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Blockchain and Applications

2nd International Congress

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Preface

The 2nd International Conference on Blockchain and Applications 2020 (BLOCKCHAIN'20), held in the Heritage city of L'Aquila (Italy), has been a meeting point for both experienced and young researchers investigating in the areas of blockchain and artificial intelligence (AI). The conference has acted as a forum at which the attendees listened to lectures, and shared and discussed ideas, projects and advances associated with these technologies and their application domains. Within the scientific community, blockchain and AI are viewed as a promising combination that will transform the production and manufacturing industry, media, finance, insurance, e-government, etc. Nevertheless, there is no consensus with schemes or best practices that would specify how blockchain and AI should be used together. Combining blockchain mechanisms and artificial intelligence is still a particularly challenging task, and the BLOCKCHAIN'20 conference has been a milestone towards its achievement.

The BLOCKCHAIN'20 conference has been devoted to promoting the investigation of cutting-edge blockchain technology, exploring the latest blockchain- and AI-related ideas, innovations, guidelines, theories, models, technologies, applications and tools for the industry. Critical issues and challenges have been identified so that researchers and practitioners may address them in future research. The technical programme has been carefully designed to offer a fresh and balanced selection of advances and results in blockchain and AI, encouraging focus on novel and interdisciplinary topics.

The technical programme has been diverse and of high quality, and it focused on contributions to both well-established and evolving areas of research. More than 40 papers have been submitted to 20 from over 20 different countries (Canada, France, Germany, India, Ireland, Italy, Jordan, Luxembourg, Malaysia, Malta, Morocco, Netherlands, Oman, Portugal, Slovenia, Spain, Sweden, UAE and USA).

We would like to thank all the contributing authors, the members of the Programme Committee, the sponsors (IBM, Indra, EurAI, AEPIA, AFIA, APPIA and AIR Institute) and the Organizing Committee for their hard and highly valuable work. We thank the funding supporting with the project "Intelligent and sustainable

mobility supported by multi-agent systems and edge computing" (Id. RTI2018-095390-B-C32); their work contributed to the success of the BLOCKCHAIN'20 event, and finally, we thank the Local Organization members and the Programme Committee members for their hard work, which was essential for the success of BLOCKCHAIN'20.

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BLOCKCHAIN-MainTrack

Sandboxes and Testnets as "Trading Zones" for Blockchain Governance

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Abstract. FinTech regulatory sandboxes and testnets use cases offer a hybrid model for integrating blockchain technologies with governance, connecting code with regulations, on-chain infrastructure with off-chain institutions. The hybrid models are an alternative to the reduction of governance to consensus mechanisms in the present libertarian but also anarcho-capitalist and communitarian blockchain projects. Inspired by the concepts of "innovation through dissonance" in the so-called "trading zones," we claim that the regulatory sandboxes can integrate all four regulatory forces (law, social norms, market, and technical infrastructure) rather than only two (FinTech insistence on markets and technology). This evaluation criterium for sandboxes was defined and tested with a simulated ledger (testnet) for exploring near-future scenarios of blockchain governance. In 2019, we conducted five workshops with 35 participants using templates of smart contracts to decide upon regulations of novel services that use satellite data to trigger automatic transactions (change of ownership). In the workshop and following questionnaire, the participants expressed need for a better integration of their natural language, regulations, and code without prioritizing any regulatory force or domain (market, culture, technology, or law), but supporting what we describe as a playful "regulation through dissonance."

Keywords: Blockchain · Governance · Regulatory sandbox

1 Introduction

Blockchain applications are often embraced, but also rejected for their ability to disrupt existing institutions and regulations in the financial services, land registries, and various industries. Bitcoin cryptocurrency, self-regulating and anonymous DAOs (Decentralized Autonomous Organizations), and smart contracts promise a more efficient, transparent, and decentralized governance reduced to algorithms. They claim to embody various libertarian [4], but also communitarian values and aspirations [1], such as "credible neutrality" [3] or "Ostrom's eight principles for commons stewardship" [11], but it remains unclear who decides on the values and how exact should be their mapping to the algorithms and code which are prone to changes.

Like any software, blockchain technologies suffer from security flaws and they need occasional maintenance. Any change in the code makes essential the coordination between the stakeholders, such as developers, miners, and users. Paradoxically, the

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technology that is supposed to disrupt all governance has severe governance deficit when it comes to responding to the everyday challenges (common in every infrastructure) of maintenance, scaling or security flaws.

This lack of management of the actual software by its stakeholders leads to crises, and different fractions split to make their own version of the ledger and this weakens the original network. These so called "forks" of the mainnet (the main network of nodes that form the distributed ledger and the core functionality), but also testnets (simulated ledgers for testing of new applications) further erode the trust in the blockchain platforms.

There are many critiques of the governance by blockchain idea that expects algorithms or consensus mechanisms to mature and replace all existing institutions [6, 13]. What is often neglected in these discussions is the emergence of an alternative to these purist and reductionist views of governance by algorithms and code. It introduces a more hybrid model for convergence of blockchain technology with governance institutions, markets etc. via the regulatory sandboxes. Sandboxes defy the reductionist view of "governance-by-design" and introduce a more pragmatic model for adoption of blockchain technologies that can extended to other than FinTech domains.

2 Regulatory Sandboxes, Testnets, and Other Simulators

Regulatory sandboxes, but also testnets use cases, and simulators offer an alternative to the exaggerated social and political promises and threats of the blockchain technologies. They replace the discourse on disruption with actual experiments in contained and supervised environments that support stakeholder negotiations. Their goal is to integrate technology with governance that avoids the pitfalls of technocratic determinism and reductionism or equally restrictive dream of ex-ante regulations preventing any innovation in the name of "slow" governance.

