactory ones.

Safety If it is risky to participate in the market, individual participants may try to manage their risk in ways that damage the market as a whole, or otherwise try to prevent their trading counterparties from being able to receive other offers. In the environment of token ecosystems where safety can be measured in code, an additional layer of safety for participants can be included, like privacy features, cryptographic agility and peer-reviewed algorithmic codes.

4.2 Mechanism Design

In a centralised system, a central entity can get together and deal with any situation that does not achieve the objectives. (E.g. government, central banks, board of directors.) But in the decentralised ecosystem, there need to be rules in place to reduce bad behaviours and negative outcomes.

Mechanism design is important because it affects the actions and behaviours of people in the network. It also seeks to account for endogenous preferences in market design [16], an important contributing factor to efficient mechanism design.

Mechanism design seems complex, extending classical general equilibrium theory to non-classical environments, and attempting to create a general normative theory of economic policy [24]. However, they can be broken down into various factors: trading institutions, theory of the firm, public choice, industrial

organisation, regulation, public economics, finance, macroeconomics, law and economics, and development.

4.2.1 Factors in Mechanism Design

In the context of token ecosystems, mechanism design needs to consider:

1. Provide adequate governance
2. Include non-financial incentives
3. Design structure of the mechanism

Governance In decentralised ecosystems, governance becomes of utmost importance to govern actions of agents (participants) in the ecosystem. Governance help to organise the transaction within the ecosystem, make it safe for participation and prevent congestion when issues arise. This can take various forms, including the legalisations and design of smart contracts. Klement and Neeman (2004 [18], 2005 [19], 2008 [20]) discussed the mechanism design frameworks to identify the procedural mechanisms to minimise the resources needed in disputes. Heifetz et el [16] (2007) discussed the inclusion of behavioural economics analysis to design governance with endogenous preferences.

Governance constrains the ecosystem differently, depending on the token function, use-case and objective function. There are concerns with a high degree of centralisation, inflexible smart contracts, consensus protocols and the regulations and laws of the various judiciaries. It is also not limited to just smart contracts, but can also include various resolution mechanisms, consensus protocols and other layers of governance.

Non-financial incentives Depending on how attractive financial incentives, non-financial incentives may also involve different types of mechanism strategies. This helps to further strengthen the incentive-compatible mechanism to achieve the objectives. Non-financial incentives can reach Nash implementation theory through the phenomena of possible renegotiation of the mechanism and observability sans verifiability of contingencies [24]. Reputation is also a noteworthy variable to reduce information asymmetry, incentivise low-quality sellers to report their true information [32] and mitigate the moral hazards when transacting within the economy (Bolton, 2004) [6].

Structure A mechanism provides a structure for the token economy to achieve Pareto efficiency, produce a dominant strategy [17] (Jackson, 2003), achieving Egalitarian mechanism or feasible utility profile that is Lorenzo dominant [33] (Vulkan et al., 2003). Further study by Makris and Renou [23] (2018) shares about the design model in multi-stage games and solution to bilateral bargaining problems. These structures can involve various (incomplete) contract theories,

resolving asymmetric information between participants and quasilinear preferences over allocations to achieve the desired outcome in the ecosystem.

A problem in mechanism structure lies in ecosystems with opposing outcome functions (e.g. stakeholders' vs shareholders' objectives). It is unclear how useful traditional mechanism design theory will be in these contexts; e.g. whether approaches based on analysis of specific mechanisms will be more useful than the attempt to characterize optimal mechanisms. Nevertheless, it is precisely by exploiting the special features of many important economic contexts that this approach has generated significant new insights [24].

4.3 Token Design

Token design is highly dependent on the token type and token function. i.e. Security, Utility, Currency To work well, tokens need to

- Define the token policy
- Reward with financial incentives to encourage specific behaviours outlined in Mechanism Design
- Design proper architecture of the token – that is to consider aspects of the tokens including property rights, identity, payoffs.
- Mathematical proofs or models for necessary valuation, supply, etc.

