Towards inter-organizational business process governance through blockchain

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Abstract. Blockchain may be the catalyst needed to truly realize inter-organizational business processes. A blockchain makes use of a distributed ledger on which data is canonically grouped into blocks, of which the integrity and validity is agreed upon by a decentralized consensus mechanism. Through smart contracts – persistent scripts which are executed on a distributed virtual machine – inter-organizational business processes can be executed and monitored without the need to trust a third party. This new paradigm introduces a wide array of governance challenges, both for internal and external stakeholders of a blockchain platform. If blockchain technology is ever to be widely introduced into the daily lives of people and businesses, it is crucial for it to be adopted by our existing institutions or spark the creation of entirely new institutions [1], and robust governance of its usage is of paramount importance. Anecdotal evidence suggests that organizational networks face difficulties in implementing blockchain applications due to a lack of governance structure. Moreover, the current literature does not provide guidelines for the management or governance of inter-organizational business processes, let alone if they are based on blockchain. The researcher has identified this as a research gap, therefore conducting this study to formalize and advance the concept of inter-organizational governance in business networks based on blockchain technology.

Keywords: *blockchain, business process governance, smart contracts, inter-organizational processes.*

1 Introduction

The technological phenomenon called ‘blockchain’ is now a decade old. Put into practice by Bitcoin [2], the well-known cryptocurrency, the first peer to peer transaction on this distributed ledger was made by Nakamoto on the third of January 2009. The idea of transacting digital assets on a peer to peer basis, without the need of a trusted third party, appeared to have significant business potential. While mostly used and researched by libertarians up until 2015, it arguably was the inception of the Ethereum [3] network which sparked widespread interest from both the public and private domain. Since that moment, the space has received an enormous amount of attention, particularly based on the promise of *smart contracts*.

The impact of blockchain – and smart contracts in particular – on the field of business process management appears significant. As trade became more globally oriented during the emergence of the Web in the 90's and 00's, a push for inter-organizational optimization of business processes initiated. However, the governance of these cross-organizational business processes had to be centralized through a trusted third party. Organizations were, and still are, reluctant to give away control to a single party, obstructing the advancement of promising research directions such as choreographies, collaborative business processes, and workflow management systems. Blockchain technology has the potential to revitalize [4] the idea of managing inter-organizational business processes by decentralizing the execution and storage of business processes.

2 Problem statement

The literature often states that rigid governance structures are needed for blockchain to be adopted by enterprises [4–9]. However, little research has been conducted into what governance in the context of blockchain means and what is needed for enterprises to effectively govern their usage of blockchain. The field of business process management distinguishes between the governance of business processes and business process management and various governance mechanisms are identified and evaluated [10]. However, the BPM literature does not contain extensive frameworks, models or guidelines for governance, contrary to related fields such as IT governance [11] or economic governance [12–14].

The uncertainty towards "blockchain governance" is clearly seen in real-world business networks trying to implement the technology. Organizations generally first design a technical solution – such as modeling their business processes in smart contracts – and later consider how they should collectively govern this solution. An example is the case of IBM and Maersk's TradeLens [15], which on-boarded one other carrier onto their platform over a ten month period. The main cause reported for this is that the governance structure posited IBM and Maersk as owners of the platform, allocating all IP to them. As of writing this proposal, no clear framework or guidelines exist for business networks to design an effective governance structure for their blockchain-based business processes. Hence, this is identified as a research gap. The main research question this study aims to answer is the following: **"how can the management and operation of blockchain-based inter-organizational business processes be effectively governed?"**

3 Methodology

The research makes use of design science research to expand the knowledge base and improve the environment [16]. Situational design knowledge will be used to justify abstract design knowledge, following the approach of Goldkuhl and Lind [17]. We start with designing a blockchain-based IOBP governance framework, which is an abstract artefact producing scientific knowledge. Hereafter, two situational artefacts will be de-

signed, which produce situational design knowledge and ground the validity of the abstract design knowledge. Table 1 below presents an overview of the artefacts, their types, and methods used to design them:

Table 1. Artefacts, their types and to be used methods

Artefact	Type	Methods
IOBP Governance Framework	Abstract Construct	Literature Review Semi-structured Interview Formal Ontology
IOBP Governance Implementation Guidelines	Situational Method	Delphi Interview Case Study
Blockchain-based IOBP Prototype	Situational Instantiation	Technical Action Research Case Study

