FLAG-ERA

Joint Transnational Call (JTC) 2016

FLAG-ERA JTC 2016 Project Seminar

February, 25th, 2020

ICT for Social Sciences:

FuturICT 2.0

Coordinator: CNR-ISTC, Italy – LABSS, Mario Paolucci

www.futurict2.eu - http://labss.istc.cnr.it/

Supported by the European Commission

Summary of WP – FuturICT 2.0

Main activities carried out so far and principal results achieved:

- **WP1** (*Bridge ICT & Social Sciences*): Frame for STIMUL activities established. Both rounds of project calls complete.

- **WP2** (*Simulation and Experiments*): Large scale experiment-simulation on norms in the climate change game;

- **WP3** (*Finance 4.0*): Design papers, Fin4 system implementation, simulations

Summary of WPs - FuturICT 2.0

Main activities carried out so far and principal results achieved:

- **WP4** (*Dissemination*): Development of the project dissemination plan. Creation of the logo and visual identity of the project. Development of the project website. Presence on social media established. Project dissemination.

- **WP5** (*Management*): Consortium Agreement signed by all partners. Management of meetings and activities. Management of the workflow to develop the project logo and website.

Modifications/Deviations from to workplan

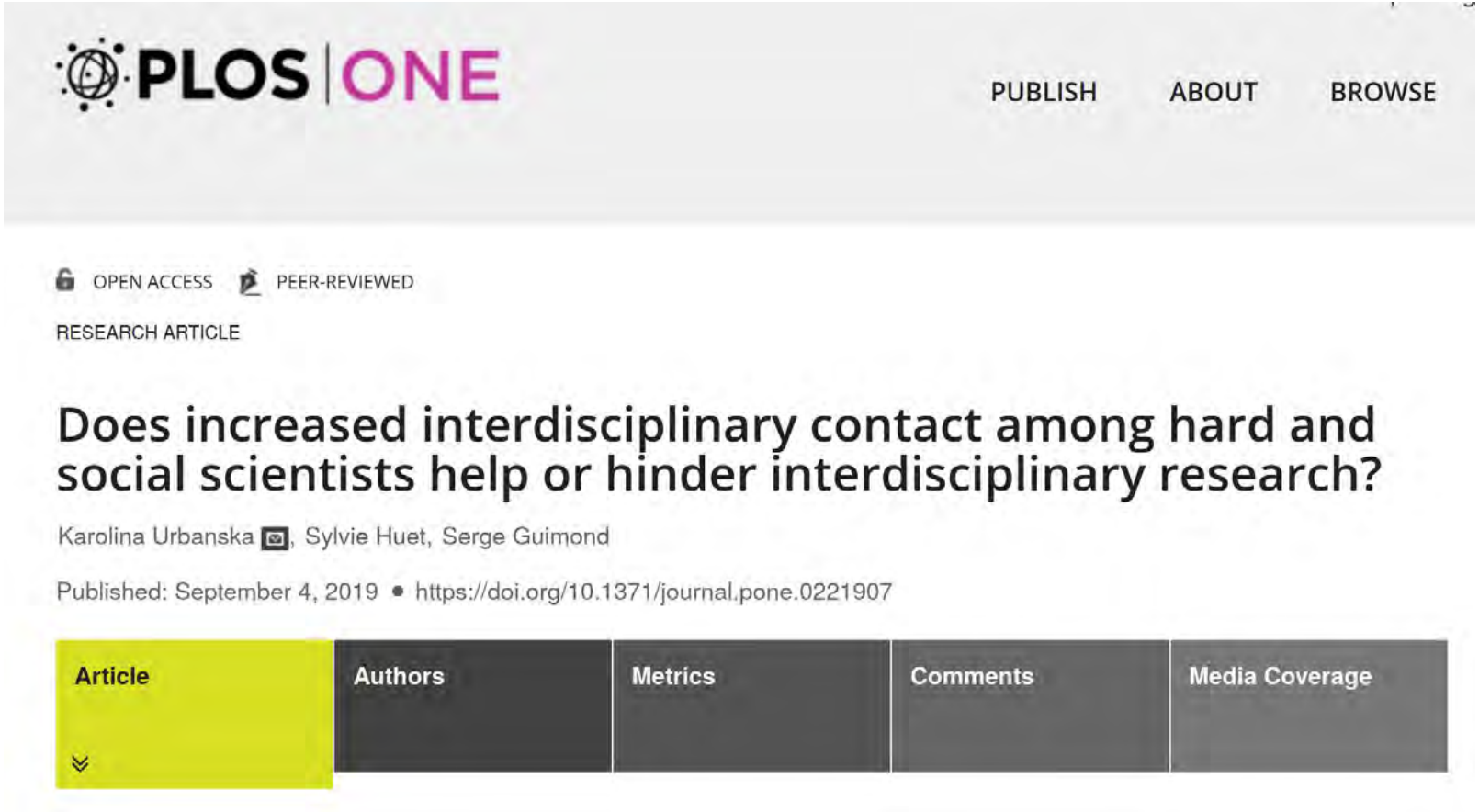
- Deviations from initial workplan: Slight delay due to delays in funding for some partners.
- Modifications to the workplan, the objectives and the expected results: one year extension.

- Networking, joining specific initiatives (i.e., ClimateCup)
- Other relevant information for the Call Steering Committee: Partnership minor change (Latvia, Belgium).

WP1 - The STIMUL projects

- First round (2018): 10 projects
  - aspects of social dynamics (perception of groups, perception of justice, social dynamics), modelling consumer or user behaviour in different contexts, developing software tools incentivising specific collective behaviours (Fin4).
    - Example: “Restorative Justice through a GT lens”
- Second round (2019): 10 projects
  - Topics: radicalisation and fundamentalism, reputation evolution in different web sites, environment, Finance 4.0

WP1 - The STIMUL projects



PLOS ONE

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OPEN ACCESS PEER-REVIEWED

RESEARCH ARTICLE

Does increased interdisciplinary contact among hard and social scientists help or hinder interdisciplinary research?

Karolina Urbanska, Sylvie Huet, Serge Guimond

Published: September 4, 2019 • https://doi.org/10.1371/journal.pone.0221907

Article | Authors | Metrics | Comments | Media Coverage

WP1 - The STIMUL projects

- **group membership** in the more prestigious hard sciences is related to a stronger tendency to **downplay** the intellectual contribution of social science disciplines compared to other hard science disciplines.
- This bias **was not present** among social scientists who produced very similar evaluation of contribution of hard and social science disciplines.
- using both waves of the survey, the social network comparison of discipline pairs shows that **asymmetries in the evaluation** of other disciplines are only present **among discipline pairs that do not have any experience of collaborating** with one another.

WP2 - Large Scale simulations and experiments

Joint work with

Giulia Andrighetto, Alberto Antonioni, Francesca Lipari, Mario Paolucci, Anxo Sanchez, Aron Szekely, Luca Tummolini

(slides prepared by Francesca Lipari)

A paper is under preparation and will be submitted in the next months.

1. Motivation

Global issues

- How individual decisions influence global outcomes?
- Societies across the globe face important challenges: natural disasters, ecosystem and habitat destruction, and the decline of vaccinations.
- How can we solve these challenges?

On social norms

By using **social norms**

Usually the cause not the **solution**

BUT how?

- Social norms needs to be measured

Many ways of defining social norms (Bicchieri, 2006; Cialdini et al., 1990; Coleman, 1990; Elster, 2009; Gintis, 2010; Posner, 2002)

  - presence of social norms indirectly through behaviour (e.g. Fehr & Gächter, 2000; Henrich et al., 2001)
  - or self-reported attitudes (Wallen & Romulo, 2017)
  - or they experimentally change factors that are assumed to shift norms (Aarts & Dijksterhuis, 2003; Bicchieri & Chavez, 2010; Cialdini, Kallgren, & Reno, 1991; Cialdini, Reno, & Kallgren, 1990; Hallsworth et al., 2016; Keizer, Lindenberg, & Steg, 2008; Krupka & Weber, 2009).

