Crypto Token Economy Design for Disruptive BM

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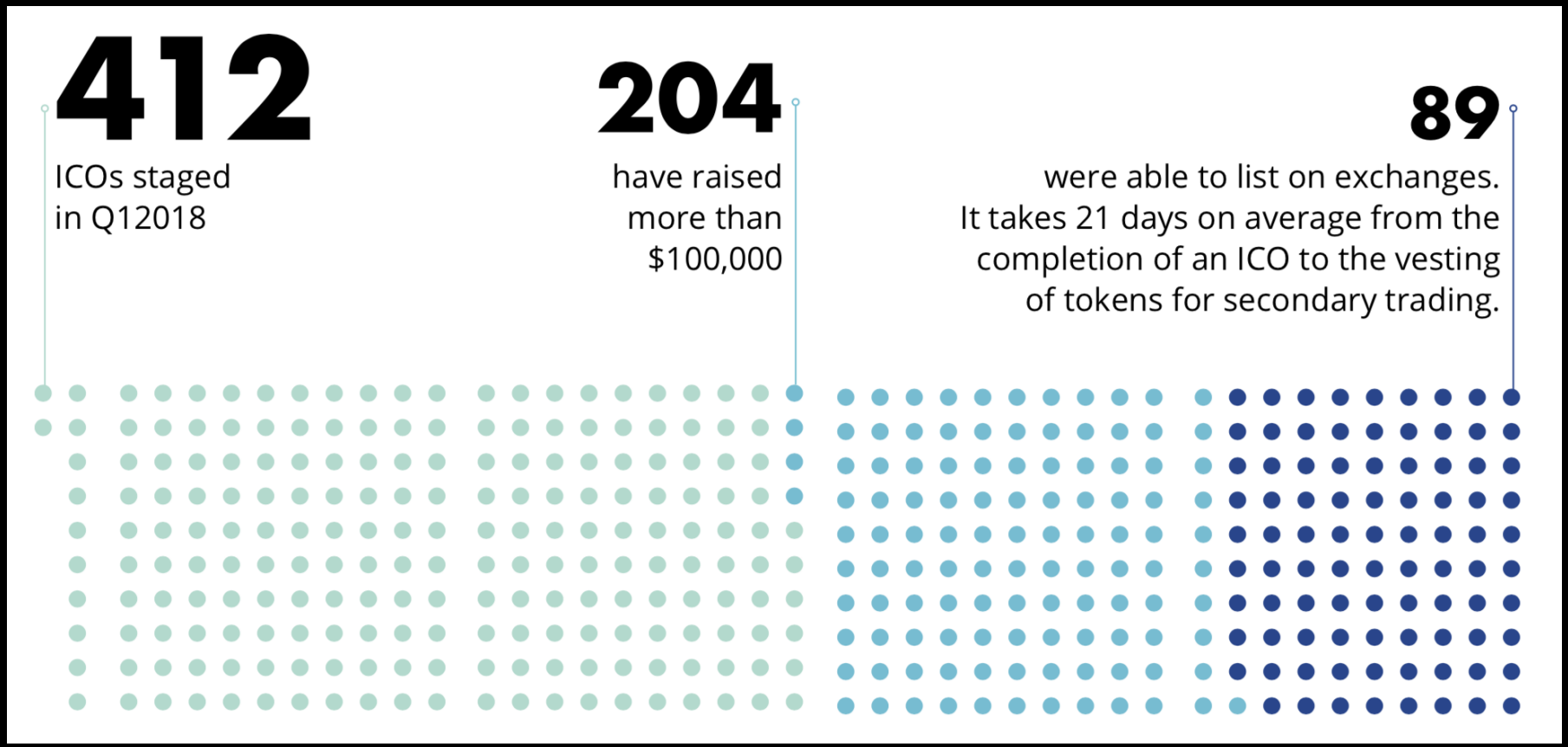
2018.6. 8

Why Token Economy is Important?

Main Figures for ICOs of Q1 2018

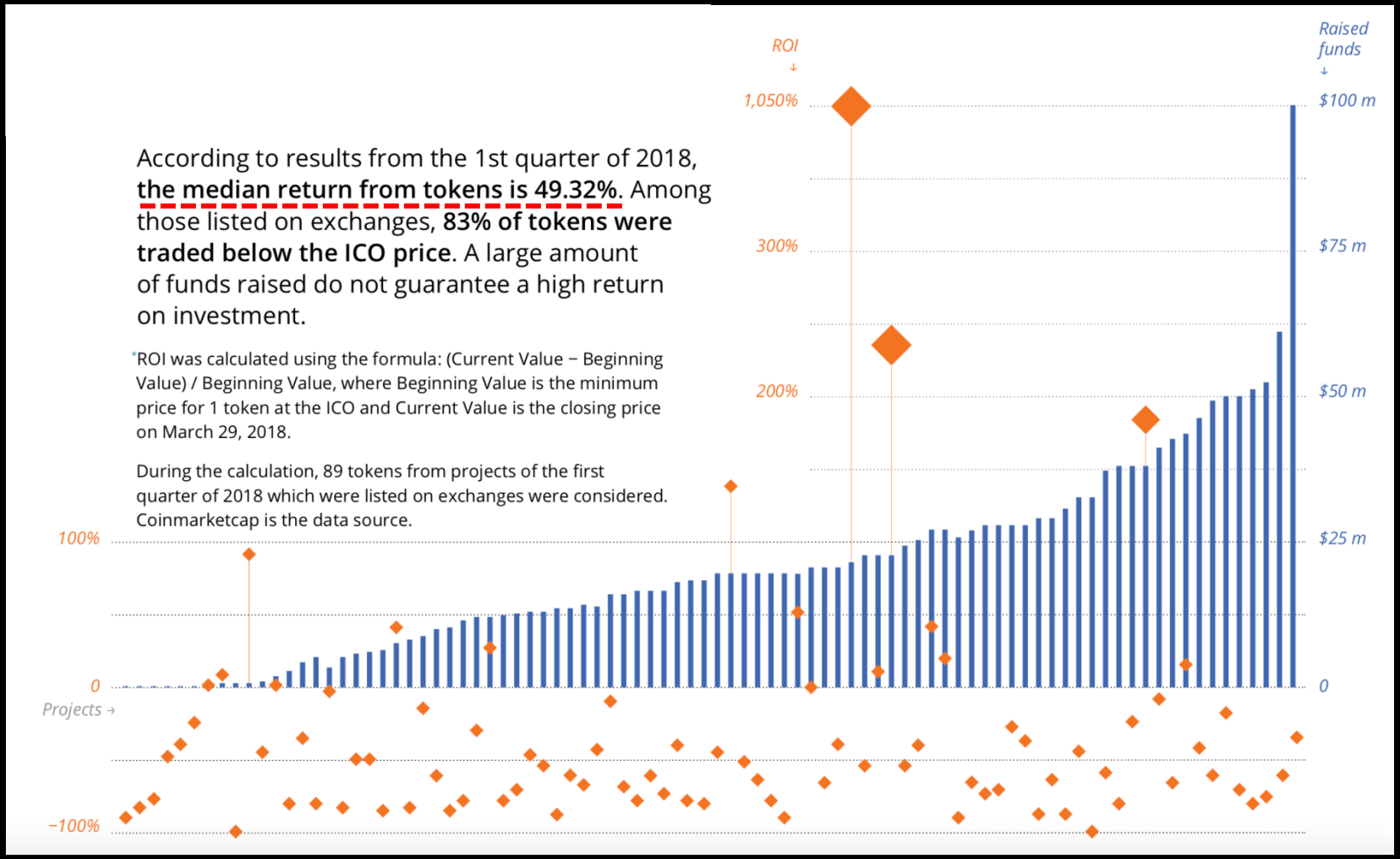
$3,331,005,381 for the quarter is the total funds raised by 412 projects.



