Anticipatory Policy as a Design Challenge: Experiments with Stakeholders Engagement in Blockchain and Distributed Ledger Technologies (BDLTs)

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Abstract. We are proposing a combination of design and policy methods enabling anticipatory governance [4, 5, 7] of emerging blockchain and decentralized ledger technologies (BDLTs). Involving stakeholders in the early development and design of an emerging infrastructure is critical for the support of the Responsible Research and Innovation (RRI) agenda [8, 9, 14] and related calls for anticipatory governance. On the example of our Lithopia project [6] connecting satellite data with blockchain services, we will discuss the strategy of combining prototyping with future scenarios through a simulation game. We claim that this combination of policy deliberation and design supports anticipatory governance of blockchain and decentralized ledger technologies and engages the public in future-making.

Keywords: Anticipatory governance · Anticipatory design · Blockchain · Smart contracts

1 Introductionon

Users in most design methods are addressed as individuals that have various needs and desires (UX, human-centered design) supported by the right combination of technology and modalities [2, 3]. In the case of participatory and service design, users are addressed as part of an organization, community or another social group which poses further challenges [15]. Design has to respond and integrate various conflicting needs and desires of many users, their patterns in behavior, the context of the organizational culture, and the possibilities and limits of the existing technological infrastructure and regulations [11].

Lithopia project takes the challenges of participatory design, co-creation, and service design further, and views the users as stakeholders in the future. In this project, we explore the possibility of design as future-making [13] that reacts directly to the policy challenges involved in the emerging technologies, such as the blockchain. The user in the case of emerging technologies is a citizen and not only an individual or a group member. S/he is someone deeply invested in the possibility of anticipatory governance of such emerging technologies that create regulatory uncertainties, exaggerated expectations, but also fears. Design for anticipatory governance supports the capacities

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of "foresight, engagement, and integration" as a way of "managing emerging knowledge-based technologies while such management is still possible" [5].

To support such early engagements with emerging infrastructure, the users in the Lithopia project are defined as citizens in a simulation of village that that uses functional prototypes of near future services connecting satellite data and the blockchain and distributed ledger technologies (BDLTs). The simulation and the prototypes train them to think as stakeholders in the future of this community shaped by the emerging new infrastructure. As future citizens, they face conflicting interests and expectations about the technology as much as about society, and the project provides them with means to connect deliberation with prototyping. To induce such experience of a future citizenship invested in prototyping and data governance in the case of the blockchain technologies they interact and tweak several functional prototypes in the simulation game of a "smart village" called Lithopia.

2 Prototyping in the "Smart Village" of Lithopia

The workshop uses templates of a Lithopia Hyperledger Fabric based contracts supporting transactions, such as become a Lithopian, offer a partnership and property, to reveal how blockchain services operate on the level of code and network communication. We enable the participants to prototype while deliberating on the life in Lithopia as stakeholders in ist future. The first activity is to make everyone a citizen of Lithopia through a smart contract experienced directly over a Node-RED interface that communicates with the REST API Hyperledger Fabric services installed on our server.

In the next step, they all see a design fiction movie that depicts a typical "sunny" day in Lithopia with villagers performing strange gestures to trigger social contracts, such as becoming a friend, partner, buying or selling a property. We confront the participants with a near future scenario of smart contracts triggered by satellite and drone data that act as notaries. Everyone is then given a template to deliberate upon it and even change or hack the contracts or even demand a moratorium on such technology. After participants become citizens of Lithopia, they have to propose a partnership or sell and buy property, and then follow how the data are saved on the ledger, and how they are triggered and changed by the smart contracts utilizing outside APIs and services.

In order to change ownership or partnership status in Lithopia, you have to be at the right place at the right time (GPS locations visible to Sentinel 2A and B satellites) and perform special gestures, move big LiCoins as objects or even cover a 10×10 m area visible as a pixel to the Copernicus satellites. While revealing the functional prototype and explaining the template (as well as the basic terminology or permissioned blockchain services, APIs etc.), we are slowly introducing the rich narrative of Lithopia and its special relation to the Micronesian island of Yap that uses large stone coins to preserve their oral memory of ownership, marriages, and important events.

Lithopians deploy their carpets or large 3D printed LiCoins visible to satellites and drones to trigger smart contracts, but they do not use any tokens or currency. In the plastic of these large LiCoins, Lithopians mix and hide the illegally obtained lithium from the old mines to reclaim the ownership of their natural resources. Their smart

contracts are a form of oral culture timestamping that emphasizes genealogy over exchange and stewardship over ownership. The story also explores a form of resistance that is not direct, but creative and exploratory.

The project was inspired by the traditional mining region of Cínovec in the Czech Republic and its resistance to the interests of the mining industries trying to extract its rich lithium deposits. The prototypes and this story then set up a stage to discuss the current hype of national cryptocurrencies and other speculative investments in emerging technologies. Lithopia mocks the speculative ICOs, national cryptocurrencies, but also the political promises linked to Lithium reserves in the Czech Lands, and offers this as a model for other similar sites that pose the challenge of the commons.