- Social norms emergence needs time

On social norms (2)

informal *and* ***shared behavioural*** *rules that are supported by empirical and normative* ***expectations*** *and potentially backed by* ***enforcement*** *through* ***sanctions*** *(Bicchieri, 2006)*

Behavior+ Expectations -> Social Norms
(Bicchieri & Muldoon, 2014).

Empirical *Expectations (EE):* people's beliefs about what others will do

Normative *Expectations (NE): people's* beliefs about what others think that they ought to do.

On this account, social norms can be said to influence behaviour if people respond to both empirical and normative expectations, and, they can be said to exist if we observe both behaviour and corresponding expectations.

Our experiment

- Using a month long experiment, we
  1. *measure the* **existence** *of social norms* in a way that properly accounts for their components of behaviour and expectations
  2. test the ***causal*** *effects of how expectations change* on behaviour
  3. measure the **enforcement** *of social norms* via punishment
  4. measure the **resilience** of an emerged norms to a ***change*** *of environmental risk* over time

Our experiment (2)

- We use the ***collective-risk dilemma game*** a model of strategic interaction in many domains of application (e.g., prevention of dangerous climate, see Milinski et al., 2008).
  - Threshold cooperation model or **step-level PGG**
- We vary **risk** (i.e. external shock) and
  - measure subjects' *behavior, expectations, and punishment* to capture the **emergence** and change of norm and
  - *manipulate* expectations to test their **causal** effect on behavior.

Our hypothesis:

1. Cooperation is related to individuals' empirical and normative expectations (*Hypothesis 1*)-> **Existence** of the norm

2. Cooperation changes based on manipulated empirical and normative expectations (*Hypothesis 2*) -> **Causal effect** of expectation change on behavior

3. Punishment is targeted towards norm non-compliers (*Hypothesis 3a*) and that subjects anticipate this (*Hypothesis 3b*). -> **Enforcement** of a norm

4. It takes longer for a norm of cooperation to emerge after a norm of non-cooperation is established than it is for the reverse (*Hypothesis 4*). -> **Resilience** of an emerged norms to external factor

2. Experimental Setup

Experimental Setup

- Long-term and on-line experiment: 30 days (June-September 2018)
- 300 students playing a step- level PGG in 28 rounds (see also Milinski, Sommerfeld, Krambeck, Reed, & Marotzke, 2008; Vicens et al., 2017).
- Outside the lab
  - More time to crystallize the decision
  - More diverse population

- o-Tree (Chen, Schonger, & Wickens, 2016)
- IBSEN Platform (EU H2020 project,Sanchez et al.)
  - Pre-registration at COS

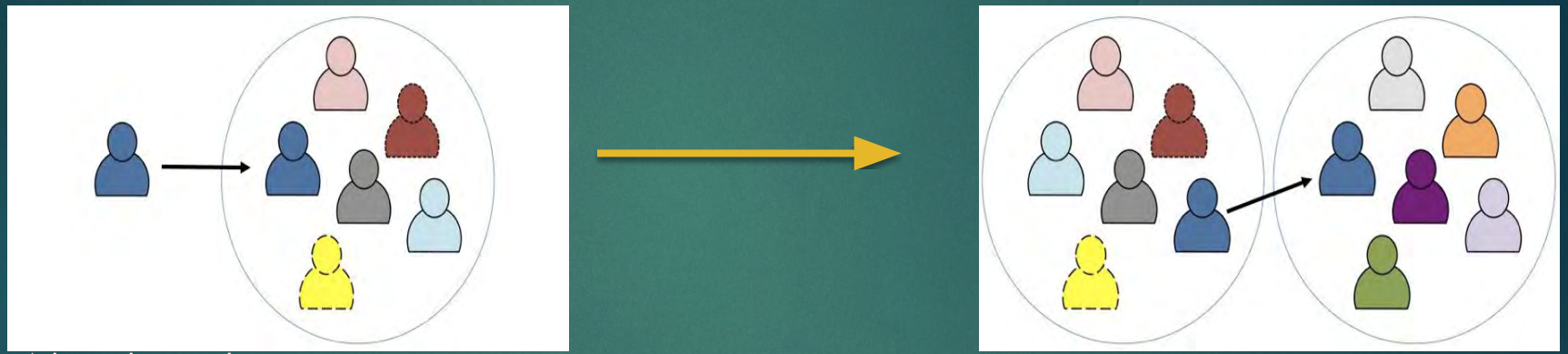
The Game

It is N-person cooperation problem, where N>2 people, that have a

1. Endowment: E = 100
2. Contribution from 0 to 100
3. Group members (N): 6
4. Threshold: T = 300
5. **threshold payoff function:** if threshold is not met players lose all points with a probability p, otherwise they keep what they did not contribute
6. **probabilistic risk of 'disaster'**
   - If sum of C ≥ T: keep 100-C (Milinski, Sommerfeld, Krambeck, Reed, & Marotzke, 2008)
   - If sum of C < T: lose everything (p) or keep 100-C (1-p)

The interaction

- From large population to small interacting groups of 6
- Everyday everyone disperse and re-form with other



- 4 treatments:
  - The **within-subjects** treatments change the risk probability (0.9 or 0.6). Subjects face one risk probability for 14 rounds and in the other 14 rounds they face a different risk probability.
  - The **between-subjects** treatments vary the ordering: whether subjects face a 0.9 risk and then a 0.6 risk or *vice versa*

The treatments

Is there any effect of the risk and of the order of the risk in norm emergence and change?

Round	1-14	15-28
Treatment 1 (n148)	p(disaster) = 0.9	p(disaster) = 0.6
Treatment 2 (n138)	p(disaster) = 0.6	p(disaster) = 0.9

Elicitation of expectations

- For **Existence**: we elicit subjects'
  - personal normative beliefs,
  - empirical expectations, and
  - normative expectations.
- For **causal relationship**: we manipulate subjects empirical and normative beliefs to examine the causal effects of these expectations on their cooperative behaviour.
- For **Enforcement**: we elicit subjects' willingness to punish misbehaviour in a third-party punishment setup and their beliefs about others' willingness to punish misbehaviour (Bicchieri, 2017).

Psychological measures

- Big Five (John, Donahue, & Kentle, 1991)
- Social Value Orientation (Murphy, Ackerman, & Handgraaf, 2011)
- Risk Preferences (Eckel & Grossman, 2002)
- Autism Spectrum Quotient (Baron-Cohen, Wheelwright, Skinner, Martin, & Clubley, 2001)

These allow us to identify individual-level predictors for norm adoption, compliance, and breaking.

