# ORGANIZATIONAL ADOPTION OF DIGITAL INNOVATION: THE CASE OF BLOCKCHAIN TECHNOLOGY

*Research paper*

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## Abstract

*With the increasing digitalization of the economy, it is becoming increasingly important for organizations to embrace digital innovation. The emergence of blockchain technology exemplifies the disruptive impact of digital innovation and, simultaneously, poses challenges for organizations. Hence, organizations are in transition with regard to fostering its organizational adoption. This kind of adoption is reflected in far-reaching measures in terms of technology, organization, and people. The measures are governed by project management that aligns internal measures with the outside environment. Based on this framework, our research builds on an empirical study to explore the organizational adoption of blockchain technology. We conducted in-depth interviews in 11 cases with experts leading the adoption of blockchain. The objective of our study is to better understand organizational adoption and to explore the factors influencing adoption. Our results uncover a multitude of factors and inherent tensions. The paper's contributions are twofold. First, our findings can be used as guidelines for organizations planning to adopt digital innovations such as blockchain and to effectively cope with the related phenomena. Second, the factors advance the literature on blockchain by conceptualizing its organizational adoption and aligning the factors to the organizational adoption framework.*

*Keywords: Blockchain Technology, Organizational Adoption, Digital Innovation, Influencing Factors*

# 1 Introduction

Analysis of the organizational impact of information technology (IT) innovation represents part of the origins of information system (IS) research (Kwon and Zmud, 1987) and remains a cornerstone today as "it is widely acknowledged that IT will revolutionize organizational life" (Eason, 1988, p. xi). With the increasing digitalization of businesses and their environment, digital innovation is repeatedly disrupting industries and markets (Tilson et al., 2010). Digital innovation poses challenges for firms to adapt and change their organization in order not to be eradicated (Yoo et al., 2012).

Innovations enable a breakthrough in capabilities and provide novel opportunities (Bower and Christensen, 1995). Problems arise if firms fail to respond appropriately to changes and, hence, face the risk of losing market share. Kodak and Nokia are infamous examples of failure to adopt innovations and adapt the organization to these innovations (Lucas and Goh, 2009).

Blockchain presents an example of disruptive digital innovation, as it is believed to have a fundamental impact on a number of industries (Giaglis and Kypriotaki, 2014; Risius and Spohrer, 2017; Wörner et al., 2016). Strong impacts are expected especially on the business models of organizations in the services sector, such as the financial services industry, health-care industry, and energy industry (Avital et al., 2016; Holotiuk et al., 2017; Wörner et al., 2016). Blockchain provides a number of opportunities to create new products, processes, and business models (Avital et al., 2016). Although blockchain appears to be a promising technology suitable for a variety of applications, its adoption over the past few years has not lived up to the expectations due to "scalability issues, costs, and volatility in the transaction currency" (Beck et al., 2016, p. 1), among other reasons.

The required changes due to digitalization along with new technologies are often underestimated. Firms have to rethink how to organize for digital innovation (Yoo et al., 2012) and provide more flexibility and freedom to actually adopt digital innovation, as "innovation is considered a source of competitive advantage and economic growth" (Damanpour and Schneider, 2006, p. 215). However, organizational adoption of innovation is recognized as a complex process in management (Damanpour and Schneider, 2006; Markus and Tanis, 2000).

To maintain their market shares, organizations have to place a strong emphasis on the adoption of digital innovations such as blockchain into their structure, mindset, and processes (Bower and Christensen, 1995). Research has shown that with the introduction of digital technology, the organization has to change accordingly, which causes new tasks, new coordination methods, as well as new forms of organizing to evolve (Yoo et al., 2012). Although the organizational adoption of technologies has been studied thoroughly, blockchain as an emerging technology has not been given much attention from that angle. However, understanding its adoption is fundamental to guide and foster the development of blockchain. Studies on IT systems adoption are not applicable due to two reasons. First, their focus is often on adoption based on evaluating and acquiring the IT system, which is inapplicable for blockchain as many people within the organization are unfamiliar with blockchain and cannot evaluate it and, furthermore, there are no standardized applications available which can be acquired on the market. Second, research often focuses on the individual level of adoption without acknowledging the organizational dimension (Hameed et al., 2012), which is unsuitable for the blockchain context as this technology is expected to have strong impacts on the industry level, where it can facilitate the exchange of value between organizations. It is not a technology with which people interact, as per online services. Consequently, we analyze how organizations are changing during the endeavor to adopt blockchain technology. Via the example of blockchain, we study the factors influencing the organizational adoption of digital innovation. Hence, we formulate the following research question:

> *What are the influencing factors and how are they influencing the organizational adoption of blockchain?*

Based on the three pillars of Linstone's (1999) decision-making model – *technology*, *organization*, and *user* – Basoglu et al. (2007) developed a more comprehensive model for organizational adoption focusing on *technology*, *organization*, *people*, and *project management*, which is extended further by

our research. *Organization* defines "how work gets done – how activities are coordinated, how decisions are made, how objectives are set, and how employees are motivated" (Foss and Saebi, 2015, p. 3). Furthermore, the design of organizations addresses a wide range of aspects, such as coordination and the limits of the firm (Arrow, 1974) or the role of formal and real authority (Aghion and Tirole, 1997). *People* are characterized by their skills and by how they contribute to the organization by applying their skills to develop or work with digital innovation. Additionally, people from outside the organization and their skills can also be involved. *Technology* addresses the creation of new service offerings and the development of ideas on how to utilize and apply digital innovation (Bower and Christensen, 1995). All these aspects have to be carefully managed and proper *project management* has to ensure the alignment of such aspects to perform organizational adoption (Basoglu et al., 2007).