<Source : ICO Rating, 'ICO Market Research Q1 2018'>

ROI after ICOs of Q1 2018

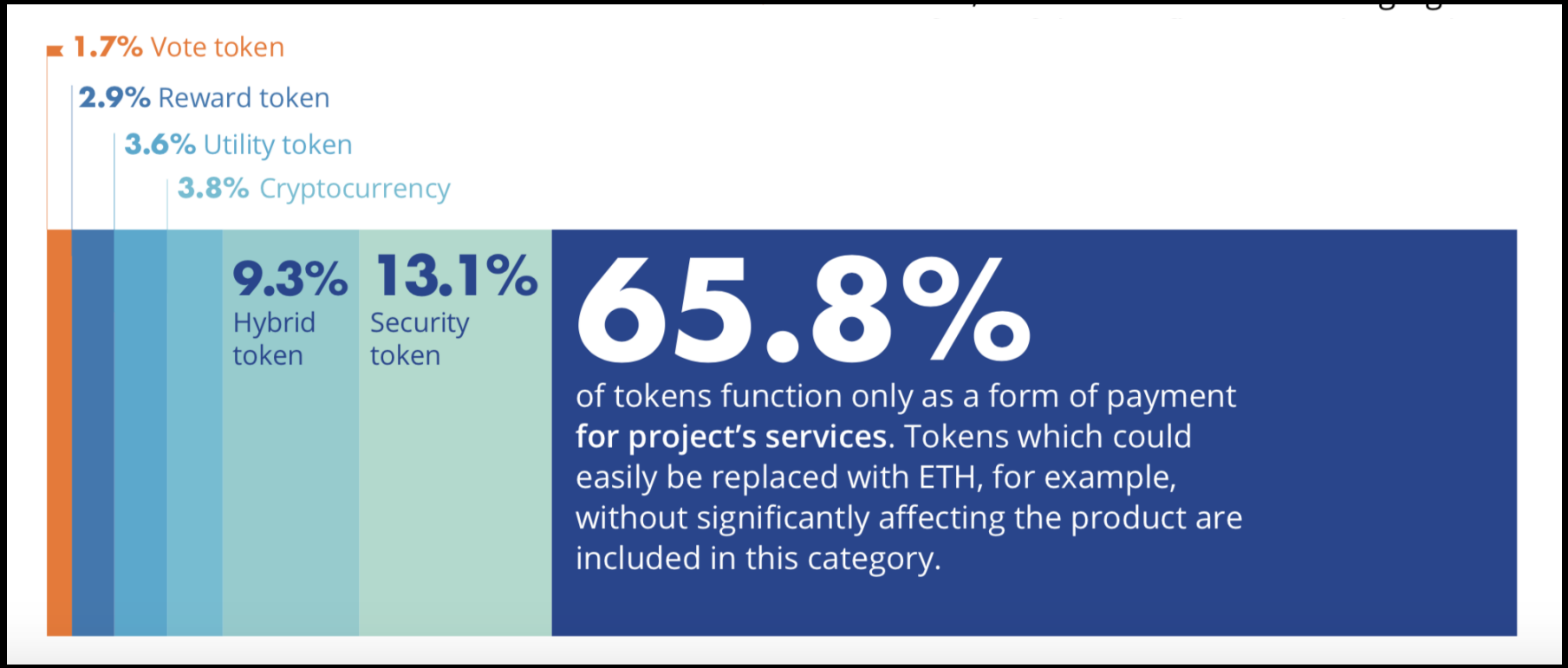
83% of tokens(among 89 tokens) were traded below the ICO price.



<Source : ICO Rating, 'ICO Market Research Q1 2018'>

Token Types Found in ICO Projects

Vote tokens were one of the most unpopular types of tokens.



<Source : ICO Rating, 'ICO Market Research Q1 2018'>

Token Economy & ICO Success

ICO Success depends on the 'Token Economy'!

Because the Token Ecosystem is the Core of BM Sustainability!

What is Token?

Crypto Token Definition

A unit of value that an organization
creates to self-govern its business model,
and empower its users to interact with its products,
while **facilitating the distribution and sharing**
of rewards and benefits to all its stakeholders.

<Source : 'William Mougayar, 'Status of the Token Market', 2018>

Main Features of Crypto Token

- ✓ **Tokens are Digital Representations of Assets**
  - Tangible or Not Tangible
  - Goods vs Rights
- ✓ **Ownership is governed by a Decentralized Ledger Technology**
- ✓ **Ownership can be transferred via Smart Contract**
- ✓ **Programmable Functions built into Tokens**
  - Access, Voting, Action-Taking, Fundraising, Dividends, Notification, Participation, Liquidity, etc.

What is Tokenization?

"Tokenization"

Process of turning an Asset, Right, or Digital Goods

into an Interchangeable Unit to Power an Ecosystem

<Source : Melanie Swan, 'Blockchain Economics', 2018>

Token Classification Framework

Purpose

Cryptocurrency, Network Token, Investment Token

Utility

Usage Tokens, Work Tokens, Hybrid Tokens

Technical Layer

Blockchain-native Token, Non-native Protocol Token, dApp Token

Cryptographic Tokens

Legal Status

Utility Token, Security Token, Cryptocurrency

Underlying Value

Asset-backed Token, Network Token, Share-like token

<Source : http://www.untitled-inc.com/the-token-classification-framework-a-multi-dimensional-tool-for-understanding-and-classifying-crypto-tokens>