Our hypothesis

Hypothesis:

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ETH zürich

Using Cryptoeconomics to Explore Postmonetary Incentive Systems – The Finance4.0 Design Space

Dr. Marcus M. Dapp, Senior Research Assistant | UZH Blockchain Lecture Series 09.12.2019

Global Challenges

ACTION

EFFECTS

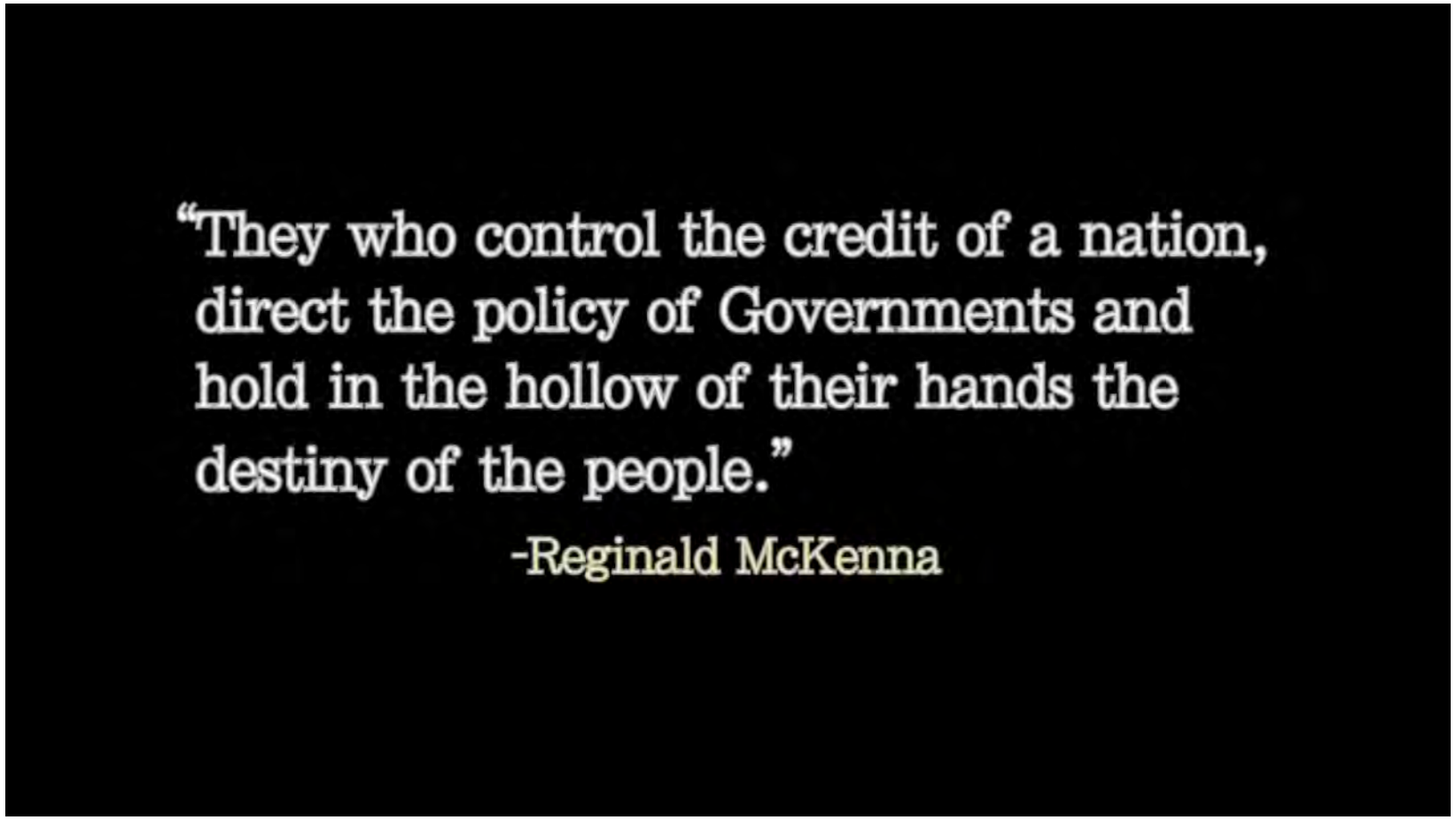
«TIME IS MONEY»

Money is a **signal** of what is valuabe to us.

Money is **future potential**, similar to stored energy.

Money is **directed energy**. Today, it maximizes only profit.

Money **creation** is the privilege of banks. Why?


"They who control the credit of a nation,
direct the policy of Governments and
hold in the hollow of their hands the
destiny of the people."
-Reginald McKenna

Extend concept of money as information signal.

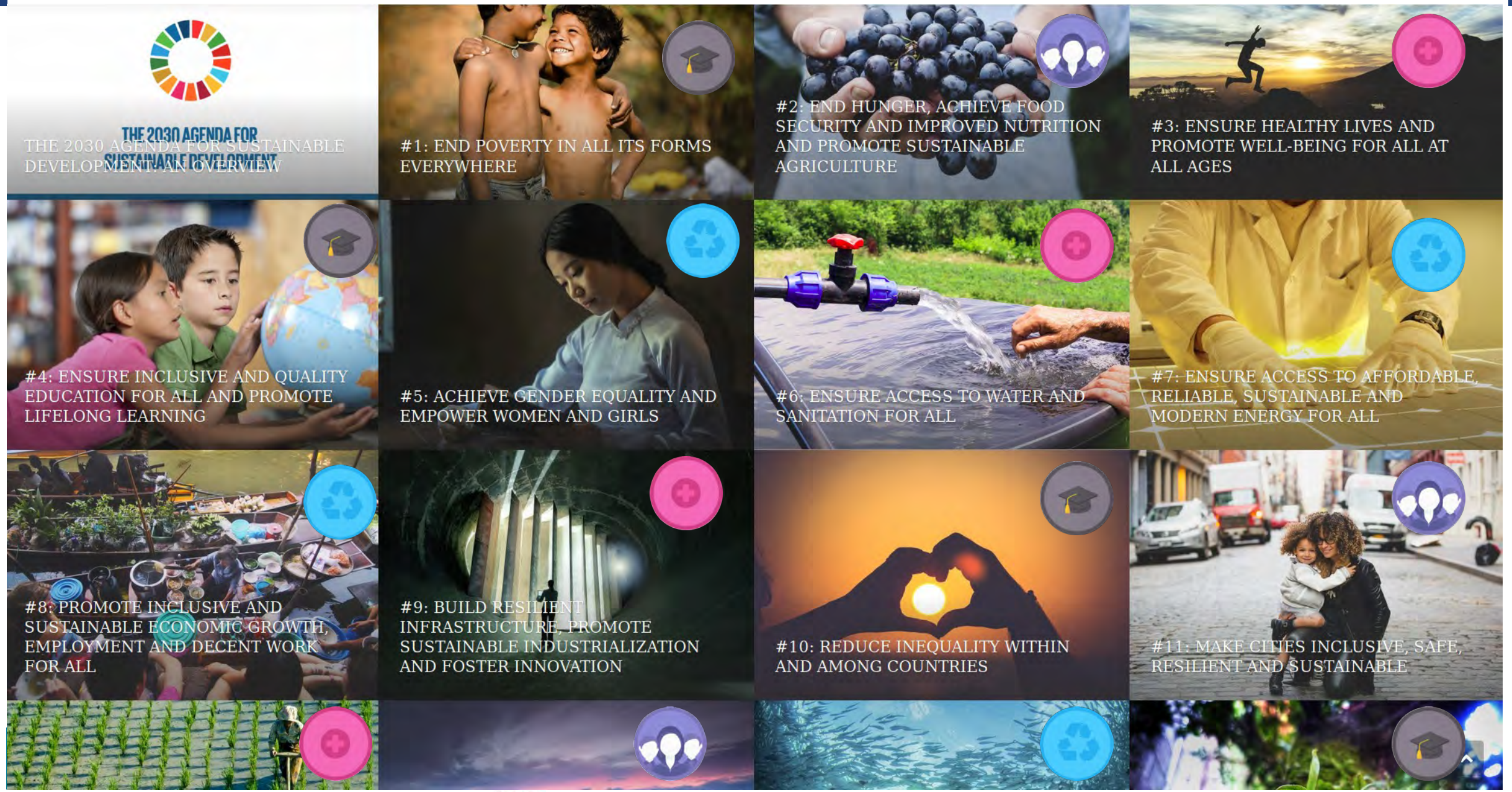
Explore new monies to represent different directions.

Experiment by letting everyone design new monies.