Token policy Token policy is adapted from traditional monetary economics and monetary policy. It seeks to design how tokens, incentive itself, will be managed and governed, unlike mechanisms where it seeks to design how the system mechanism is governed and managed.

Traditional monetary policy includes open market operations, discount rates, required reserves and quantitative easing. The equivalent in token policy is to open the market by listing on exchanges or secondary market transactions. Although discount rates are not as applicable in the decentralised market, the direct application is through the savings function of the mechanism. Catalini and Gans (2018) summarise that the incentives for token holders to save is a function of the expected growth in demand of the platform and expected growth in money supply. The required reserves can be achieved through saving choices as the ICO design stage [9].

Token policy constraints market differently, based on the objectives of the token ecosystems, such as ensuring price stability (stable currencies), extracting rent from token holders (decentralised governance), etc. Unlike monetary policy, token policy can extend to use-cases beyond the function of money. Token policy also considers expansionary or contractionary policy by altering the number of tokens available in the network.

Financial incentives A market can reach mass adoption much easier with financial incentives in participating in the token ecosystem. Sometimes this involves financial rewards for joining (e.g. airdrops), and it can also involve potential returns to equity owned, arbitrage on the exchange rates of the token price in dollars in 2 periods. Financial incentives become an important constraint to achieving network effects in the ecosystem.

Valuation of token ecosystems is a compelling incentive for venture capital, investors and buyers to participate in the ecosystem. As token ecosystems derive its values from ex-ante factors, instead of the Quantity Theory of Money from ex-post factors (e.g. velocity), a better mechanism should be used. Instead, we should consider valuation from an endogenous and ex-ante perspective. 2 valuation models for utility tokens uses dynamic price equilibrium and dynamic adoption are analysed by Catalini and Gans [9] (2018) and Cong et el [12] (2018) respectively.

Architecture: Property Rights Architecture includes principles from structure of property rights, payoffs based on property rights, identity and design of monetary tokens. Property rights are not the resource itself that is owned, rather the rights to use the resource [1]. With clear definitions of property rights come with bargaining power (ex-ante, ex-post), ownership, identity and property rights. Based on the GHM results regarding ownership, investments and incentives, there are plenty of papers researching on the topic of property rights and ownership. Chiu (1998) examines the effect of asset ownership on investment decisions with the absence of contracts [10]. Schmitz (2006) [30] analyses the payoffs if ex-post bargaining fails. Schmitz (2013) concluded that it might be optimal to allocate ownership (a property right) to the party whose investments are less productive, condition that the party has relatively small ex-post bargaining power [31].

Self-identity is another variable of consideration in the property rights of tokens. The role of blockchain is enabling the property rights inherent in the concept of self-identity [15]. We optimise the token economy for economies with decentralised participation constraint because participants can stake claims to the Ricardian rent. This is due to traceability of ownership over the self-identity without a third-party.

5 Results: Token Economics Model

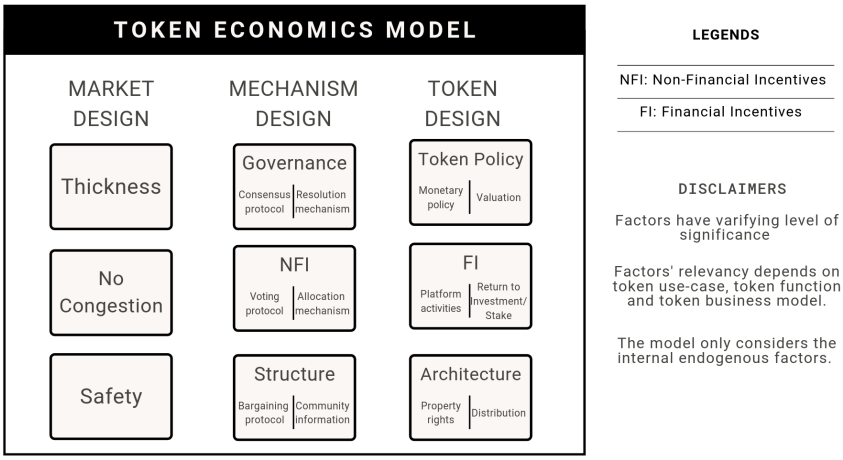

Figure 1: Token Economics Model

This results in a token economics model that consists of the various endogenous factors to be considered, when developing the token economics model for the project. (See Appendix A)

