Ostrom and Blockchain Governance

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- Studies of public services - California policing,
- polycentric design (Tiebout & Ostrom)
- logic of collective action (Olson), public choice theory
- Natural resource commons – field work (water, forests)
- Theory of CPR: Institutional econ + game theory

1990 *Governing the Commons*

Institutional Analysis & Design

2005 *Understanding Institutional Diversity*

Sustainability of Social Ecological Systems Framework (Ostrom 2009)

Extensions

- Knowledge commons (Hess & Ostrom 2008, Frischmann 2014)
- Innovation commons (Potts 2019)

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All efforts to organize collective action must solve common problems:

1. Coping with free-riding
2. Solving commitment problems
3. Supplying new institutions
4. Monitoring individual compliance with rules

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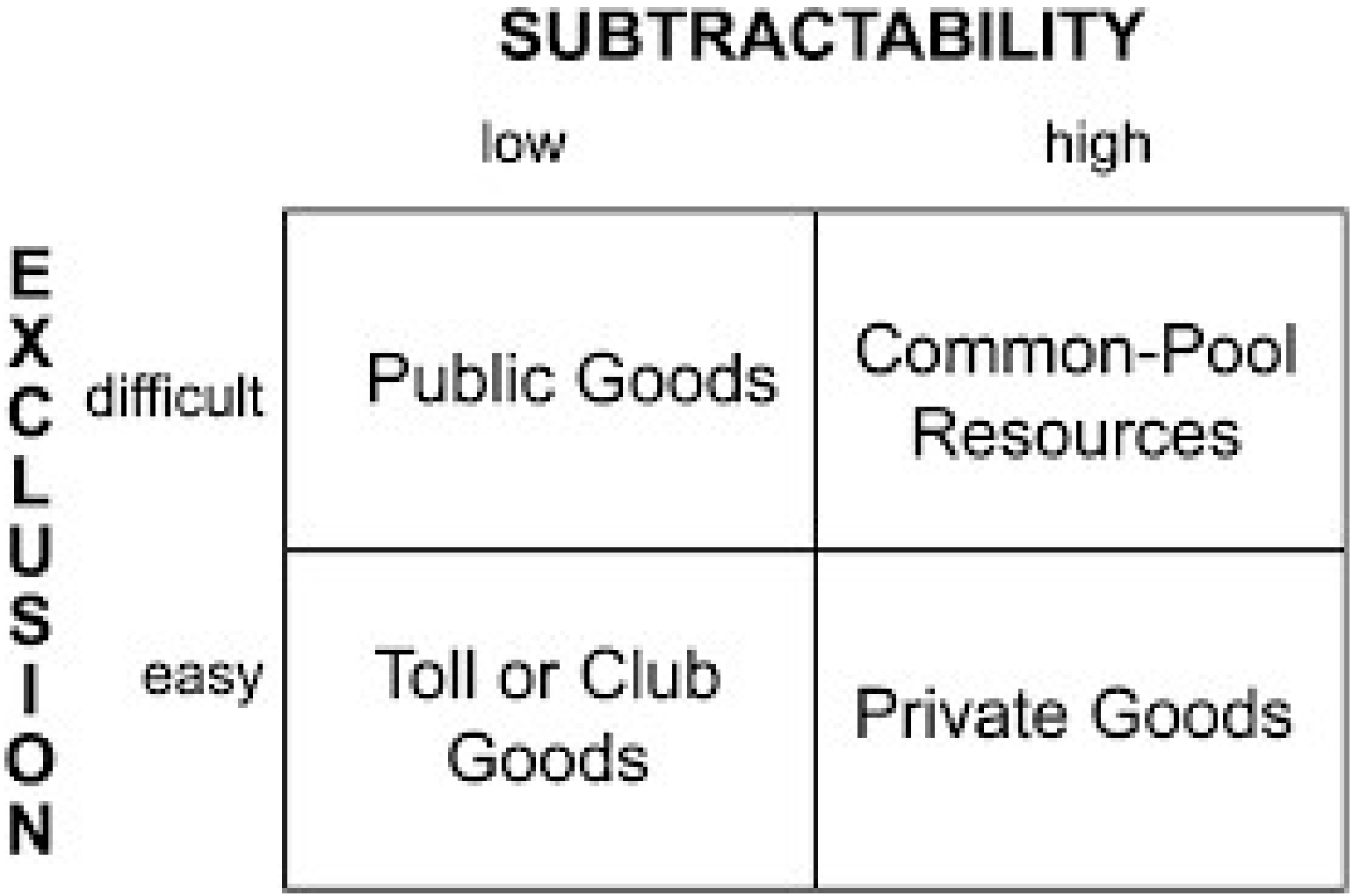

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New Institutional Economics of Common Pool Resources

- Private ordering (governance)

- Evolved institutions for resource coordination
- Complex institutions evolve
- Against experts

- Rational free-riding & rational rule-making
- Rules in use, build-your-own institutions

- Community formation
- Transaction costs
- Collective action in small units

- Polycentric systems, local adaptation, local information

- Community formation, rule-making & communication
- Monitoring and punishment (incentive design)

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Eight principles for managing a commons (Ostrom 1990):

1. Define clear group boundaries;
2. Match rules governing use of common goods to local needs and conditions;
3. Ensure that those affected by the rules can participate in modifying the rules;
4. Make sure the rule-making rights of community members are respected by outside authorities;
5. Develop a system, carried out by community members, for monitoring members' behaviour;
6. Use graduated sanctions for rule violators;
7. Provide accessible, low-cost means for dispute resolution;
8. Build responsibility for governing the common resource in nested tiers from the lowest level up to the entire interconnected system.