Finance 4.0

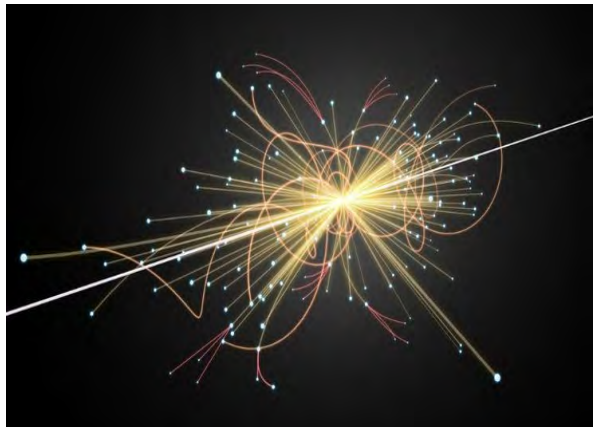
local video link

https://www.youtube.com/watch?v=oNlKdHjvExo


THE 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT
#1: END POVERTY IN ALL ITS FORMS EVERYWHERE
#2: END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE
#3: ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES
#4: ENSURE INCLUSIVE AND QUALITY EDUCATION FOR ALL AND PROMOTE LIFELONG LEARNING
#5: ACHIEVE GENDER EQUALITY AND EMPOWER WOMEN AND GIRLS
#6: ENSURE ACCESS TO WATER AND SANITATION FOR ALL
#7: ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL
#8: PROMOTE INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, EMPLOYMENT AND DECENT WORK FOR ALL
#9: BUILD RESILIENT INFRASTRUCTURE, PROMOTE SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION
#10: REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES
#11: MAKE CITIES INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE

Finance 4.0 Design Principles

Multi-dimensional incentive system



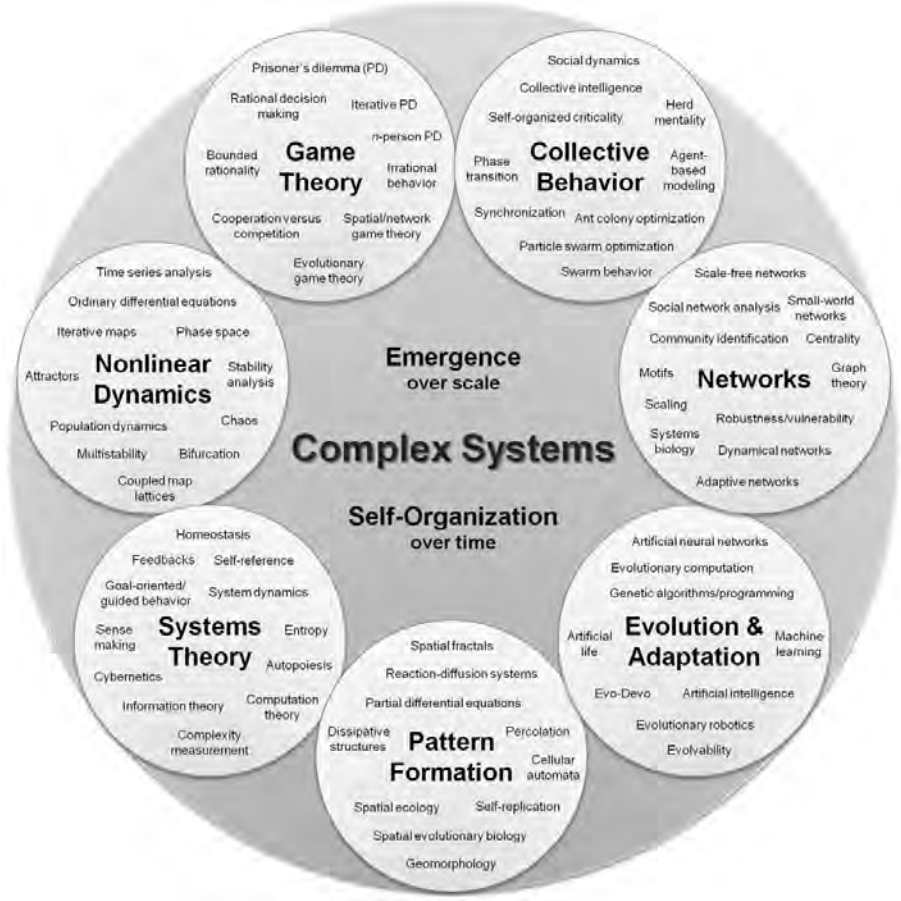
Bottom-up money creation

Decentralized Network of Peers

Democratic Governance

Not just developing software,
but enabling new economies.

Applying cryptoeconomic design
and distributed ledger technology.



If nothing else, Bitcoin has made money into a general design problem, as it should be, and not just the design of financial products or the look of paper bills, but of vessel abstractions of time, debt, work, and prestige.

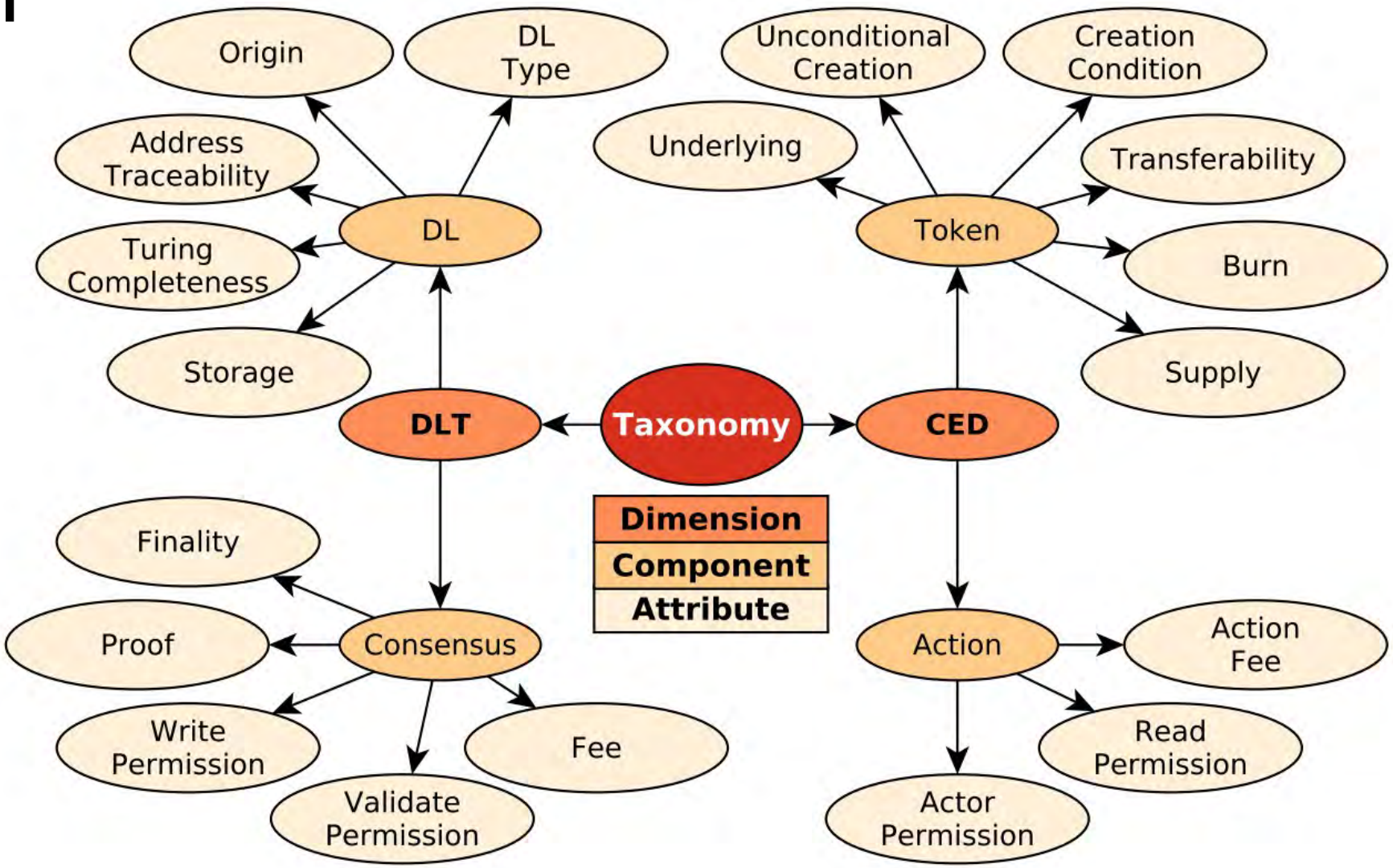
– Bratton (2015), The Stack, p336f.

