Please quote as: Billert, M. (2019): Yes, We Can! Blockchain Based Crowdfunding and Crowdworking. In: Pre-ICIS SIGBPS 2019 Workshop on Blockchain and Smart Contract.

Yes, We Can! – Blockchain-Based Crowdfunding and Crowdworking

Matthias Simon Billert
University of Kassel
Pfannkuchstraße 1, 34121 Kassel, Germany
billert@uni-kassel.de

Abstract

In the current process of crowdfunding and crowdworking, many criteria-based conditions must be considered on different platforms. Assignments must be initiated for each platform, which costs time, money and resources. In order to counteract these challenges and reduce transactions, we developed a blockchain-based platform using a design-oriented approach. This platform accompanies the process from requirements to self-executing, event- and condition-controlled contracts in a partially automated manner. Based on the literature of crowdfunding, crowdworking and blockchain-based smart contracts, we derived requirements for a platform creation. While we contribute to the literature by eliciting design-oriented requirements, we show practical implications by building a blockchain-based platform concept for facilitating a more efficient combined crowdfunding and crowdworking process by reducing transactions.

Keywords: blockchain-based smart contracts, crowdfunding, crowdworking, design science

Introduction

If an anonymous, indefinite number of people process a task via an open call initiated by a person or a group, then it is called crowdsourcing (Durward et al. 2016). In recent years, the number and the extent of digital crowdsourcing platforms increased worldwide. A special kind of crowdsourcing is crowdfunding, where crowdsourcers use the crowd for obtaining money (Hemer 2011) and crowdworking, where a crowd get paid for processing a defined task (Durward et al. 2016). Although the process of crowdfunding and crowdworking is established, it still contains many interactions between the individual actors, high transaction costs, insufficient status reports and proof of qualification as well as manual splitting and execution of activities and tasks. In addition, the platforms are each controlled by third parties, who could exploit the users' trust. However, new ICT technologies such as blockchain-based smart contracts offer opportunities to meet the challenges and to ensure both the decentralized execution of "contracts" and system consistency (Luu et al. 2016), which means that activities and processes can be executed automatically. This leads to the following research question: *How can blockchain-based smart contracts support the combined crowdfunding and crowdworking process?* In order to answer this research question, we have developed a platform concept that shows the prerequisites, implementations and added value of blockchain-based smart contracts in the combined crowdfunding and crowdworking process.

Theoretical Background

Crowdsourcing

Crowdsourcing is an open call of a task by an individual, group, institution or company (crowdsourcer) to an unspecified, anonymous number of potential contributors (crowdsourcees). Thereby, crowdsourcing represents a kind of service provision in which the crowd is integrated into existing processes using new technological possibilities in the course of the advancing digitalization (Durward et al. 2016). Special forms are crowdfunding, where a project or parts of a project are financed by the crowd in exchange for material or nonmaterial remunerations and crowdworking, where tasks are completely outsourced to crowdworkers, who get paid in the course of a digital gainful employment, which is based on crowdsourcing (Durward et al. 2016).

Blockchain-Based Smart Contracts

A contract formalizes a relationship between two or more persons who have agreed on a series of promises (Szabo 1996). Contracts in business relationships primarily serve as legal proof of predetermined claims. With digitalization, new possibilities have arisen to formalize relationships with the help of digital technologies. The series of commitments between the parties is recorded digitally and supplemented with protocols on compliance with the commitments (Szabo 1996). Furthermore, various types of contractual clauses are to be combined with the hardware and software used, so called smart contracts. Nakamoto's (2008) white paper for an electronic peer-to-peer payment system introduced a digital payment system based on a cryptographic process that can execute a transaction between any two parties without a trusted third party using a chain of digital signatures. The transactions are put into blocks and provided with a digitally signed hash of the previous transaction (Nakamoto 2008). This creates a chain of blocks that is managed decentralized over several nodes. Blockchain can also be used in conjunction with smart contracts. In this context, smart contracts are self-executing, event- and state-controlled program codes (Hans et al. 2017; Hardwick et al. 2018), which are stored on the blockchain and are forced to execute correctly by the consensus protocols (Luu et al. 2016). Any set of rules in the corresponding programming language can be coded into the contract according to business logic, which means that a large number of applications can be implemented.