Cryptoassets : 7 Types

<Source : Don TapScott, 'State of the Blockchain World', 2018>

Functional BCP(Blockchain Crypto Property) Classification

BCP Class	1 - Native Utility Tokens No legal counterparty (decentralized ecosystem)				2 - Counterparty Tokens Natural/legal person as counterparty (relative right)					3 - Ownership Tokens Right in rem (absolute right)		
BCP Sub-Class	**Basic Tokens** 	**Infra-structure Access Tokens** 	**Application Access Tokens** 	**Application Settlement Tokens** 	**IOU Tokens** 	**Derivative Tokens** 	**Fund Tokens** 	**Equity Tokens** 	**Membership Tokens** 	**Joint-Ownership Tokens** 	**Co-Ownership Tokens** 	**Sole-Ownership Tokens** 
FINMA Equivalent	Payment Tokens	Payment and/or Utility Tokens			Payment, Utility and/or Asset Token	Asset Tokens			n/a	n/a		
Functionalities	Medium of exchange, unit of account and store of value providing access to an underlying technology (1)	(1) Access to enhanced functionality infrastructure, i.e. SCS or burning mechanisms, without legal claim against a counterparty	(1) Access to decentralized application or platform without legal claim against a counterparty (2)	(1) (2) Use as P2P settlement instrument on an application / platform	(1) Tokenization of a claim against a legal counterparty (e.g. right to receive funds, services or use infrastructure)	(1) Tokenization of a claim Value derives from an underlying on- or off-chain base value	(1) Tokenization of a fund share	(1) Tokenization of a corporate membership Equity related shareholder's and financial rights	(1) Tokenization of a personal membership	(1) Joint-ownership of an asset, i.e. IP	(1) Co-ownership of an asset, i.e. IP	(1) Sole-ownership of an asset, i.e. IP
Underlying Value	None	None	None	None	Debt / Claim	Derivative (debt)	Fund share	Equity share	Personal membership right	Ownership of an asset	Ownership of an asset	Ownership of an asset
Examples	Bitcoin, Bitcoin Cash, Litecoin, Monero, ZCash	Ether, Ether Classic, Cardano, Lisk, ICON, EOS	Wings	Siacoins, Mysterium, Filecoin	Lykke Colored Coins, "Utility Tokens" with counterparty	Modum	Blockchain Capital	Daura C-Shares	tba	tba	tba	tba

<Source : https://www.mme.ch/fileadmin/files/documents/180501_BCP_Framework_for_Assessment_of_Crypto_Tokens_-_Block_2.pdf>

Tokens-Regulations (Swiss FINMA Guideline)

Payment Tokens

are synonymous with **cryptocurrencies** and have no further functions or links to other development projects. Tokens may in some cases only develop the necessary functionality and become accepted as a **means of payment** over a period of time.

Utility Tokens

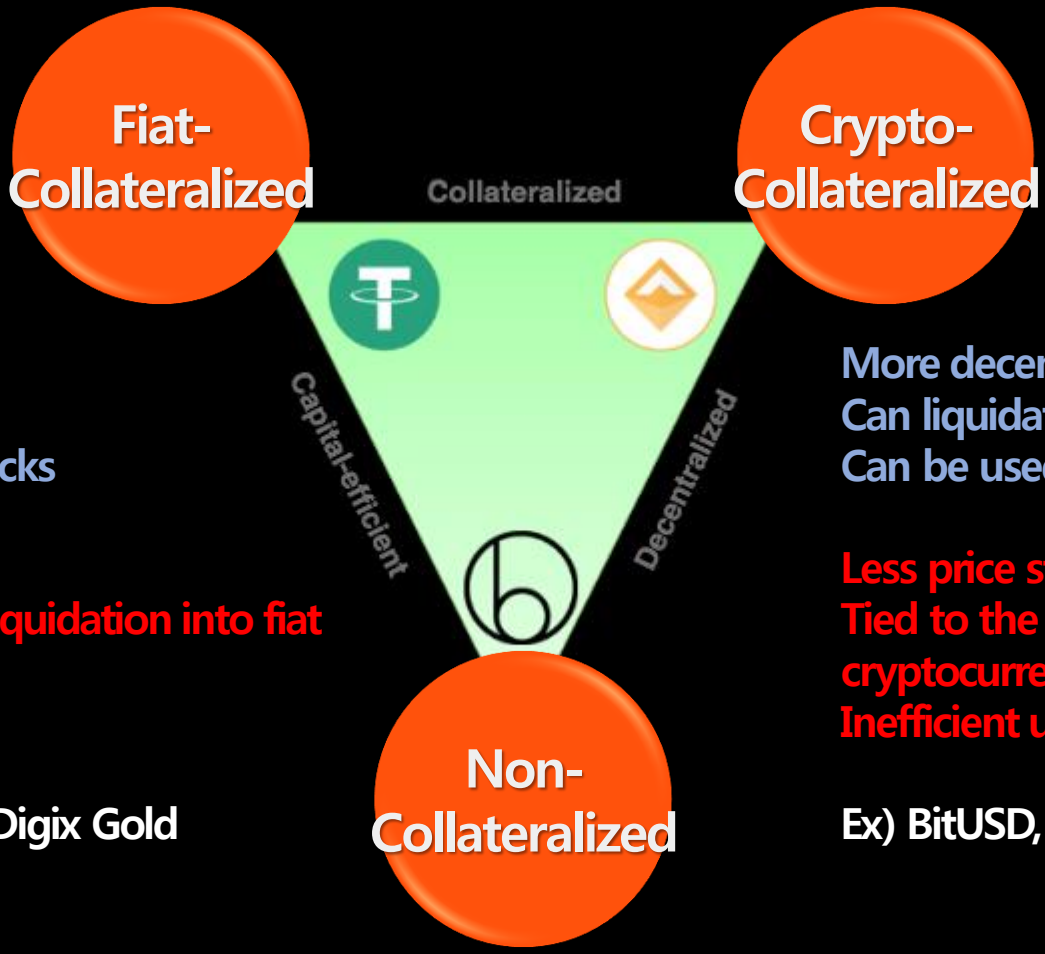
are tokens which are intended to provide **digital access to an application or service**.

Asset Tokens

represent **assets** such as participations in real physical underlyings, companies, or earnings streams, or an **entitlement to dividends or interest payments**. In terms of their economic function, the tokens are analogous to **equities, bonds or derivatives**.

<Source : https://www.finma.ch/en/news/2018/02/20180216-mm-ico-wegleitung>

Price-Stable Cryptographic Token



100% price-stable
Simplest
Less vulnerable to hacks

Centralized
Expensive and slow liquidation into fiat
Highly regulated
Need regular audits

Ex) Tether, TrueUSD, Digix Gold

More decentralized
Can liquidate quickly and cheaply
Can be used to create leverage

Less price stable than fiat
Tied to the health of a particular cryptocurrency
Inefficient use of capital