Theoretical size of Design Space

DL = 72
Consensus = 64
Action = 8
Token = 480

Size of theoretical design space:

17.694.720 combinations
(of attribute values)



Ballandies, Dapp, and Pournaras, “Decrypting Distributed Ledger Design - Taxonomy, Classification and Blockchain Community Evaluation,” ArXiv:1811.03419, November 19, 2019, http://arxiv.org/abs/1811.03419.

Act in a positive way...

Clean the ocean.

Help someone in need.

Recycle your stuff.

Plant a tree.

Prove it.

Obtain a *TreeToken*.

Obtain a RecycleToken.

Obtain a CareToken.

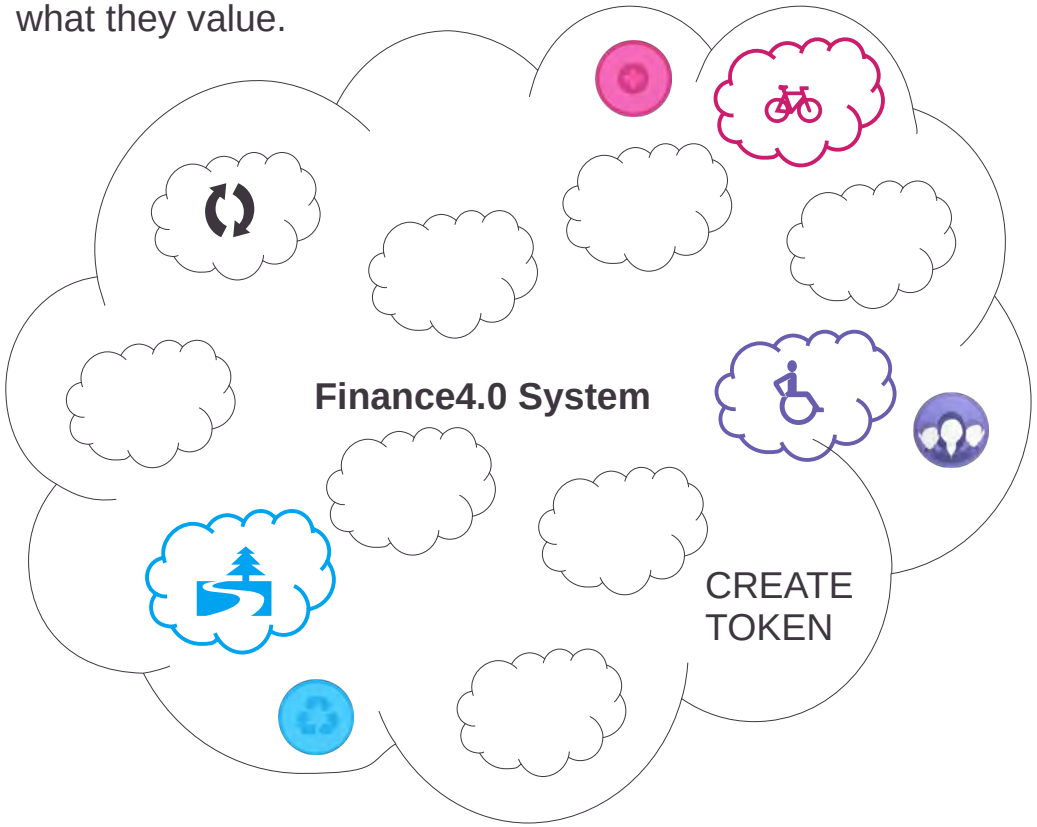
Obtain a CleanToken.

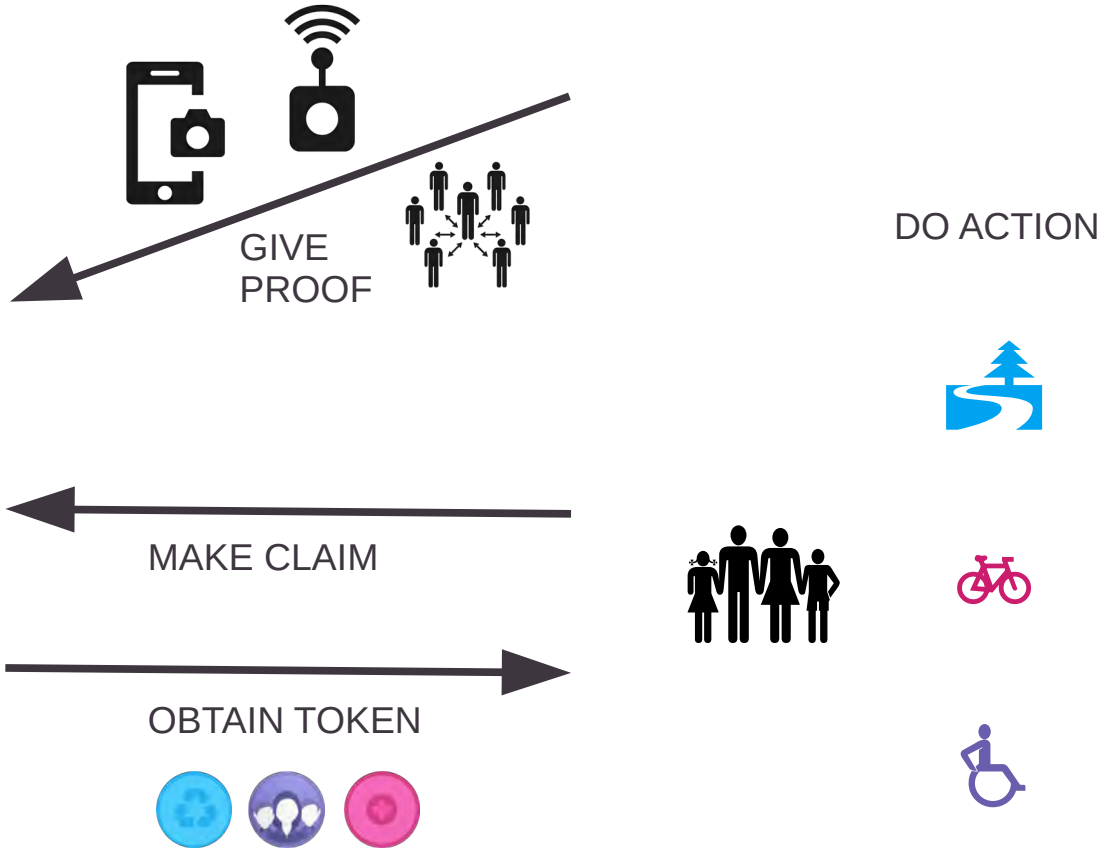
… obtain Positive Action Tokens.

Everytime you spend money, you are casting a vote for the kind of world you want. - *Anna Lappé*

Finance4.0 – Multi-dimensional incentives for positive actions

Communities reward what they value.