Research Approach

For the development of our platform concept, we use the three cycles of design science research according to Hevner (2007). Therefore, we carried out a first iteration combining the most important components of the crowdfunding and crowdworking system with the use of blockchain-based smart contracts. First, the necessary information about the rigor cycle for the development of the concept through the design cycle was transferred from the knowledge base. The knowledge base contains knowledge about the crowdfunding and crowdsourcing as well as information about the blockchain-based smart contracts. After the first iteration, the knowledge base was extended by the adaption of the combined crowdfunding and crowdworking process. Expert knowledge of the crowdsourcing ecosystem and blockchain-based smart contract application examples were taken from the environment and passed on via the relevance cycle for the collection of the requirements. The creation of the platform concept via the design cycle will be discussed in the next chapter. The Framework for Evaluation in Design Science Research (FEDS) by Venable et al. (2016) for the evaluation of the artifact is part of future research. In the next iterations, expert interviews will be conducted in the area of blockchain-based smart contract platforms for the evaluation of the previous artifacts from the current concept to the future applicable prototype. The preliminary evaluation criteria, which can change in the course of the iterations, are the reduction of transactions, constant status messages as well as a partial automation in the division and execution of activities and processes.

Design and Development of the Blockchain-Based Platform Concept

Problem Identification & Motivation

Crowdsourcers must be able to convince the investors of their project and ensure that they fulfill all prerequisites and obtaining the necessary financing. For this purpose, venture capital donors and business angels use a complex validation procedure (due diligence), which examines the opportunities and activities of the crowdsourcers in detail. Therefore, the costs should be in proportion to the invested capital so that the transaction costs are not even higher. The strong control by the system and the transfer to the associated crowdworking platforms is considered to be particularly negative (Mrass et al. 2018). In addition, there is uncertainty about the source of income, a lack of co-determination and compliance with minimum wages. Another problem is that some crowdsourcers and crowdworkers circumvented the platform after the initial contract and reached an extraordinary agreement. On the crowdworking platforms, there were also some trust conflicts between the platform operators and crowdworkers, who tried to trick the system with automated work. For both crowdfunding and crowdworking, it is important to check whether blockchain technology can be used. A possibility to prove the usage of the blockchain technology is the Ten-Step Decision Path of Pedersen et al. (2019), which checks, if the application of the

blockchain is feasible and justified. It is composed as follows: 1) Need for a shared common database, 2) Involvement of multiple parties in the creation and updating process of data, 3) Conflict of interest and/or trust issues between the individual parties, 4) Avoidance of a trusted third party, 5) Check for different system access rules between the parties, 6) Unchanged rules for the transaction process, 7) Need for an objective, unchangeable protocol, 8) Need for public access, 9) Public transactions → permissionless public blockchain, 10) Inter-organizational (→ permissioned public blockchain) or intra-organizational (→ permissioned private blockchain).