The factors are divided into 3 design pillars, Market Design, Mechanism Design and Token Design. Market design is the design of the environment. Mechanism design is the design of the overall gears in the token economy. Token design is the design specific to the token that will be used in the token economy.

5.1 Application of Market Design to Token Ecosystems

Thickness (Size of Network) Bring all the relevant parties who want to transact together. Make sure to consider the timing of transactions like when should offers to be made and how long it can be left open.

1. Attract Early Adopters
   (a) Incentivise early participation using diminishing returns mechanisms (E.g. Bitcoin block reward, Loom limited edition NFT)
2. Partnerships
   (a) Partner with related companies to drive early adoption and bootstrap network effect (E.g. Alliances and consortium)

(b) Tokens to entice network partnership between companies and users

3. Bonuses

   (a) Extra token if someone joins the network through referral
   (b) Airdrop

Ease of Congestion Ensure that there is sufficient time to consider the options. Otherwise, there are too many offers and no time to consider them. Resolve this issue by having the system to help people make better choices and reduce information asymmetry.

1. Govern Transaction

   (a) Grade transactions and remove low-quality transactions to ease congestion
   (b) Meter bandwidth

2. Charge Fees

   (a) Access fees
   (b) Congestion fees

3. Governing validators

   (a) Fixed set of validators for consensus (E.g. EOS)
   (b) Randomly select groups of nodes for consensus (E.g. Cardano, Dfinity)
   (c) Specifying super-nodes with authority for consensus (E.g. MakerDao)
   (d) Proof of Authority Notary notes (E.g. Hyperledger Fabric, Corda)

Ease of use (Safe and simple participation) Make it easy for people to join and also make it safe for them to transact.

1. Resolving asymmetric information
2. Staking

   (a) Safety deposits that can be activated during a dispute
   (b) Skin in the game so everyone is less likely to a bad actor (E.g. Algorand, Ethereum)

3. Privacy Features

   (a) Privacy mechanisms like zero-knowledge proofs (E.g. zCash, Quorum, Corda)
   (b) Ring signatures (E.g. Monero)

4. Cryptographic Ability
    (a) Post-quantum security (E.g. QRLedger, IOTA, Corda)
    (b) Compatibility with hardware secure models and better key management
5. Peer-reviewed White papers
    (a) Fundamental algorithmic issues (E.g. algorithm and code that produces skewed results, creating non-random outcomes , collisions and forgery)

5.2 Application of Mechanism Design to Token Ecosystems

Governance (Rules and strategies) To govern actions within the token ecosystem in a decentralised manner, should something arise, there must be balance between automation and human inputs.

1. Consensus (Participants can have a say in this process)
    (a) Various decentralised layers of governance, in case of external faults, with different objectives (E.g. MakerDao's varying layers of governance)
    (b) Honest interaction between participant
        i. TCR mechanism to reveal true value
        ii. Layered TCR (Ocean Protocol)
        iii. Design details
2. Resolution Mechanisms (Automated mechanism)
    (a) Smart contracts: Hardcoded into the system (E.g. Money will automatically be paid when actions are done/goals are met.)
    (b) Schelling point (E.g. Schellingcoin)

Non-Financial Incentives (Other incentives to strengthen strategy) Ensure that incentives account for financial and non-financial variables to strengthen the strategy desired in the mechanism design.