3 Imagining Alternative Futures and Design Through Lithopia

Lithopia project combines storytelling and prototyping, deliberation and testing to give a direct experience with the design process, but also policy issues - automation and algorithmic governance, privacy and transparency in the age of satellite imagining, and the most critical question of who regulates the future infrastructure. The Lithopias gradually learn to deliberate upon these issues by using arguments as much as code.

Prototyping plays a central role in this exercise of anticipatory governance of BDLTs. It is used not only as a design method for gathering requirements or feedback, but also as a policy tool that provides strategic, future-oriented planning often addressed by various foresight and future scenario methods. After the Lithopias experience the tools (dashboard, REST API server) and activities in our simulation game, we ask them to tweak or design their own prototype, which they also present, and then everyone has to vote on the future of the blockchain in Lithopia.

Participants decide as a group whether Lithopia should continue or discontinue the use of blockchain based smart contracts with or without any outside supervision and regulation. We ask every participant to list three main reasons for/against, their expectations, fears, but also proposal for regulations or competencies and forms of supervision. In the final step, based on the voting, they finish the simulation and continue with collaborative two axes future scenario exercise on blockchain and governance to summarize the experience and define four possible scenarios for the future. In this part, the goal is to follow how the experience of prototyping and "living" in Lithopia influenced the final vote and the four possible futures.

4 Bridging Policy and Design Divides

With Lithopia project we want to bridge the divide between designing and policy-making to support anticipatory governance. The emerging technologies profoundly challenge not only our existing infrastructures but also regulations and governance and we need better methods to tackle this. Policy and regulations do not need to be just some ex-post strategies that come after a significant technological challenge and as a response to a crisis. This reactive view of policy is not efficient and just cements the

distrust in the public institutions and infrastructures. Present calls for RRI and anticipatory governance are trying to change this reactive role of current governance and offer a more pro-active and even anticipatory practice that can prepare the society and different stakeholders to the new challenges, but they remain discoursive.

AnticipatoryLedgers project has a goal to define a framework for using design and future scenario methods to support anticipatory governance of BDLTs. It combines prototyping with testing and engaging stakeholders to not only define their needs, fears, and expectations but also to negotiate, adapt and envision desirable future for such future infrastructure.

In this paper, we described the process of defining the framework and the use case which we plan to apply to test such anticipatory prototyping. The central hypothesis is that the practices of prototyping can support policy-making as more inclusive and democratic activity that empowers the users to feel as stakeholders. We are still looking for ways how to involve the various users in the early stages of development and we are taking inspiration from the DIY and maker movements [1, 12] along participatory design. The creation of new products, services, and infrastructure should not be left only to developers if we want to avoid the mistakes of ex post regulations.

To make this convergence of technology and governance more inclusive, we need to involve the ethical and policy reflections and considerations directly and early in the prototyping phase of the BDLTs applications. The present fragmentation of BDLTs with many white papers, competing platforms and speculative investment related to future scenarios is an ideal stage to engage the citizens in the future making. Though prototyping, we can involve the public and the different stakeholders directly in the processes of making the future infrastructure together rather than imposing it by claiming better, faster and more secure algorithms.

The goal of the Lithopia project is to "prototype" ethical and governance frameworks and protocols simultaneously rather than in parallel. In this sense, our methods could help the BDLTs to move from their utopian sentiments of the early manifests of cyberspace and Internet, which detested governance and ethics external to code and technology, to more mature interest in different concepts and theories of ethics and management through prototypes. Instead of claiming that every new platform will make society more just and free through the work of one group - hackers and programmers - we need cooperation that will pick up the problems and issues early by working on the prototypes. For the policy scholarship on emerging technologies, our project and proposal of working directly on the BDLTs application provide a new method to test the hypothesis and demonstrate the concept.

5 Summary

This experimental, design and policy-driven research tries to use productively the current tensions and convergences between emerging technology (BDLTs) and "venerable" issues in governance and ethics. The BDLTs as a crucial future infrastructure for governance shows a lack of direct engagements of the public and the different stakeholders in the processes of its development, testing, and implementation of the applications. Similarly, the various STS concepts, which advocate direct and early

engagements with emerging technologies through interdisciplinary and interactive "socioethical engagements" [16, 17], "upstream engagements" [18, 19] or "technologies of humility" [20], lack a more design-oriented or prototyping focus, which defines any emerging technology and infrastructure. The proposed research agenda (AnticipatoryLedgers) and Lithopia project hope to bridge these divides.

The goal of Lithopia project is to use design and policy methods to support various stakeholders in the early phases of development rather than only in the adoption of emerging technologies. We use the anticipatory governance as a framework for prototyping that can capture the complex social, economic and political outcomes resulting in so-called "mediated (future) scenarios" [10].

The Lithopia prototypes of smart contracts serve to enable participants to evaluate neglected issues of BDLTs governance (accountability, shared responsibility, a division of powers), but also ethical principles (deontological versus utilitarian rules and laws) or philosophical questions (relation between hashes, concepts, codes, data). These prototypes and future scenarios help the stakeholders to define design and policy requirements for the BDLTs community, such as more hybrid governance models.

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