4 Intended solution

The purpose of this study is to create a foundation for inter-organizational business process governance in blockchain-based networks. The study will predict which economic activities are likely to shift to a blockchain [18] and which decisions are to be taken to govern these activities. The study will prescribe how organizations are to share decision proposals, come to a decision, and hold each other accountable [6]. Lastly, the study will produce a technical prototype. Blockchain is still a nascent field in the literature and significant hurdles to adoption exist in practice [5]. The output of this research intends to provide a solution to a subset of these hurdles in the governance domain, by providing the business community with artefacts that are applicable across industries. A preliminary business process governance design framework – adapted from the MIT-CISR governance framework [11] – is depicted in figure 1 below. This model, its elements and the relationships between them will be improved by conducting a domain and task-level ontological analysis of the concept Business Process Governance.

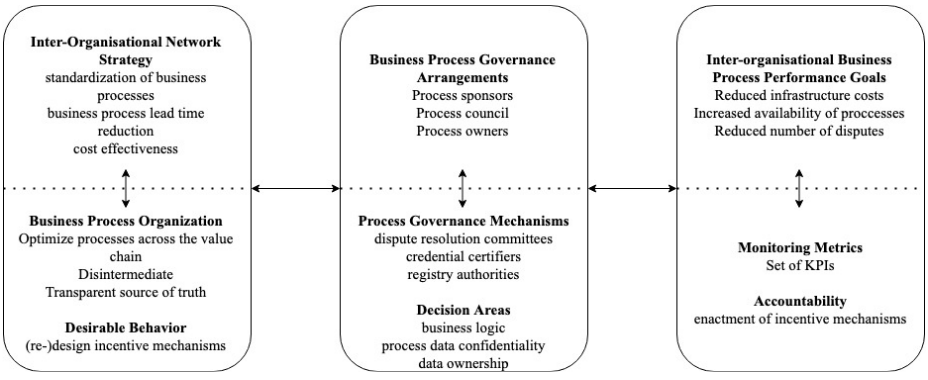

Fig. 1. Preliminary blockchain-based IOBP governance framework

The validity of the solution must be safeguarded through rigorous justification and evaluation of the artefacts. By using the abstract design knowledge as input for the design of situational artefacts, and in turn using the situational knowledge to ground the scientific knowledge, the validity of the solution is ensured.

5 Relevance

Blockchain research in the field of BPM has been mostly concerned with the challenge of merging process models into smart contracts [19–22]. Other works, such as [23–25], investigate the execution and monitoring of business processes based on blockchain. These works are often use case driven, emphasizing the redesign and execution phases of the BPM lifecycle [26]. This observation is confirmed by established business process management literature, which claims there is a lack of models for governance and management of inter-organizational processes [27]. This issue has not been solved yet, which confirms our identified research gap. Although this research proposes to specifically investigate blockchain-based inter-organizational business process governance, it is likely to be – to a certain extent – generalizable to inter-organizational business processes making use of other infrastructure. Hence, the theoretical relevance of this study is significant as it will lay the foundation of inter-organizational business process governance. If blockchain is to deliver on its potential, it will likely impact BPM across all six capability factors [4, 28]; strategic alignment, governance, methods, IT, people and culture. Looking specifically at the governance success factor, we can see that – among other matters – blockchain decentralizes the decision-making process, changes the tasks and responsibilities of actors involved in business processes, creates transparency for process-related metrics such as accountability and requires new standards for communication between organizations.

6 State of the project

The project is currently in its initial phase. It is sponsored by an e-commerce software company called Deity, which develops software to create progressive web apps using service-oriented architecture principles. The company envisions blockchain as a possible solution to integrate loosely coupled services across various organizations, ensuring maximum interoperability with legacy systems. Through this research, the company aims to validate to what extent blockchain is a relevant technology for their industry and how they should employ it in their products.

An offer has been received to partake in a consortium of Dutch pension funds working together in the Dutch Blockchain Coalition [29]. A multi-year project has been started to transform Dutch pensions, research is needed to construct sound governance.

A possible threat for the project is that inter-organizational networks will ‘merely’ make use of permissioned blockchains, administered by a central entity. The blockchain will function like an advanced database and likely not open up radical possibilities for innovative BPM, since the same hurdles to adoption will surface as before the introduction of blockchain.

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