Ex) BitUSD, Dai

No collateral required
Most decentralized and independent

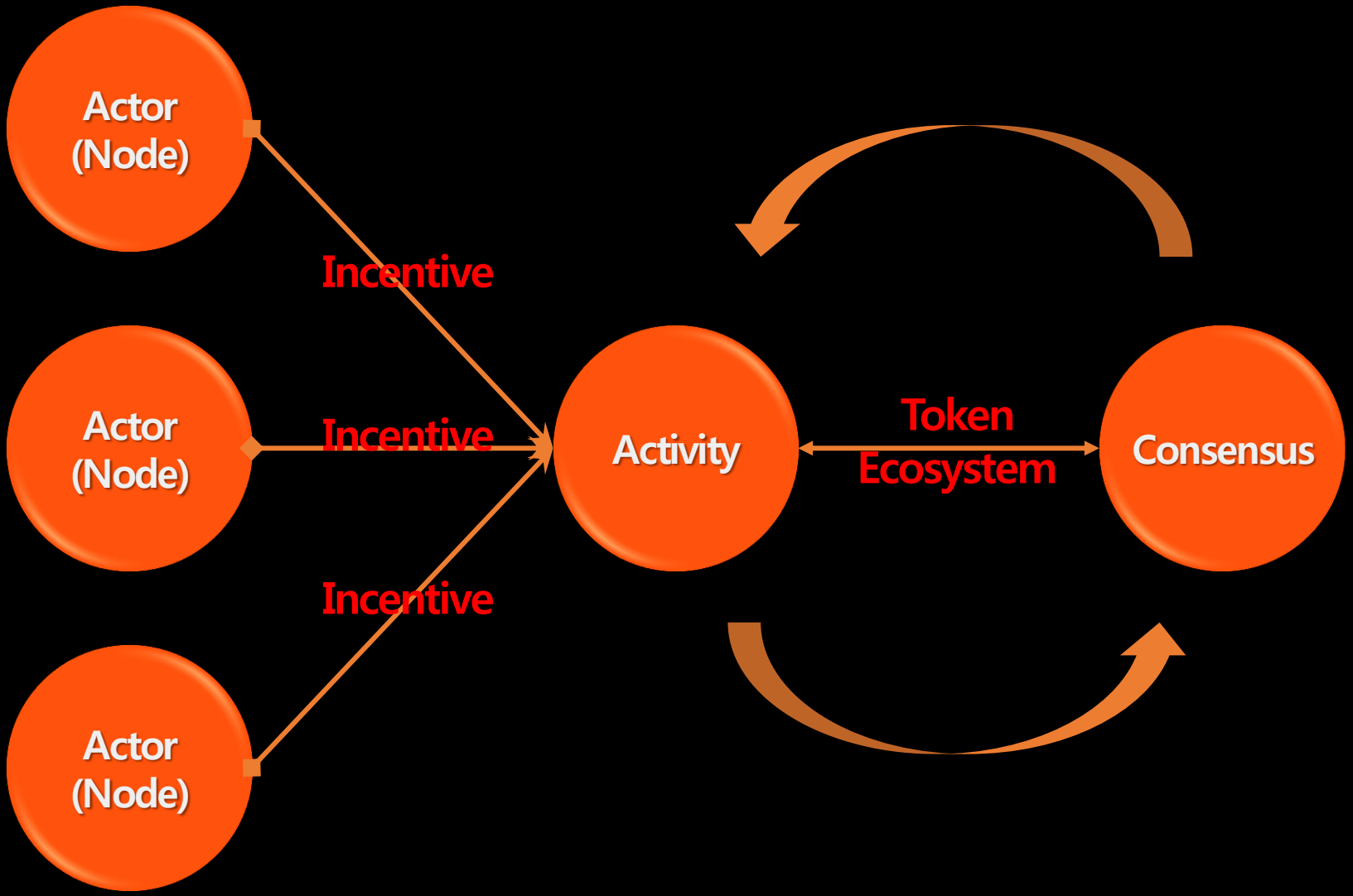
Ex) Basecoin

Require continual growth
Most vulnerable to crypto decline
Difficult to analyze safety bound or health

<Source : https://hackernoon.com/stablecoins-designing-a-price-stable-cryptocurrency-6bf24e2689e5>

Actor – Incentive – Activity – Consensus

Decentralized trust network is empowered by token ecosystem.



Behavioral Economics for Token Ecosystem

Token economist is a behavioral public policy maker.

Extrinsic Motivation

Intrinsic Motivation

《Choice Architect》 based on 'Libertarian Paternalism'*

***Libertarian paternalism** is the idea that it is both possible and legitimate for private and public institutions to affect behavior while also respecting freedom of choice, as well as the implementation of that idea.

<Source : https://en.wikipedia.org/wiki/Libertarian_paternalism>

Token as an Enabler for Disruptive Business Model

Token Itself is not Important!

We have to Build up
New Circular Ecosystem disrupting
Traditional Value Network!

"Tokens are just Enabler"

<Source : 'William Mougayar, 'Status of the Token Market', 2018>

Crypto Token Value Proposition

- ✓ By Whom will the token be used?
- ✓ How?
- ✓ At what Cost?
- ✓ For what Benefit?
- ✓ Resulting in what Valuable Transactional Activity?

<Source : 'William Mougayar, 'Status of the Token Market', 2018>

Token Valuation Approaches

The DCF Model

$$DCF = \sum_{Y=0}^{N} \frac{FCF_Y}{(1 + R)^Y}$$

An asset's value is the present value of its (expected) future cash flows.

The value of a traditional security-like financial asset is straightforward to model, and usually translates into the famed discounted cash flow equation.

In the case of security tokens, the model may still apply.

<Source : https://medium.com/paratii/on-the-immaturity-of-tokenized-value-capture-mechanisms-1fde33f2bc8e>

The Cost of Production Model(Adam Hayes)

$$p^* = \frac{E_{day}}{BTC / day^*}$$

- ✓ The Price, p*, serves as a theoretically lower bound for the market price, below which a miner would operate at a marginal loss.
- ✓ Cost per day as $/day and mining production is expressed as BTC/day.
- ✓ E represents $/day.

The market price of a bitcoin will have its lower bound theoretically set at the marginal cost of bitcoin mining in a competitive market.

The marginal product of mining a bitcoin should theoretically equal its marginal cost in a competitive market which should, in turn, equal its selling price.

<Source : https://medium.com/mosaic-network-blog/cryptoasset-valuation-techniques-part-1-23f3188c7d96>

The INET Model(Chris Burniske)

$$MV = PQ$$

M = size of the asset base
V = velocity of the asset
P = price of the digital resource being provisioned
Q = quantity of the digital resource being provisioned

A cryptoasset valuation is comprised of solving for M, where M = PQ / V. M is the size of the monetary base necessary to support a cryptoeconomy of size PQ, at velocity V.