1. Voting Protocol (Participants can have a say in this process)
    (a) Commit-reveal (E.g. Ethereum smart contract)
    (b) Quadratic Voting (Similar concepts E.g. Dfinity, Tezos, Futarchy, PeerVote)
    (c) Quorum voting (E.g. Dfinity)
    (d) Delegated voting (E.g. Tezos)
    (e) Partial-Lock Commit-Reveal Voting (E.g. Token Curated Registries)

(f) Politeia voting (E.g. Dcred, Politeia)
(g) Conviction Voting (E.g. Giveth)

2. Allocation mechanisms (Automated mechanism)

(a) Reputation: to mitigate the moral hazard problems when transacting
(b) Egalitarian mechanism models (E.g. Algorand)

Structure (incentives, strategies and efficient trade) Ensure that the underlying mechanism that allows the ecosystem to run is efficient. Strategy needs to prevent bad actors from colluding.

1. Bargaining Protocols (Participants can have a say in this process)

(a) Auction mechanisms: multi-attribute auctions, payment mechanisms , pace of auctions [28] as solutions to congestion and safety issues
(b) Bargaining payment mechanism (within the ecosystem): fixed price, first price, second price, Vickrey-Clarke-Groves, Reverse Dutch, All-Pay

2. Community information (Automated mechanism)

(a) Oracles to aggregate the flow of information and data within the token ecosystem (E.g. Etherisc, TLSNotary, VeChain, Weeve, Oraclize, Blockchain Nervous System in Difinity, Ultimate Oracle in Gnosis)

5.3 Application of Token Design to Token Ecosystems

Token Structure (Properties of the token) How the token is specifically designed, that can be defined and coded into the token ecosystem.

1. Token policy

(a) Supply of tokens; Expected growth of money supply
(b) Saving function of tokens
(c) Inflation/deflation tokens
(d) Distribution of token allocation
(e) Velocity (if necessary)

2. Token valuation: variables that can allow tokens to have endogenous value

(a) Token bonding curve and curated markets
(b) Expected value of funds
(c) Dynamic price equilibrium [3]
(d) Exchange rate of tokens to dollars reflect buyer's willingness to buy (ex-ante, market clearing condition)

(e) Scarcity of tokens included by pricing choices causes buyer competition that reveals consumer values
(f) Rational expectation of exchange rate in next period by agents
(g) Value of price commitments
(h) Demand growth from demand of buyers
(i) Savings function/incentives to save
(j) Function of expected growth through demand of platform or money supply
(k) Value to consumer
(l) Heterogeneity of user base
(m) Platform productivity

Financial Incentives Rewards for participating in the token economy to further strengthen the incentive-compatible mechanism to achieve the objectives.

1. Platform activities
   (a) Transaction fees
   (b) Rewards for joining the network
   (c) Discount tokens [7]
   (d) Referral links
   (e) Reward policies beyond mining [14]
2. Returns to investment
   (a) Potential returns to equity owned
   (b) Arbitrage on exchange rates of token prices

Architecture (Design of token structure) Tokens can help to govern actions through property rights and establish trust through scale economies.

1. Property rights
   (a) Economics of property rights: claim rights, ownership rights, and governance
   (b) Self-identity
2. Distribution
   (a) Scale economics: balancing size and trust. The larger the blockchain and the more heterogeneous its participants, the more politically complex is the challenge of setting strategy.
   (b) Allocation and lock-up of tokens in various time periods
3. Peer-reviewed Algorithm and Code

6 Discussion and Further Research

6.1 Discussion

This is a general base framework for designing a token ecosystem. The factors in the token economics framework have differing level of significance. For example, governance under Mechanism Design is more important than some factors. As the ecosystem moves towards decentralisation, decentralised governance will become a crucial factor for the robustness of the ecosystem.

Not all factors are always applicable to the token ecosystem. Some permissioned ecosystems do not require tokens, hence, there is no need to consider the properties of token policy. However, the tokens could represent an asset and property rights would be a relevant factor to consider.

The endogenous factors define the success and value from within the token ecosystem. There are other external factors like the interaction with the real-world ecosystem and factors relevant to the project itself (i.e. team, choice of blockchain platform, regulations, jurisdictions).