Objectives of the Solution

Depending on which type of blockchain is needed, the objectives of the solution are composed. Therefore, the crowdfunding as well as the crowdworking process will be considered separately: *Crowdfunding on the blockchain decision path*: 1) Yes, shared common database, 2) Yes, crowdsourcer and investors, 3) Yes, trust issue between all parties, 4) Yes, current platform operator, 5) Yes, sourcer and investor, 6) Yes, stable transactions, 7) Yes, proof of payment and work, 8) Yes, free access, 9) No, personal information, 10) Inter → Permissioned public blockchain. *Crowdworking on the blockchain decision path*: 1) Yes, shared common database, 2) Yes, crowdsourcer and crowdworker, 3) Yes, trust issue between all parties, 4) Yes, current platform operator, 5) Yes, sourcer and worker, 6) Yes, stable transactions, 7) Yes, proof of payment and work, 8) Yes, free access, 9) No, personal information, 10) Inter → Permissioned public blockchain. The results demonstrate that a permissioned public blockchain is needed for the crowdfunding and crowdworking process, with which the prerequisites are equal. Based on the previous problem identification and the literature of crowdfunding, crowdworking and blockchain-based smart contracts, the following four main objectives for (partial) automation can be derived for implementing a blockchain-based platform: 1) Clear formulation of requirements for services 2) Objective breakdown of services into partial services 3) Formalization of the individual components of a partial performance with indication of condition 4) Conversion of the formalized components into contract-language constructs for the creation of self-executing, event- and condition-controlled codes. During the entire process, a reduction of interactions and transactions between individual contracting authorities is also to be achieved in order to reduce administrative and transaction. In addition, there is constant information transmission on status changes to the crowdsourcer and crowdworker in order to maintain competition during the process in a transparent, non-discriminatory and objective manner.

Design and Development: Preliminary Artifact

In the current process, a crowdsourcer uses a crowdfunding platform to search for potential investors to support the initiated project. Next, the crowdsourcer submit the task to a crowdworking platform with or without the influence of the investors. In the new, future process, the search for investors and crowdworkers is combined and the respective conditions are defined in a smart contract. This minimizes the number of interactions between the individual stakeholders and at the same time it reduces the costs of the transactions. Furthermore, third parties are no longer involved and required.

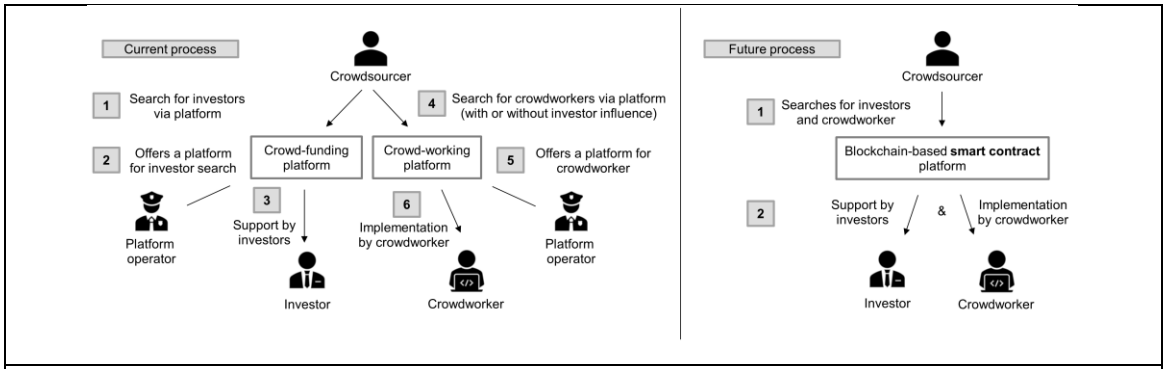

Figure 1. Current (left) and future (right) combined crowdfunding and crowdworking process

The platform concept provides the formulation of the service requirements, which are determined at the beginning of the crowdfunding and crowdworking process. The services are then broken down into

subservices and formalized into individual components. This allows contract-language constructs to be implemented from which self-executing, event- and status-controlled codes can be created. The platform will be developed step by step according to an inside-out approach. The implementation will take place backwards to the actual user-centered process (outside-in). In the middle, the programming language solidity is used for implementing smart contracts. Based on this, e³value (Akkermans and Gordijn 2003) is used, which can formally decompose and map individual components of a subservice with status information. Finally, the principle of ifttt (Mi et al. 2017) is used to establish the semi-automated crowdfunding and crowdworking process (task decomposition) for the implementation of services from the requirements. When an occurring condition is triggered (if this), a defined action is automatically executed (then that). Ifttt also serves to formulate the demand in services at the same time.