<Source : https://medium.com/@dburniske/cryptoasset-valuations-ac83479fica7>

The INET Model(Chris Burniske) : Sample

INET Token Model

INET Supply Schedule Inputs

Metric	Assumption	Notes
Total Planned Supply	100,000,000	
Percent of Tokens Issued in Private Sale	5%	
Lock-up Period for Private Sale Investors	3	Dictates # of yrs of release
Percent of Tokens Issued in ICO	75%	No lockup
Percent of Tokens Issued to Foundation	10%	
Lifetime of Foundation	50	Dictates # of yrs of release
Percent Issued to Founders	10%	
Lock-up for Founders	5	Dictates # of yrs of release
Percent of Tokens in Float Bonded by Nodes	20%	
Percent of Tokens in Float Initially hodl'd	60%	
Decrease in percent of INET that is hodl'd each year	1%	

Blue represents a particularly subjective assumption

Supply Schedule Output

Year From Launch
INET Released from Private Sale that year
INET Released from Public Sale that year
INET Released from Foundation that year
INET Released from Founders that year
Aggregate Number of Tokens Released
Number of Tokens in Float after Bonders
Percent of Tokens Released that are Hodl'd
Number of Tokens in Float after Bonders & Hodl

INET Economy Inputs

Metric	Assumption	Notes/Sources/Units
Cost per GB for INET	$ 0.25	Market will set pricing, de
Cost decline for bandwidth	16%	https://www.telegeograp
Annual global IP traffic (2016)	1,200,000,000,000	http://www.cisco.com/c/e
CAGR for global IP traffic (2016-2021)	24%	Assume this goes to 2025
% of global IP traffic addressable for INET	75%	
Velocity	20	

Blue represents a particularly subjective assumption

INET Economy and Utility Value Output

Year From Launch	
Cost per GB for INET use ($/GB)	$
Annual global IP traffic (GB)	
Annual global IP traffic available to INET (GB)	
% Share of VPN Market Facilitated by Token	
Traffic Facilitated by INET Each Year (GB)	
GDP Facilitated by INET Each Year	$
Monetary Base Necessary for INET's GDP	$
Current Utility Value of Each Token in the Float	$

<Source : https://medium.com/@dburniske/cryptoasset-valuations-ac83479ffca7>

The VOLT Model(Alex Evans)

$$-\frac{R \times Y}{2N^2} + C$$

$$Minimum - cost\ N = \sqrt{\frac{RY}{2C}}$$

$$Average\ VOLT\ holding = \sqrt{\frac{YC}{2R}}$$

Step 1: VOLT Supply Schedule
Step 2: The VOLT Electricity Demand
Step 3: Money Demand for VOLT Tokens
Step 4: Revisiting the Velocity Thesis

<Source : https://medium.com/blockchannel/on-value-velocity-and-monetary-theory-a-new-approach-to-cryptoasset-valuations-32c9b22e3b6f>

The VOLT Model(Alex Evans) : Sample

VOLT Token Model

Annual Money Supply	2018	2019	2020	2021	2022	2023	2024	2025	20
New Tokens Issued		3,000	3,090	3,183	3,278	3,377	3,478	3,582	3,6
Tokens Released By Founders		2,500	2,500	2,500	2,500	0	0	0	
Tokens Released By Foundation	2,000	2,000	2,000	2,000	2,000	0	0	0	
Total Circulating Tokens	82,000	89,500	97,090	104,773	112,551	115,927	119,405	122,987	126,6

Annual Electricity Demand	2018	2019	2020	2021	2022	2023	2024	2025	20
Total kWh Consumed (000s)	1,372,516,860	1,386,242,028	1,400,104,449	1,414,105,493	1,428,246,548	1,442,529,014	1,456,954,304	1,471,523,847	1,486,239,0
Total Residential Electricity Spend in $ (000s)	$164,702,023	$166,349,043	$168,012,534	$169,692,659	$171,389,586	$173,103,482	$174,834,516	$176,582,862	$178,348,6
kWh Provided by VOLT (000s)	62,729	189,896	573,813	1,724,519	5,100,881	14,425,290	36,423,858	73,576,192	111,467,9
Annual Spending in VOLT in $	$2,195,525	$6,646,366	$20,083,465	$60,358,161	$178,530,819	$504,885,155	##########	##########	##########

Annual Market Adoption	2018	2019	2020	2021	2022	2023	2024	2025	20
% Market Penetration	0.00%	0.01%	0.04%	0.12%	0.36%	1.00%	2.50%	5.00%	7.5

Annual Money Demand	2018	2019	2020	2021	2022	2023	2024	2025	20
Transaction Cost in $	$20.0	$20.0	$19.9	$19.7	$19.2	$17.8	$14.4	$9.0	$3
Number of Transfers Per Year	52	91	159	277	482	843	1,486	2,671	4,9
Average VOLT Balance Held in $	$20,955	$36,440	$63,247	$109,143	$185,178	$299,502	$428,985	$482,012	$392,4
Annual Forgone Return in $	$1,048	$1,822	$3,162	$5,457	$9,259	$14,975	$21,449	$24,101	$19,6
Token Velocity	105	182	318	553	964	1,686	2,972	5,343	9,9
Utility Value Per Token	$0.26	$0.41	$0.65	$1.04	$1.65	$2.58	$3.59	$3.92	$3,

Transaction Cost Decline	2018	2019	2020	2021	2022	2023	2024	2025	20
% Decline in Transaction Cost		0.103%	0.307%	0.915%	2.679%	7.500%	18.750%	37.500%	56.25

Variable Growth Rates	2018	2019	2020	2021	2022	2023	2024	2025	20
YOY Velocity Growth		74%	74%	74%	74%	75%	76%	80%	8
YOY GDP Growth		203%	202%	201%	196%	183%	153%	102%	5

<Source : https://medium.com/blockchannel/on-value-velocity-and-monetary-theory-a-new-approach-to-cryptoasset-valuations-32c9b22e3b6f>

The Mature equilibrium Model(John Pfeffer)

$$MC = MR$$

MC : Marginal Cost
MR : Marginal Revenue

MC really only comes down to the raw computing costs of maintaining the blockchain and capital charge.

<Source : John Pfeffer, 'An (Institutional) Investor's Take on Cryptoassets', 2017>

The Black-Scholes Option Model(Johnny Antos)

$$\frac{\partial V}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + rS\frac{\partial V}{\partial S} - rV = 0$$

V the price of the cryptoasset
S the real economic utility value of the underlying product provisioned by the cryptoasset. Note that this is not necessarily equal to the simple sum of the cost of raw inputs. For example, this could include abstract drivers of value such as privacy, decentralization, or censorship-resistance.
t time
r risk-free rate
σ volatility of S
K strike price, the frictional transaction cost of spending a token at exercise (the time when realizing the benefit, S)