As much as part of the mechanism design can be automated with code, it is important to balance both digital decision making and decentralised participants' decisions. The left factors under Mechanism Design are factors that allow for users' participation. The right factors are factors that have a high level of automation within the system, usually governed by code. (See Figure 1)

6.2 Limitations

This paper is only the start of this new field. The current factors can benefit from further creative design mechanisms, which were not included, like voting (quadratic voting) and creative allocation of digital property rights (Harberger tax).

It also focuses mainly on the factors that affects the system and architecture of the ecosystem. It does not include other critical factors like performance of the blockchain platform and algorithms underlying the specific DLT.

Lastly, the framework is based upon the reasonability rationality of participants. However, humans are irrational. Hence, the framework is limited by the irrationality of human behaviours that is not mitigated by the economical design.

6.3 Further Research

Future research will focus on expanding on the various endogenous factors, including auction mechanisms, incomplete contract theory, agent-principle theory,

second-price discrimination, and systems architecture from computer science.

In addition, further studies on the exogenous factors like expertise of the team, regulations and blockchain platform and its popularity will be reviewed. They also determine the value and success of a token ecosystem, be it in a permissioned or permission-less distributed leger technology. Outside of the token ecosystem, future studies can include important external factors like different legislations, global jurisdictions and macro-economy of digital assets as a whole.

Finally, additional research based on consumer psychology and behavioural economics can help to better design robust ecosystems for decentralised environments.

7 Conclusion

This paper introduces the framework to design the economics of new decentralised and token-based ecosystems. It comes in 3 pillars: market design, mechanism design and token design.

Market design governs the environment of the network, mechanism design governs the rules of the network. Token design governs the actions of the people on the network through direct incentives.

The discussion illustrates the important roles played by economics in designing sound mechanisms, using endogenous factors within the token ecosystem. These designs take an engineering approach with economic foundations applied.

Incentives and rules need to be designed so that ecosystems can produce robust outcomes and are resilient to externalities (gaming and collusion). The largest obstacle with designing ecosystems lies in the complexity of human objectives and bounds of rational judgement, fields where behavioural economics further their research.

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Figure 1

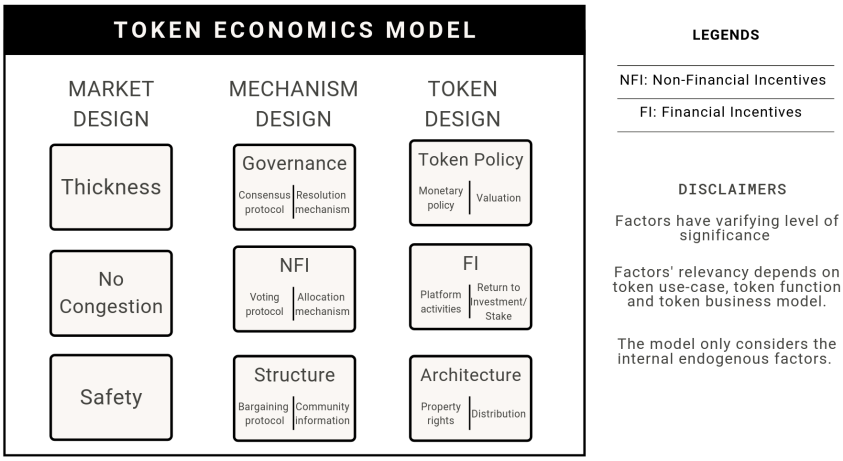

Figure 2: Token Economics Framework

The token economics framework shows the summary of what the token economics framework look like, with the endogenous factors discussed.

Note that the factors do not have the same weightage of signficance. For example, governance factor and its sub-factors are extremely important in designing and engineering the DLT ecosystem.

As mentioned in the paper, the factors' relevancy depends on token use-case, token function and token business model, as well as the objective of the DLT ecosystem.

The framework only considers the internal endogenous variables. Other important considerations include (but not limited to) external variables (legislations) and team, popularity of DLT platform, security of DLT platform, etc.