The hybrid and alternative model of blockchain sandboxes was pioneered in the FinTech domain in 2015 by the UK Financial Conduct Authority as part of their innovation program (Innovate).[1] FCA's goal was to create a FinTech "ecosystem" that can negotiate and supervise the interactions between stakeholders and their interests. In the "sandbox," the innovators, existing financial institutions, but also government regulators negotiate and experiment with new services and combine various agendas: regulatory compliance, innovation, but also inclusivity and diversity.

The regulatory sandboxes simply extended the concept of a testing environment commonly used in software development and computer security to explore the interaction between emerging technology and society, regulations and code. In software development and security, a sandbox usually means a virtual server or other isolated and controlled environment, in which we can test how a piece of code interacts with a given operating system or various programs. In the case of a regulatory sandbox,

[1] FCA 'Regulatory Sandbox' https://www.fca.org.uk/firms/regulatory-sandbox.

multiple regulators set up an environment by "relaxing" the rules to "live-test" the emerging technologies on a limited sample of users.

The sandbox is usually set up by the provider of the platform (or regulations) to support better integration and symbiosis with something developed by "third parties" or private companies. The purpose is to mitigate the risks on all sides and anticipate the changes that will support the adoption without disruption and instability. The hybrid model of connecting regulations and code then offers some unique possibilities how to avoid the paradoxes of blockchain governance, but also the extremes of the "governance by design" [10] or regulatory moratoria.

3 CC License as the Origin of the "Regulatory Sandbox"

The search for pragmatic rather than reductionist solutions to the dilemmas of code and regulations started in the late 1990s with discussions on the "invisible regulation" by code (emerging technology platform or "architecture") in Lawrence Lessig's writing popularized as a "pathetic dot theory" [8].

According to Lessig, the individuals ("pathetic dots") are subjected to four regulatory forces (law, social norms, market, and architecture or technical infrastructure) that are not equally visible and negotiable. Lessig provides many examples of such regulatory (in)visibility to find a way to bridge the divide between code and law. Instead of making "better" code or more strict regulations, he proposed a hybrid initiative that connects these four forces by making them not only visible, but also negotiable to the stakeholders.

The 2001 CC license suite[2] is a simple tool and platform backed by an independent non-profit organization, Creative Commons (CC). It started as a proposal for regulation of digital content, but also a piece of reusable "code" included on various websites that offers a model (and license) for sharing and managing intellectual property. The CC license offered an alternative to the strict copyright model that was not working for digital content. It defined not only a new decentralized market for digital content without a "middleman" (copyright owners organizations), but also created new social norms around sharing online content by artists and creators.

In this sense, it impacted all four regulatory domains with a simple, but hybrid structure of regulation, code, and transformed social customs. The license empowered the citizens and stakeholders to engage with regulation, market, culture, and technology over simple icons and code that define what is a fair use for particular item, such an image, text or data. In this sense, it is a model for successful engagement with technological governance that is neither only about governance of technology nor only about reduction of governance to technology.

The regulatory sandboxes and examples of use cases based on the testnets extend these hybrid efforts for technological governance. They make the interaction between the four regulatory forces visible and negotiable to the stakeholders involved in the issue of blockchain adoption. The value of a sandbox for a blockchain governance

[2] *Creative Commons website* http://creativecommons.org/licenses/.

depends directly on how visible and negotiable it makes the four forces (regulation, market, technology, or culture) to the various stakeholders. Rather than reducing the impact to only one domain (better technology or market), sandboxes make use of the full spectrum of possibilities and connect them in novel ways.

4 Evaluation Criteria for Sandboxes and Hybrid Governance

Currently, the main criterium of regulatory sandbox success seems to be their ability to translate innovation to markets. This raises criticism and suspicion about their independence on the market and technology forces. To avoid this issue, we decided to define sandboxes more broadly as any institution, space, framework, method, or even a tool that makes the interaction between the four regulatory forces visible and open to experiments, discussion, and negotiation between different stakeholders.

Instead of insisting that code is an absolute law or that sacred laws should manage innovation by blocking certain code and making it compliant "by design," the purpose of a sandbox for blockchain governance is to support participatory experiments leading to integration and transformation of all four domains and forces of change.

Regulatory sandboxes, hybrid simulators, or certain uses of testnets have the potential to foster a symbiotic rather than antagonistic relation between code and regulations, platforms and institutions. They offer a practical alternative to the ex ante or ex post regulations coming too late to catch up with scandals and misuses of technology (Facebook, Cambridge Analytica, various Google services).

The few existing examples of regulatory sandboxes in the UK, but also Singapore and Australia, work mainly with FinTech projects. There are also many emerging sandboxes, such as the US-based sandbox set up by the Consumer Financial Protection Bureau (CFPB) for cryptocurrencies and blockchain technology in 2018 or 2019 Reserve Bank of South Africa sandbox. This makes it difficult to assess their value by independent sources, but according to the white papers and reports published about the first regulatory sandbox in UK, Financial Conduct Authority's (FCA) "Innovation" program enabled 11 blockchain and distributed ledger technology-related companies between 2015 and 2018.

Their narrow definition of success (market) raises doubts whether the purpose of sandboxes is actually to protect and improve the regulations. The emphasis on market can easily destabilize the existing public institutions in favor of the new businesses. To respond to these doubts, we are proposing a more inclusive criteria of success that relate to all four regulatory forces rather than two (technology and markets). The criteria include values such as visibility of the four forces shaping the future services, but also visibility and empowerment of the stakeholders by giving them a voice in the future development of the service. Regulatory sandbox success depends on how participatory and transparent the decision making, but also prototyping processes and how they can open they are to forces beyond the market.

Sandboxes should offer rich feedback on the type of issues, hopes, and fears the various stakeholders experience while engaging with the new service rather than only a