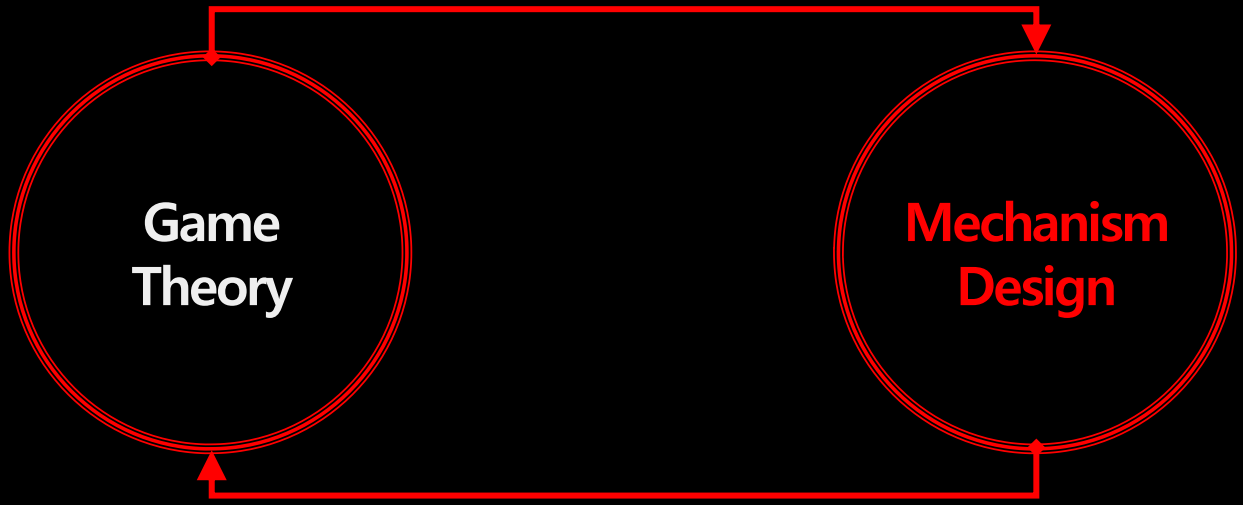
Some cryptoassets have the chance of becoming ubiquitous, paradigm-shifting platforms beyond imaginable incremental innovation on existing technology infrastructure.

'Call Options' on the utility value of what that cryptoasset might provision

<Source : https://medium.com/therationalcrypto/an-efficient-markets-valuation-framework-for-cryptoassets-using-black-scholes-option-theory-a6a8a480e18a>

Game Theory vs. Mechanism Design

Design of Tokenized Ecosystem



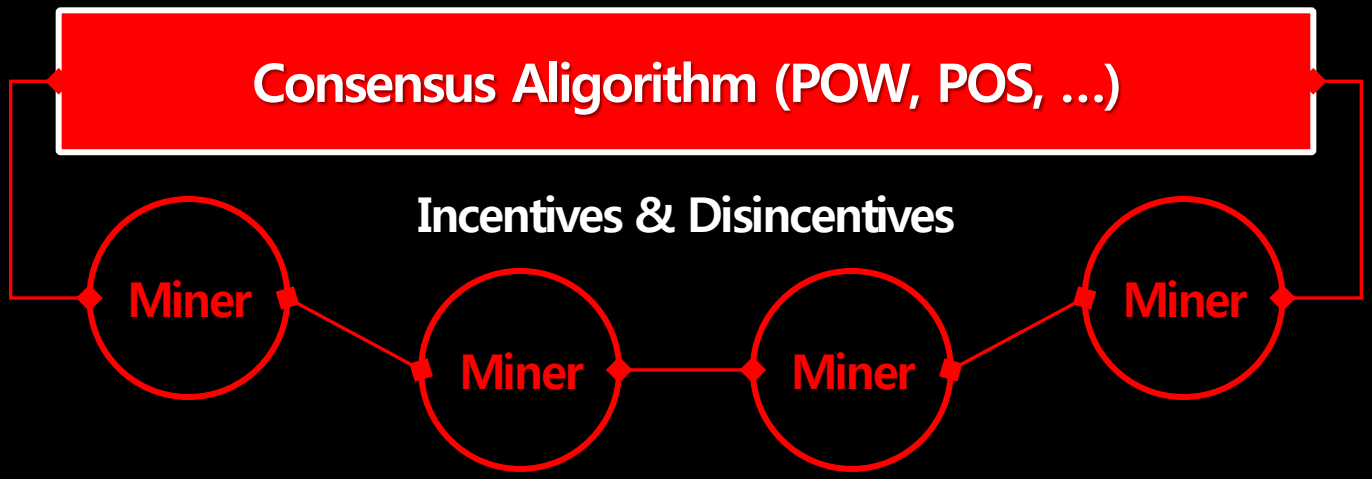
Analyzing incentives from an economic standpoint

Synthesizing incentivized systems

Token Engineering for Optimization Design

<Source : https://blog.oceanprotocol.com/towards-a-practice-of-token-engineering-b02feeeff7ca>

Game Theory for Token Economy



The larger and more decentralized the network becomes,
the increased difficulty in accomplishing an internal or external attack.

It becomes increasingly more costly to act dishonestly
than it does to act honestly within the system.
This creates **a positive feedback loop** where miners have a consistent positive incentive
to maintain the valid blockchain and mitigate against malicious actors,
resulting in a secure network.

<Source : https://blockonomi.com/game-theory>

Mechanism Design for Token Economy

Mechanism Design = Optimization Design

✓**Formulate the Problem**
- Who are my potential stakeholders?
- What do each of them want?
- What are attack vectors?

✓**Try An Existing Pattern : Identify if there is an existing solver, i.e. tokenized network design pattern that can solve your problem.**

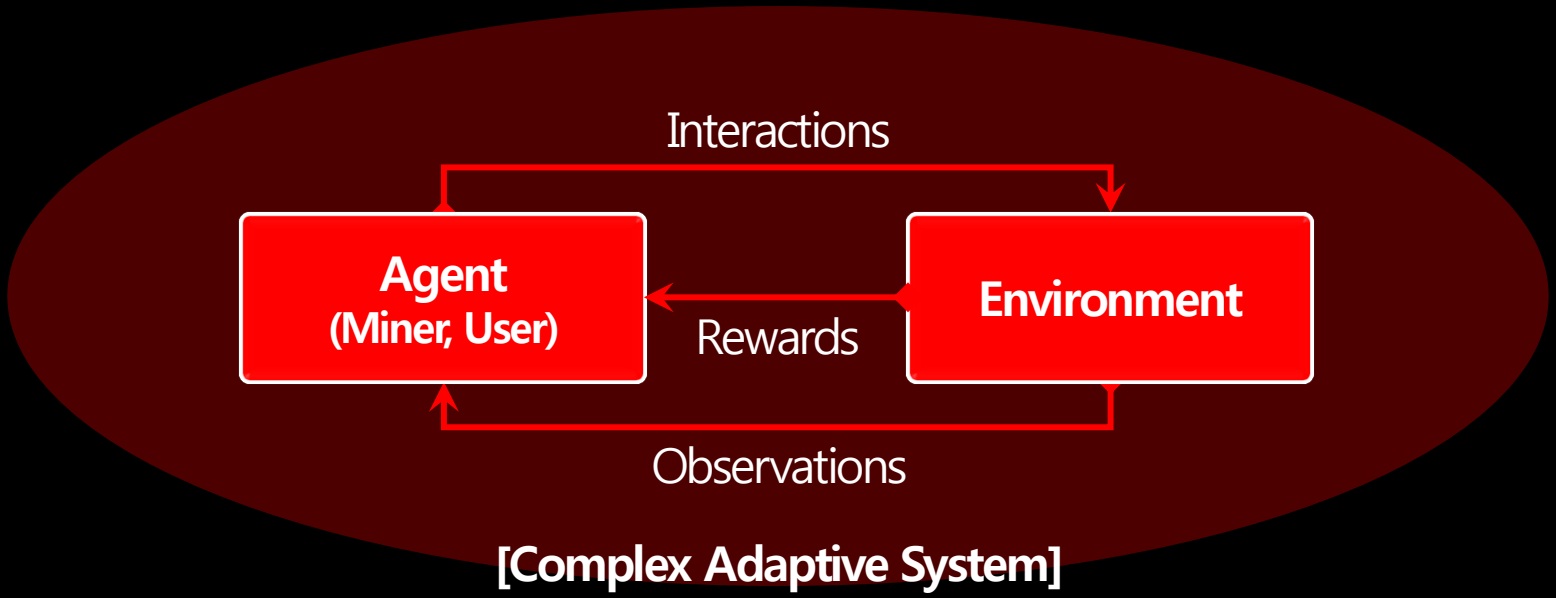
✓**New Pattern? : Design your own tokenized network.**