Dapp, Klauser, and Ballandies,
“Finance 4.0 Design: Technical Report,”
Technical Report (ETH Zurich, 2019).

Economy and governance of multi-token economies

Finance4.0 Governance

Identity

Positive Action Economy

Anonymity

Economy

Liquidity reserve
Exchange currency
“bancor” style(?)

Liq

Governance

Direct Democracy
Token Management
(vote in/out)

Gov

Society

Good Citizenship
Support & Participate:
Actions, Proofs, Votes etc.

Rep

Identity

Self-sovereign
Identity
Attributes, claims

ID

Dapp, Klauser, and Ballandies,
“Finance 4.0 Design: Technical Report,”
Technical Report (ETH Zurich, 2019).

Emergence of a new research discipline: Cryptoeconomic Design aka Token Engineering

"Use cryptography to prove properties about messages that happened in the past. Use economic incentives defined inside the system to encourage desired properties to hold into the future". - V. Buterin

"token ecosystem design as an engineering discipline... body of theory, practice, tools and a sense of responsibility… engineering is about building things that work; science is about contributing new knowledge." - T. McConaghy

"Create interconnected communities of autonomous actors within which efficient value exchange is enabled by technology." - M. Zargham

"cryptoeconomies rely on tokens and cryptographic techniques to regulate how value is exchanged between participating actors. The options and choices are referred to as cryptoeconomic design and play a key role in the stability of a DLT system in terms of convergence, liveness, and fairness. - Ballandies/Dapp/Pournaras

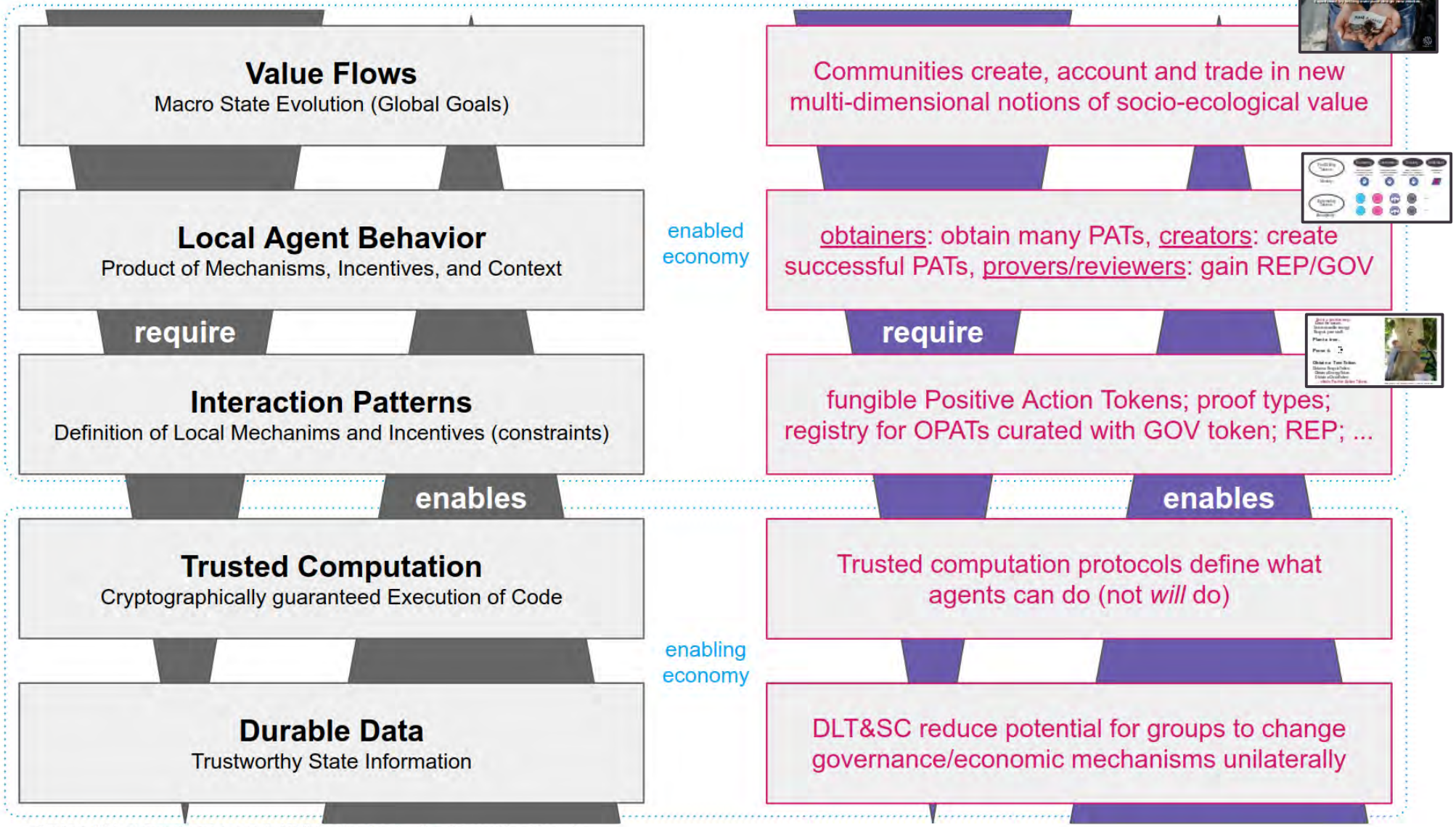
- Enable **new socio-economic models**
- **"In-vitro" experiments**
  - Gov: Futarchy, Holacracy
  - Econ: Prediction markets, Curation markets
  - DAO: https://aragon.org/
  - Artificial Life Forms http://www.plantoid.org/
- **Power Distribution by Design** raises questions
  - CED decides over people's behaviour.
  - Who decides (about who decides)?
  - Participation volunteer vs mandatory?
  - Processes for changing the CED?
  - Moral hazard of creators (token owners)?
- **Ethical design** in triangle of IoT, DLT, and AI

Emergence and self-organisation of a cryptoeconomic system

The enabling economy creates an enabled economy:

- self-organisation over time
- emergence over scale

On top of Ethereum, we create a socio-ecological, financial incentive system, called **Finance 4.0**.



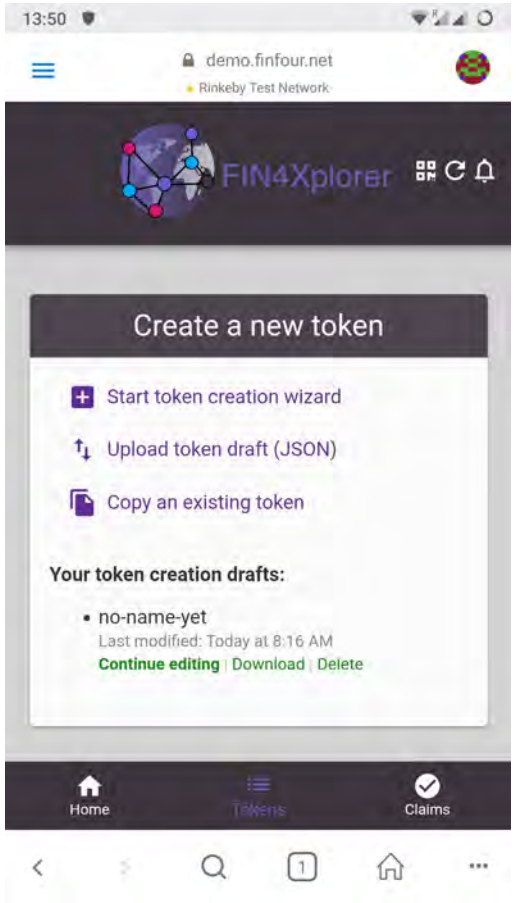
Zargham, Michael. *Creating Interconnected Collaborative Communities*. Future of Trust Summit. The Hague, 2018. https://www.youtube.com/watch?v=nOP6anxiHkk.

