

Governance by blockchain: resource
management and economic sustainability in
community networks

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January 2019

This report is submitted as
the second year's report for PhD

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Chapter 1

Outline of the dissertation

Thesis statement: *Blockchain promises the lucrative feature of trusted peer-to-peer value transfer interactions. It has the potential to go beyond its first manifestation namely Bitcoin which is the digital value transfer system. However, issues such as lack of governance, scalability, and adaptability of blockchain-based solutions remain in the way of it becoming a mainstream technology. So far a series of hack incidents and the technology being used by malicious entities targeting such blockchain-based solutions put this technology largely under shade and thwarts it going mainstream. **Therefore my thesis is that an effective and trusted governance framework for blockchain-based solutions is imperative.** Such a framework should allow things to go wrong and should have a mechanism in place through which the system can heal, in large part, on its own. This requires a trusted intervention mechanism for the, mostly, close-walled nature of a blockchain system so that its decentralised nature can be preserved. I present in this thesis such an intervention mechanism which allows the system either to be patched or updated with new policy logic if needed be. I consider the use case of resource management in community networks. This use case provides a good substrate to test my hypothesis and can be considered as a miniature form of the Internet itself. The insights and experimental results of my thesis would pave the path for the standardisation of blockchain-based solutions and if the whole of the Internet is to be made decentralised with more control pushed towards the edges.*

1.1 (Chapter I) Introduction and Motivation

1.1.1 Decentralization, trust, and peer-to-peer value transfer

1.1.2 Evolution of blockchains

1.1.3 Smart contract-based automation

1.1.4 Decentralized autonomous organizations (DAOs)

1.1.5 Hack incidents

1.1.6 Lack of governance in the current state-of-the art

1.1.7 Contribution: Self-contained governance framework for community networks

1.2 (Chapter II) Background

Takeaway: The status quo of resource management and settlement of financial claims in community networks. How blockchain can make this process more streamlined, trusted, accountable, and fast.

1.2.1 Community networks

1.2.2 Resource consumption and pricing in community networks

1.2.3 Blockchain feasibility

1.2.4 Blockchain automation

1.2.5 Economic sustainability

1.3 (Chapter III) System architecture

Takeaway: Description of my proposed architecture. How it fits well to solve the problem of efficiently making a community network economically sustainable and self governing. The important contribution is a mechanism to update the logic of a set of smart contracts automating this usecase on the go and in an informed manner by including a feedbackloop

which will analyse the stored data on blockchain in real-time. It will also describe a mechanism to measure the extent of compliance given a policy set for the use case, which in my case is sustainability of community networks.

1.3.1 Choice of platform

1.3.2 Choice of consensus

1.3.3 Device registration

1.3.4 Expenditure claims and automatic pricing mechanism

1.3.5 Fetching outside data: Oracle

1.3.6 Specifying a policy set

1.3.7 Measureing compliance

1.3.8 Logic update: feedback loop and Call delegation

1.3.9 Implementing community voting

1.4 (Chapter IV) System evaluation

***Takeaway:** How my proposed architecture makes status quo in community networks better. How does my solution looks like in comparison to similar other approaches in terms of adaptability, speed, and scalability.*

1.4.1 Scalability

1.4.2 Sustainability

1.4.3 Adaptability

1.5 (Chapter V) Compliance

***Takeaway:** It will analyse my solution in light of legal ramifications and how different concepts translate to different legal terms. This chapter will not be very technical in its nature rather a critique of my solution in the light of the existing legal framework.*

- 1.5.1 **Controllers and processors in blockchain-powered community networks**
- 1.5.2 **Integrity vs deletion: on right to be forgotten**
- 1.6 **(Chapter VI) Review, discussion, and the road ahead**
- 1.6.1 **Lessons learned and smart contract best practices**
- 1.6.2 **A step towards self-contained, self-governing, and trusted system**
- 1.7 **(Chapter VII) System verification (tentative)**

Bibliography