Proper simulators of tokenized ecosystems is important!
→ "Agent-Based Modeling"

<Source : https://blog.oceanprotocol.com/towards-a-practice-of-token-engineering-b02feeeff7ca>

Agent based Modelling for Tokenomics

"Agent-Based Model(ABM)" is a class of computational models for simulating the actions and interactions of autonomous agents with a view to assessing their effects on the system as a whole.



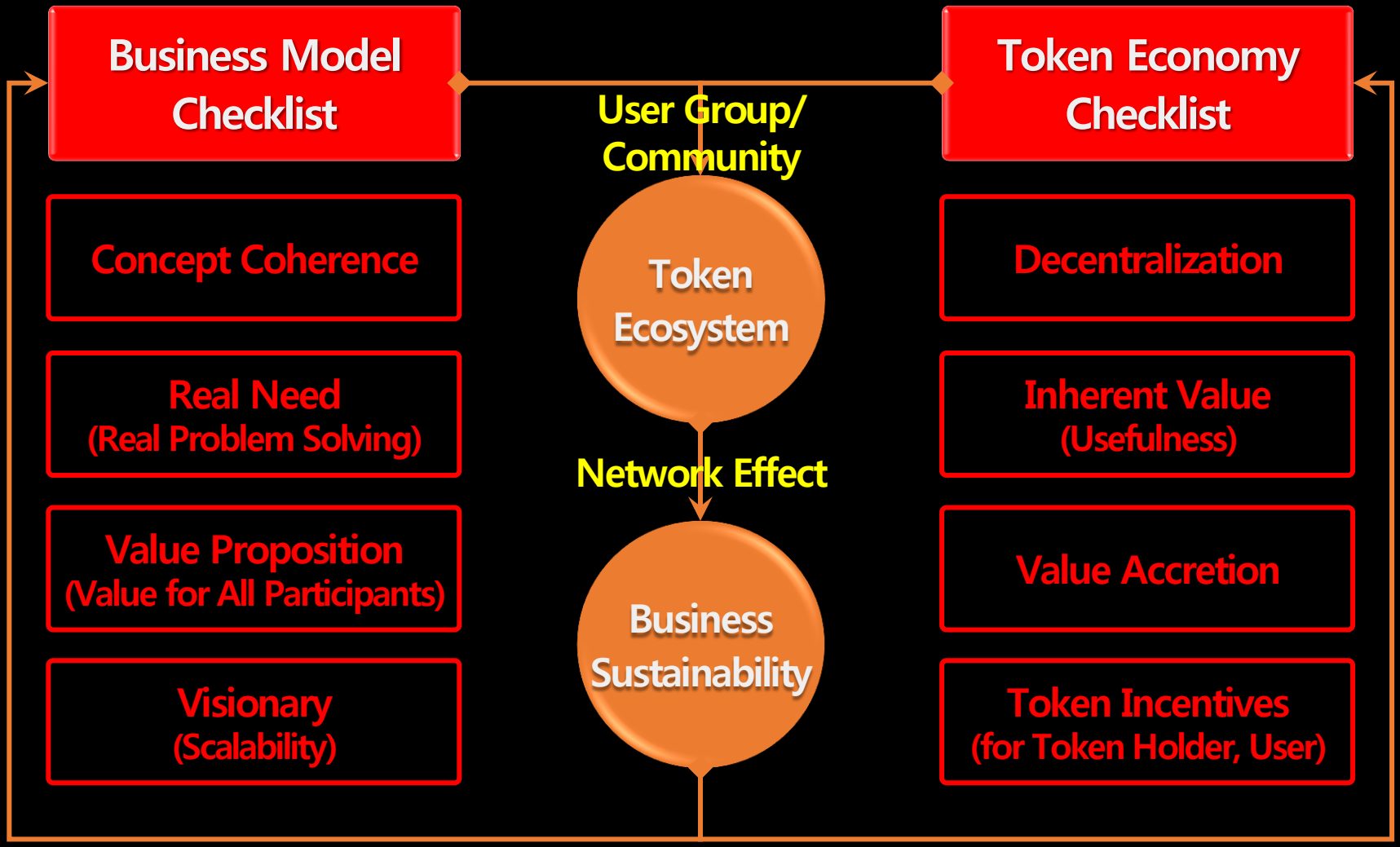
[Complex Adaptive System]

The modelling of tokenomics through ABM allows us to bypass any theoretical limitations and model the agents of our assumptions directly, while taking into account any kind of constraint or assumption we want.