"The thing to do, when you don't know,
is not to bluff and not to freeze, but to learn.
The way to learn is by experiment – or, as Buckminster
Fuller put it, by trial and error, error, error."

Meadows and Wright (2009), Thinking in Systems, p180.

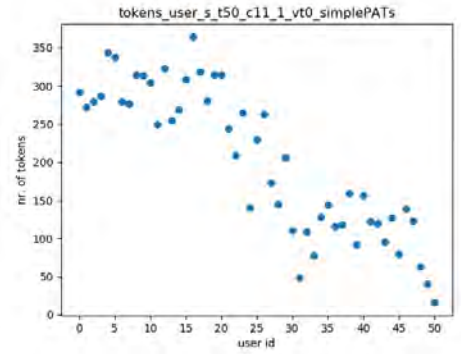
Research methods used to explore the postmonetary design space

FIN4Xplorer “DApp”



Simulations

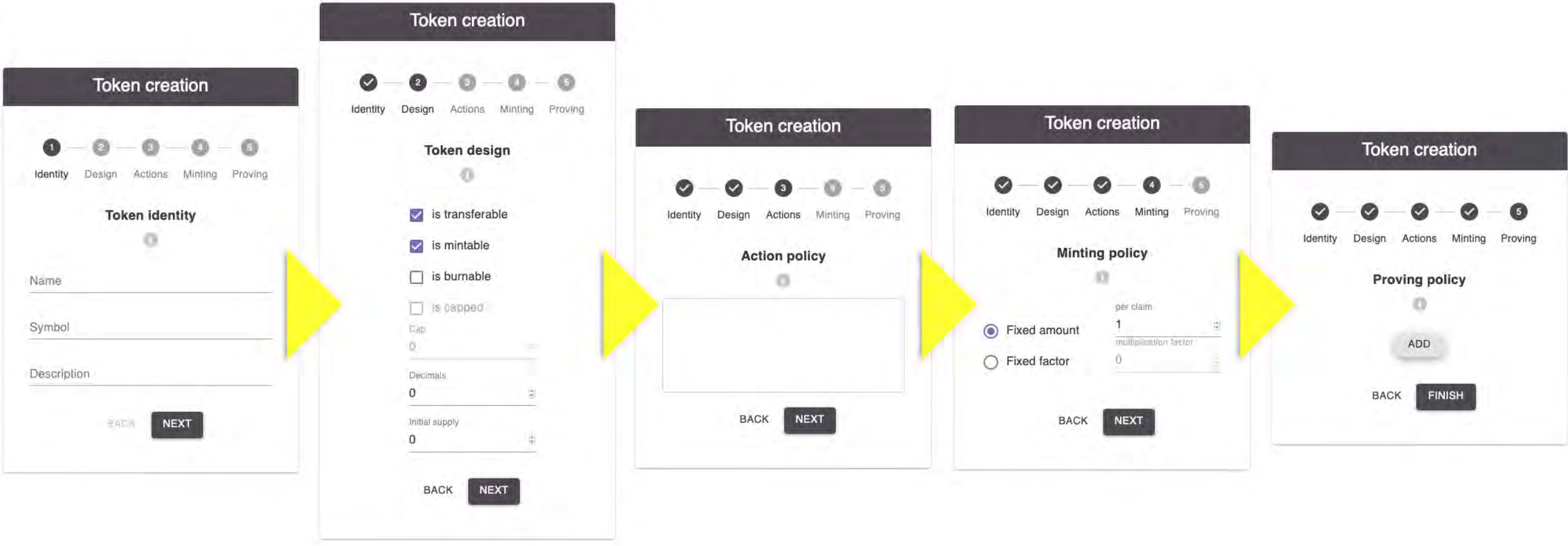
S	Key Functionality	Risks	Risk mitigation
0	Anonymous Anyone can access	Sybil attacks on access (flooding)	Blockchain (wallets & Ether)
1	Anyone can obtain PATs	Users cheating	Proof mechanisms
2	Anyone can create PATs	Spam of PATs or malicious PATs	List of trustworthy OPATs (intro GOV token)
3	Anyone can vote on PATs		



Experiments / ADR

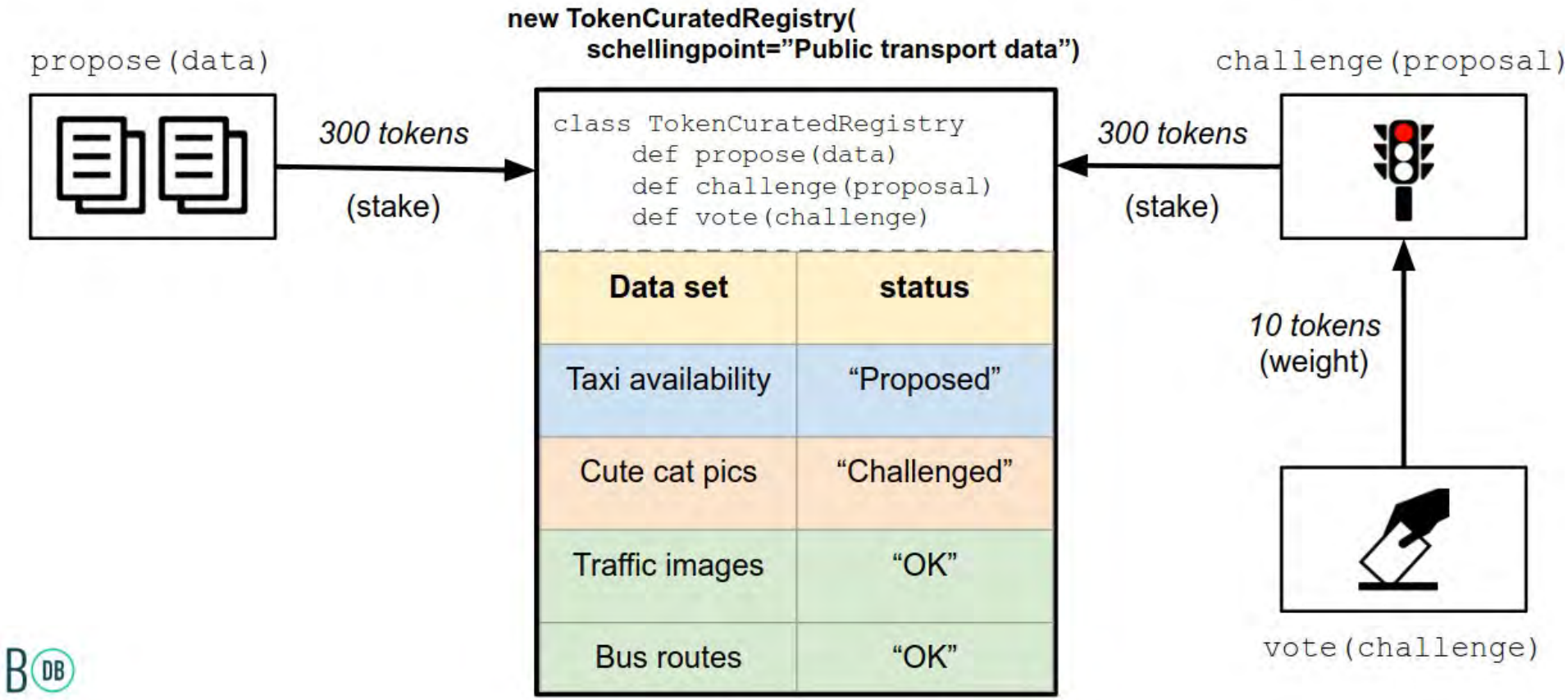
Climate-KIC

Fin4Xplorer: Token creation process overview



Finance 4.0 Demonstrator aka FIN4Xplorer. Try it out yourself:
DApp: demo.finfour.net (requires Metamask)
Documentation: fin4xplorer.readthedocs.io