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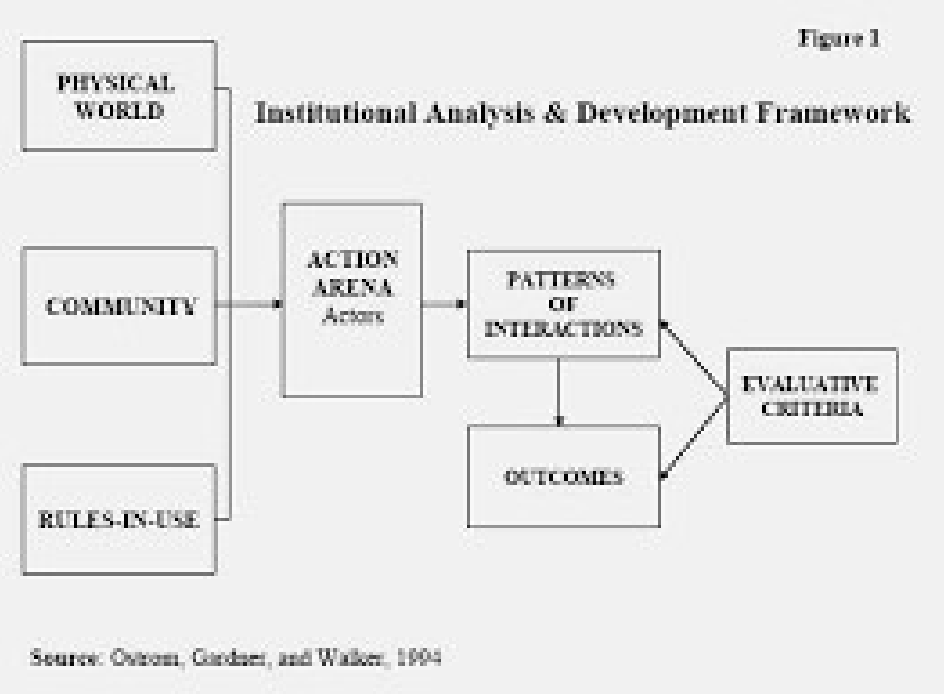
(Wilson, Ostrom, & Cox, 2013)

Principle	Description
1A	User boundaries: Clear boundaries between legitimate users and nonusers must be clearly defined.
1B	Resource boundaries: Clear boundaries are present that define a resource system and separate it from the larger biophysical environment.
2A	Congruence with local conditions: Appropriation and provision rules are congruent with local social and environmental conditions.
2B	Appropriation and provision: The benefits obtained by users from a common-pool resource (CPR), as determined by appropriation rules, are proportional to the amount of inputs required in the form of labor, material, or money, as determined by provision rules.
3	Collective-choice arrangements: Most individuals affected by the operational rules can participate in modifying the operational rules.
4A	Monitoring users: Monitors who are accountable to the users monitor the appropriation and provision levels of the users.
4B	Monitoring the resource: Monitors who are accountable to the users monitor the condition of the resource.
5	Graduated sanctions: Appropriators who violate operational rules are likely to be assessed graduated sanctions (depending on the seriousness and the context of the offense) by other appropriators, by officials accountable to the appropriators, or by both.
6	Conflict-resolution mechanisms: Appropriators and their officials have rapid access to low-cost local arenas to resolve conflicts among appropriators or between appropriators and officials.
7	Minimal recognition of rights to organize: The rights of appropriators to devise their own institutions are not challenged by external governmental authorities.
8	Nested enterprises: Appropriation, provision, monitoring, enforcement, conflict resolution, and governance activities are organized in multiple layers of nested enterprises.

Institutional Analysis & Design (IAD) model



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On the principle of alignment with Ostrom's 8 rules

	Tokenisa-tion	Self-enforce-ment and formalisation	Autonomous automatisati-on	Decentralisation of power over infrastructure	Transparenti-sation	Codification of trust
(1) Clearly defined community boundaries	✔					
(2) Congruence between rules and local conditions	✔	✔		✔		
(3) Collective choice arrangements	✔			✔		
(4) Monitoring		✔	✔	✔	✔	
(5) Graduated sanctions		✔	✔			
(6) Conflict resolution mechanisms			✔		✔	
(7) Local enforcement of local rules		✔		✔		✔
(8) Multiple			✔			✔