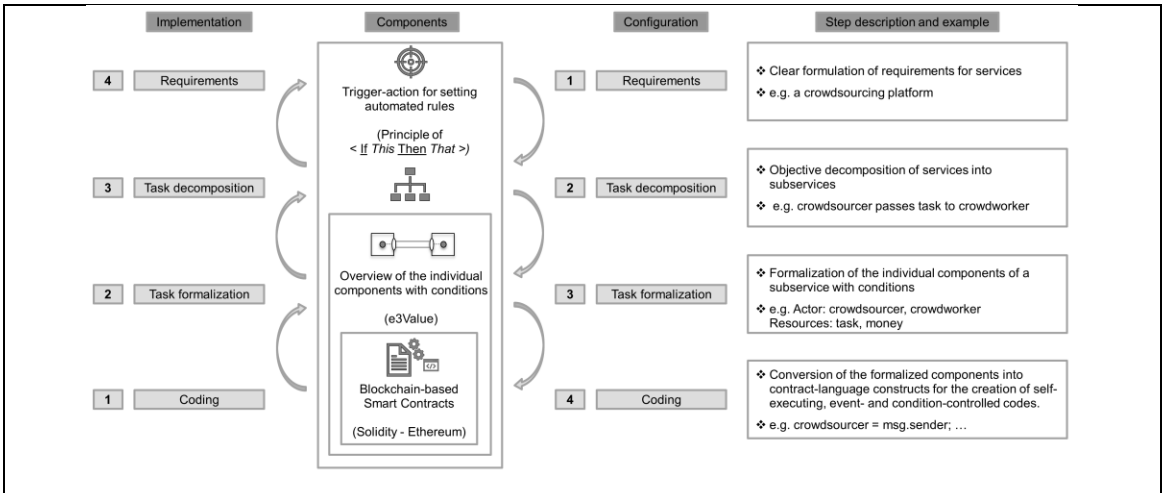

Figure 2. The individual steps of the blockchain-based smart contract platform

Further Work and Limitation

After further iterations, the concept will be transformed into a digital prototype in future work in order to be able to link it to existing processes. The prototype will be tested in detail by experiments and laboratory tests with potential users. Interviews will also be conducted with experts from both crowdsourcing platforms and blockchain-based smart contract platforms. Further research will also include the definition of specific and individual evaluation episodes. The last research mile of Nunamaker et al. (2015) will be used for this purpose. This paper shows that the platform is functionally feasible (proof-of-concept). Whether the platform will generate value (proof-of-value) and whether it can reflect complex facts will be part of future research. In this context, the FEDS by Venable et al. (2016) will also be used in all further iterations with a combined human risk & effectiveness and technical risk & efficacy strategy in order to guarantee the correctness and accuracy. For developing the platform user-, use- and utility-oriented, a formal evaluation with experts is carried out at an early stage to review the procedure. Subsequently, a formative and naturalistic evaluation is carried out to check acceptance based on domain-specific interviews. Finally, field trials will be conducted with potential users of the platform. Regarding the limitations of the paper, it should be noted that stakeholders of established systems are skeptical about innovative concepts such as the use of new technologies due to innovation-unfriendly conditions.

Conclusion and Contribution

This paper aims to reduce transaction in a combined crowdfunding and crowdworking process using the new blockchain-based smart contracts by building and evaluating a future platform in several cycles. Based on the research approach of the three cycles of design science research according to Hevner (2007), the significance of the problems and opportunities of blockchain-based smart contract application examples was strengthened. After the completion of the first digital prototype, we expect further relevant contributions on the current topic. With this paper, we contribute to the current state of the literature

with several theoretical contributions to the areas of crowdfunding and crowdworking as well as to the use of blockchain-based smart contracts by showing the different design requirements of the platform on the one hand and presenting a framework for the creation of crowdfunding and crowdworking projects on the other hand. In addition, we give several practical implications for the creation of a blockchain-based smart contracts platform through targeted instructions. The platform concept itself represents a creative theoretical contribution that extends the existing knowledge base by improving the crowdfunding and crowdworking process for an existing problem with a new solution approach (Gregor and Hevner 2013).