Fin4Xplorer: Token Curated Registry



Source: Token Curated Registry (TCR) Design Patterns
https://hackernoon.com/token-curated-registry-tcr-design-patterns-4de6d18efa15

Fin4Sim: Stage-based simulation approach

S	Key Functionality	Hypotheses, assumptions ("personas"/cases)	Risks	Risk mitigation
0	Anonymous Anyone can access	Many join, join in communities/batches,	Sybil attacks on access (flooding)	Blockchain (wallets & Ether)
1	Anyone can obtain PATs	multi-dimensional incentive system	Users cheating	Proof mechanisms
2	Anyone can create PATs	Agents will obtain more than create (90/10, dynamic)	Spam of PATs or malicious PATs	List of trustworthy OPATs (intro GOV token)
3	Anyone can vote on PATs	Some % is interested to participate in governance and obtain GOV tokens GOV are interesting to obtain, to (self)promote certain PATs	Sybil attacks on governance, Centralisation, Q: How to get GOV?	Reputation (REP token) as mechanism to receive GOV and to incentivize good behavior (sanction bad behavior) outside the (O)PAT economy

Anabele Pardi, Marcus Dapp, work in progress….

Fin4sim: Modeling the design space (2020)

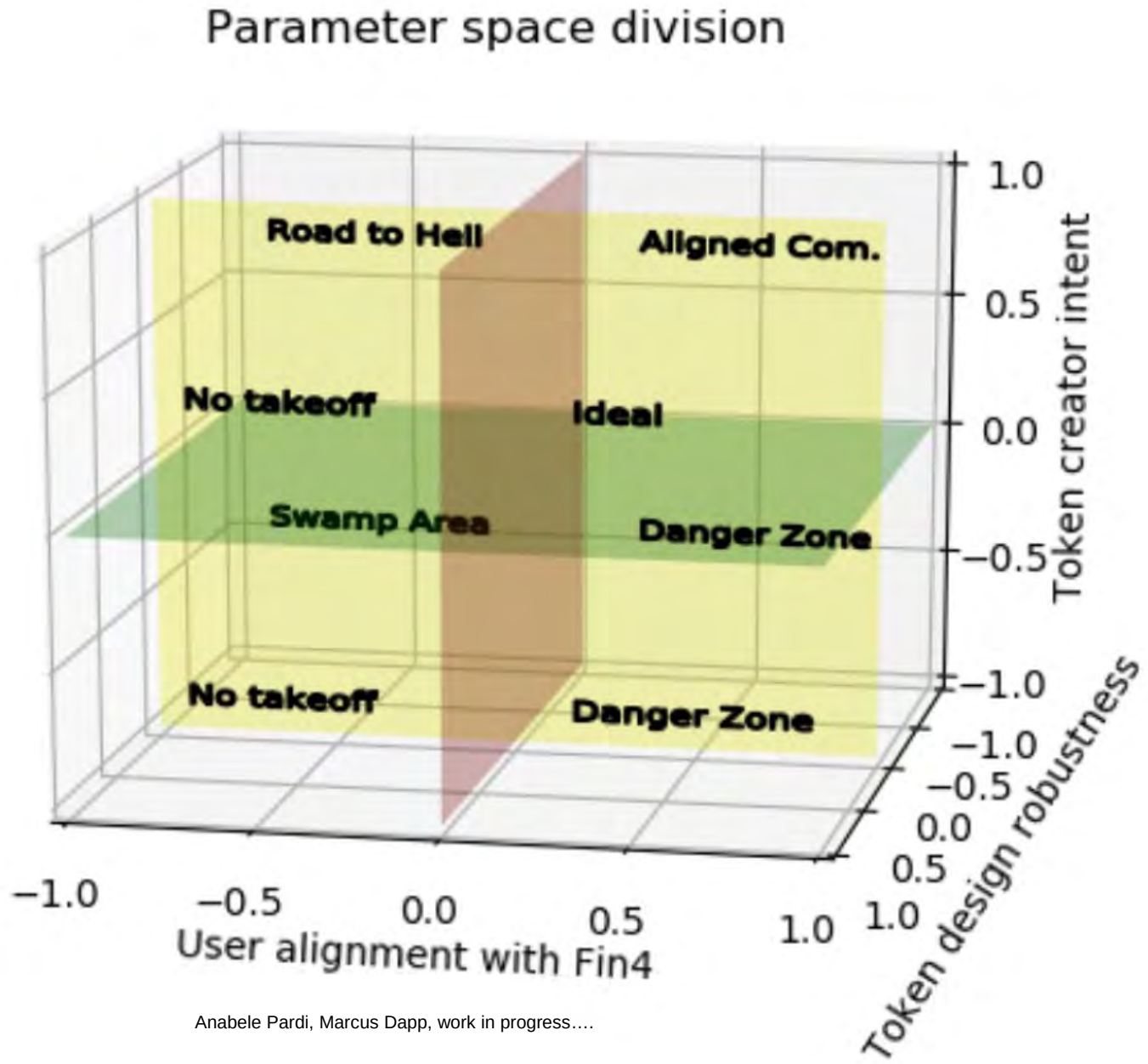
X: user alignment with Fin4 {-1,1}
«Honest vs. Cheating users»

Y: token design robustness {-1,1}
«Robust vs. Flawed proof system.«

Z: token creator intent {-1,1}
«Nobel intent vs. Malicious intent»

Spans eight generic sub cubes with ideal-typical configurations

Ideal: «Nobel creators design robust tokens to be claimed by honest users.»

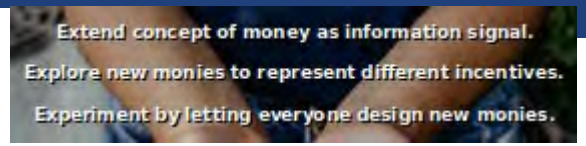


Anabele Pardi, Marcus Dapp, work in progress….

Experiments: different domains and approaches (2020)

Domain (partner)	Cryptoeconomic Design
Time-banking (KISS)	multi-token setup
Reforestation (WWF CH)	Individual incentives, Complex token
Poaching (WWF RO)	Collective incentive, Campaign design
Finance (via climate-KIC)	(TBD in 2020)

“Markets As Outcomes”



(...), today we can work to ensure that all activities (...) promote the outcomes that we want: if the quality and characteristics of an activity in question help deliver true value, then it should be rewarded for being inside the boundary.

(...) **favouring longterm investment** over short-term (...) founding **new financial institutions** (like mission-oriented state investment banks) that can provide the **strategic, long-term finance** crucial to the high risk investments **required for exploration and research underlying value creation**.

– *Mazzucato (2018), The Value of Everything, p276 (my emphases)*

Decentralized, Participatory, Multi-dimensional, Democratically governed Incentive system → ***Alternative (non-hierarchical?) Financial Institution*** → ***Strategic, long-term finance and de-risk investment: enable distributed & parallel exploration and research of value creation***

ETH zürich

Using Cryptoeconomics to Explore Postmonetary Incentive Systems – The Finance4.0 Design Space

Dr. Marcus M. Dapp, Senior Assistant | UZH Blockchain Lecture Series 09.12.2019

Project extension

A project extension of one year has been requested and approved from all partners except ETHZ and UTBV.

In that period, we plan further work on WP2 from Italian, French, Latvian and Belgian partners, and a specific workshop-dissemination event on science-policy interface in 2020.