Screenshot 2019-04-23 18.53.15

8 design principles of commons (Wilson et al., 2013)	Applies to Bitcoin/a DL?	Comment
Clearly defined boundaries	Partially	Systems can only manage native assets. Anybody can install the software and enter the community
Proportional equivalence between benefits and costs	Yes	Rewards proportional to computing power
Collective-choice arrangements	Partially	Improvements Proposals are made by developers only
Monitoring	Partially	Monitoring is possible though not perfect (pseudo-anonymity, unidentified miners)
Graduated sanctions	No	There are no sanctions, only incentives to join the information network
Conflict resolution mechanisms	Partially	Design conflicts are solved through computing power but can lead to forks
Minimal recognition of rights to organize	Yes	Code is open source. Forks are possible
Appropriate coordination among groups part of larger social systems	No	Not applicable for Bitcoin/DLs (systems are self-dependent)

Table II: Bitcoin and Distributed Ledgers compared with a commons

	Ostrom design rule	Interface with analogue economy required	Control used to comply with Ostrom rule.	Gap
1	Define Clear group boundaries.	None.	Ownership of cryptocurrency private key.	None.
2	Match rules to local needs and conditions.	Payment for goods and services.	Fees market. Limited supply (appreciating asset) High degree of decentralization (high trust)	Lacks scalability. Lacks privacy. Lacks price stability. Limited programmability. High costs to validate.
3	Ensure that those affected by the rules can participate in modifying the rules.	Social network platforms are used to participate.	Completely open access in theory but politics often prevent rules changes.	Unstructured governance model sometimes causes stasis – which restricts innovation.
4	Make sure the rule-making rights of community members are respected by outside authorities.	Exchanges used to purchase bitcoin.	Censorship resistant. Transaction transparency.	Noncompliance with regulations in a limited group of countries prevents citizens from these countries from becoming members.
5	system, carried out by community members, for monitoring members' behavior.	Rulemaking and block validation by miners.	Complete transparency of on chain transactions.	Unstructured governance model sometimes causes stasis – which restricts innovation.
6	Use graduated sanctions for rule violators.	None	Simple and strict use case makes on chain rule violation impossible.	Unstructured governance model sometimes causes stasis – which restricts innovation.
7	Provide accessible, low-cost means for dispute resolution.	None	Transactions are definitive and irreversible.	Unstructured governance model causes stasis – which restricts innovation.
8	Build responsibility for governing the common resource in nested tiers from the lowest level up to the entire interconnected system.	None	Multiple interconnected nested member groups from miners, full node hosts, coders, investors, traders, merchants.	Unstructured governance model sometimes causes stasis – which restricts innovation.

			social network identities	
2	Match rules to local needs and conditions.	Blockchain native function	Futarchy driven features and low cost to transact.	Assumed solved by Futarchy.
3	Ensure that those affected by the rules can participate in modifying the rules.	Native to blockchain	On chain voting on beliefs and predictions markets to choose protocol upgrades.	Without a mechanism to determine unique entities (Humans etc) voting weight is determined by % of cryptocurrency owned rather than democratically. Block producers require a minimum of 10000 Tezos which prevents many members from participating.
4	Make sure the rule-making rights of community members are respected by outside authorities.	Native to blockchain	On chain futarchy which driven new features leverages blockchains decentralization and is therefore regulatory resistant.	none
5	system, carried out by community members, for monitoring members' behavior.	Social networks (off Chain)	Delegates publish and associate public addresses with social network identities –which are transparent.	Social networks are centralized and subject to censorship. Reputation of non-delegates is not tracked.
6	Use graduated sanctions for rule violators.	Blockchain native function	Native escrow and smart contract capability. Predictions market will reward and punish.	none
7	Provide accessible, low-cost means for dispute resolution.	Blockchain native function	Consensus mechanism requires bonds to be staked and these may be forfeited. Native escrow and smart contract and Predictions market capability Transactions occur on blockchain and are definitive and irreversible.	None
8	Build responsibility for governing the common resource in nested tiers	Blockchain native function	Multiple interconnected nested member groups from delegates, coders, investors, traders, merchants and Dapps	Identity of Non delegates is non unique.

Governance by blockchain

- Using blockchain affordances to scale CPRs and peer production
- CPR has town-hall governance model. Local, informal, participatory
- Blockchain + CPR = scalable peer production resource/ CPR
- Rosas et al (2018) 'When Ostrom Meets Blockchain: Exploring the Potentials of Blockchain for Commons Governance' SSRN
- Governance markets (https://blog.usejournal.com/crypto-commons-da602fb98138)

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Affordances of blockchain governance of CPR (Rosas et al 2018)

1. Tokenisation
2. Self-enforcement & formalization of rules (smart contracts)
3. Autonomous automisation (DAO)
4. Decentralisation of power over infrastructure
5. Transparency and accountability
6. Codification of trust

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Governance of blockchain

Blockchain 3.0
DAO, EOS, Tezos, Futarchy…

Shackelford and Myers (2018) ‘Block-by-block’ *Yale J. Law & Tech*

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What is the common pool resource?

Governance?

Trust?

Protocols?

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