References

Akkermans, J. M.; Gordijn, Jaap (2003): Value-based requirements engineering: exploring innovative e-commerce ideas. In *Requirements Engineering* 8 (2), pp. 114–134. DOI: 10.1007/s00766-003-0169-x.

Durward, David; Blohm, Ivo; Leimeister, Jan Marco (2016): Crowd Work. In *Bus Inf Syst Eng* 58 (4), pp. 281–286. DOI: 10.1007/s12599-016-0438-0.

Gregor, Shirley; Hevner, Alan R. (2013): Positioning and presenting design science research for maximum impact. In *MIS Quarterly* 37 (2), pp. 337–355.

Hans, R.; Zuber, H.; Rizk, A.; Steinmetz, R. (2017): Blockchain and Smart Contracts: Disruptive Technologies for the Insurance Market. In *Twenty-third Americas Conference on Information Systems, Boston, 2017*.

Hardwick, Freya Sheer; Akram, Raja Naeem; Markantonakis, Konstantinos (2018): Fair and Transparent Blockchain Based Tendering Framework - A Step Towards Open Governance, pp. 1342–1347. DOI: 10.1109/TrustCom/BigDataSE.2018.00185.

Hemer, Joachim (2011): A snapshot on crowdfunding. Fraunhofer ISI - Working papers firms and region.

Hevner, Alan R. (2007): A three cycle view of design science research. In *Scandinavian Journal of Information Systems* 19 (2), p. 4.

Luu, Loi; Chu, Duc-Hiep; Olickel, Hrishi; Saxena, Prateek; Hobor, Aquinas (2016): Making Smart Contracts Smarter. In Edgar Weippl, Stefan Katzenbeisser, Christopher Kruegel, Andrew Myers, Shai Halevi (Eds.): Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security - CCS'16. the 2016 ACM SIGSAC Conference. Vienna, Austria, 24.10.2016 - 28.10.2016. New York, New York, USA: ACM Press, pp. 254–269.

Mi, Xianghang; Qian, Feng; Zhang, Ying; Wang, XiaoFeng (2017): An empirical characterization of IFTTT. In Steve Uhlig, Olaf Maennel (Eds.): Proceedings of the 2017 Internet Measurement Conference on - IMC '17. the 2017 Internet Measurement Conference. London, United Kingdom, 01.11.2017 - 03.11.2017. New York, New York, USA: ACM Press, pp. 398–404.

Mrass, Volkmar; Peters, Christoph; Leimeister, Jan Marco (2018): Handlungsbroschüre Crowdworking-Plattformen: Neue Organisationskonzepte für Dienstleistungen nachhaltig gestalten: kassel university press GmbH (7).

Nakamoto, S. (2008): Bitcoin: A Peer-to-Peer Electronic Cash System. Available online at https://bitcoin.org/bitcoin.pdf.

Nunamaker, Jay F.; Briggs, Robert O.; Derrick, Douglas C.; Schwabe, Gerhard (2015): The Last Research Mile: Achieving Both Rigor and Relevance in Information Systems Research. In *Journal of Management Information Systems* 32 (3), pp. 10–47. DOI: 10.1080/07421222.2015.1094961.

Pedersen, Asger B.; Risius, Marten; Beck, Roman (2019): A Ten-Step Decision Path to Determine When to Use Blockchain Technologies. In *MISQE (MIS Quarterly Executive)*, pp. 99–115. DOI: 10.17705/2msqe.00010.

Szabo, Nick (1996): Smart contracts: building blocks for digital markets. In *EXTROPY: The Journal of Transhumanist Thought,(16)* 18.

Venable, John; Pries-Heje, Jan; Baskerville, Richard (2016): FEDS. A Framework for Evaluation in Design Science Research. In *European Journal of Information Systems* 25 (1), pp. 77–89.