<Source : https://en.wikipedia.org/wiki/Agent-based_model>

Rules for Sustainable Token Ecosystem

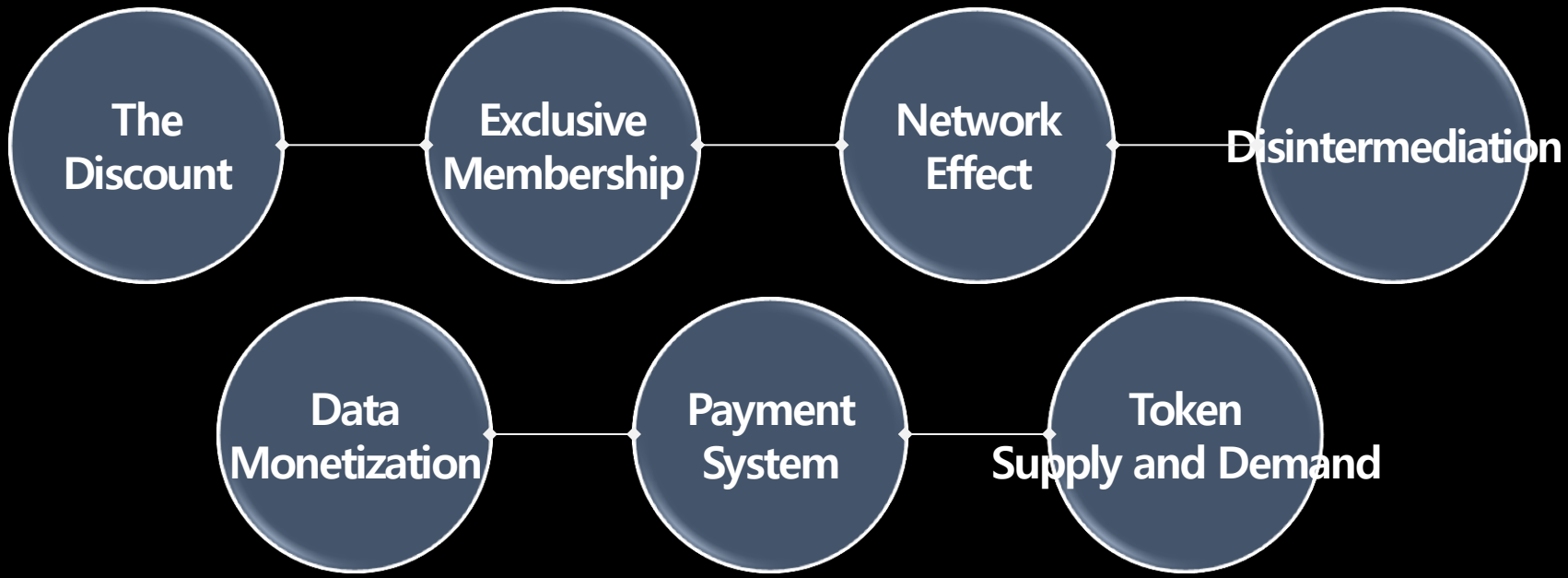
Business Model – Token Economy Fitness



<Source : https://medium.com/@sebastianhrw/a-simple-framework-for-ico-due-diligence-9a4a905fe64d>

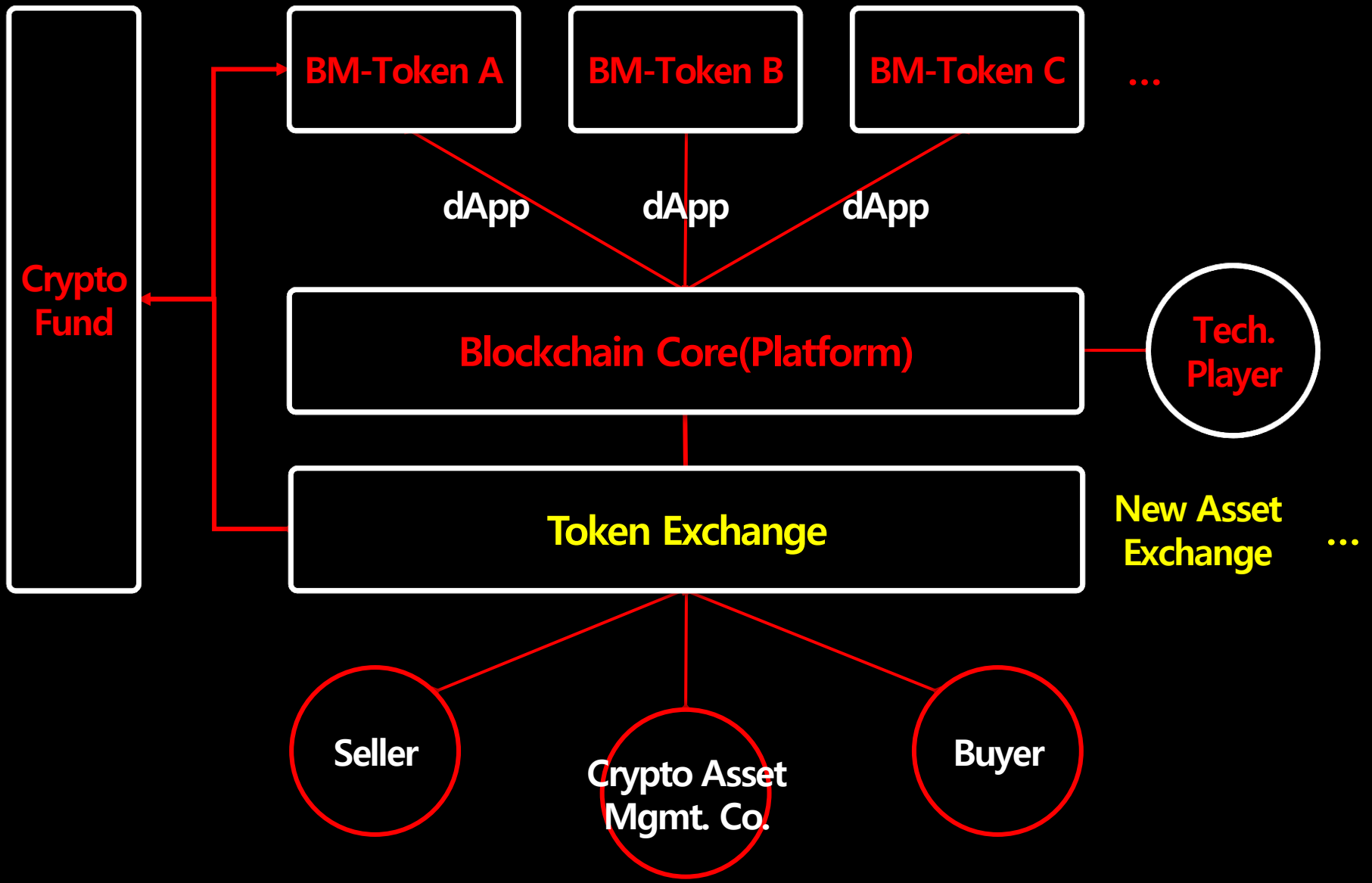
Token Economy Design Rules for ICO

- ✓ Provides a significant advantage to users of the tokens
- ✓ Incentivises users to be early adopters of the token
- ✓ Incentivises players to bring new users to the ecosystem
- ✓ Is appealing to token buyers at the ICO in their "speculative" role, as something that will appreciate if the project gets traction



<Source : https://blog.icofunding.com/tokens-and-tokenomics-the-magic-of-icos-a7a886ca323c>

Token Exchange Hub(Tokenized Ecosystem)



What Should Regulators Do?

- Apply existing regulations
- Update existing regulations
- Allow Self-Regulation
- Create new regulations
- Freeze regulation with Safe Harbors
- Recognize a new asset class
- Harmonize global regulation

More Difficult!
More Innovative!

<Source : 'William Mougayar, 'Status of the Token Market', 2018>

"Break things first, then ask for forgiveness"

- In <Cryptoassets> written by Chris Burniske