We aim to better understand the factors within the organization to adopt blockchain technology, as it has been reported that changing the "organizational structure is indeed a crucial element in the diffusion of technological innovations" (DeCanio et al., 2000, p. 1297). With the four dimensions of the framework – *technology*, *organization*, *people*, and *project management* – different factors, such as structure, processes, and mindsets, are encapsulated. Based on these factors firms can develop transformation strategies, technology assessment plans, and innovation cultures to change their organizational structure. Our focus is the configuration of these factors to foster the adoption of blockchain.

The 'soft' changes within the organization due to the impact of digital innovation are at the core of our research. To answer the research question, we build on an empirical study. We extend similar research in our domain, which addresses the impacts caused by blockchain in payments (Bott and Milkau, 2016; Holotiuk et al., 2017) and in other industries (Lee and Pilkington, 2017). We add to the topic of blockchain an extension of these insights by analyzing the organizational adoption of blockchain within firms. We conducted an empirical study based on a series of expert interviews to intensify our understanding of organizational adoption and learn about the changes at the core of the organization. With this research, we are building on long-standing calls in IS research to enhance the "organizational dimension of information management" with "empirical research" (Earl, 1996, p. 4). For our in-depth interviews, we selected experts responsible for blockchain initiatives in their organizations. Based on the interview data, we extracted influencing factors within each dimension of the framework where actions are undertaken to adopt blockchain.

The paper is structured as follows. We start by outlining current research on blockchain technology and presenting the challenges when it comes to organizational adoption of innovation. Based on existing literature, we adopt a framework for our research to conduct the analysis. Next, the empirical research method based on the interviews is briefly described. Subsequently, we present our findings from the interviews according to our framework. We conclude our paper with a discussion of the findings and summarize the factors influencing the organizational adoption of blockchain.

# 2 Background

## 2.1 Blockchain technology

Our study is focused on blockchain – a technology that is attracting the attention not only of financial institutions but also other industries (Nofer et al., 2017). This technology was initially launched as an approach to payment transactions based on cryptography to provide an alternative mechanism for the trust needed between two transacting parties (Nakamoto, 2008). Blockchain enables a collective bookkeeping system (ledger), which by means of a mathematical function (hash function) allows participants to reach an agreement on the approval of transactions. The information concerning single transactions is gathered in 'blocks'. These blocks are reviewed and verified by the network and added in chronological order to the computers of all participants of the network. A distributed ledger of verified transactions is then provided to the network (Peters and Panayi, 2015). As such, the traditional role

played by financial institutions as trusted third parties able to mitigate the risk behind a transaction is under scrutiny (Holotiuk et al., 2017).

With its new approach to transactions between two parties, blockchain has a disruptive potential to redefine industries (Wörner et al., 2016) and provides current opportunities, especially in the financial services sector. Like other digital innovations, blockchain yields impacts on three levels, namely products, processes, and business models (Fichman et al., 2014). With its fundamentally new architecture and its impact on these three levels, blockchain technology can be classified as a digital innovation.

One of its first applications was Bitcoin (Robleh et al., 2014). However, today blockchain is being proposed as a solution for a wide spectrum of applications, which include real-time payments between two parties, the transfer of funds (micro payments, remittances), and digital assets (digitally stored record of ownership of an asset). The impact of blockchain technology, though, might go much further than some modified processes and a few new products and services. A number of authors expect that the consequences could even go so far that entire business models might be affected (Swan, 2015; Tapscott and Tapscott, 2016). In this sense, due to the observable impact of blockchain on business models in the financial services sector (Holotiuk et al., 2017), blockchain might be a good example for the disruptive potential of digital innovation, as observed by Brynjolfsson and McAfee (2014). Accordingly, blockchain technology or the more general concept of distributed ledger technology (DLT) has raised enormous interest in the IS community, for instance with regard to trust and cryptographic aspects (Beck et al., 2016), the procedure and implications (Roßbach, 2016), as well as various issues of virtual currencies (Kazan et al., 2015). Still, most organizations are in the process of exploring the innovation and its impact on their industry. Of these, the financial services sector is at the center of many studies (Beck and Müller-Bloch, 2017; Nofer et al., 2017).

## 2.2 Dissemination of digital innovation

The relationship between digital artifacts and organizational design (e.g., roles, teams, and processes) is an established issue among IS researchers (Bostrom and Heinen, 1977). The competing forces between the need to standardize and automate in existing, long-standing organizational designs and the need to adapt to changes due to technical innovation constitute a huge challenge for firms (Bower and Christensen, 1995). Hence, organizations face a dilemma because they have to develop new capabilities to innovate and simultaneously maintain the old ones for their existing business (Ebers, 2017). The resulting tension between exploration and exploitation is tackled by the concept of ambidexterity (Tushman and O'Reilly III, 1996). Ambidexterity is the capability of successfully managing exploration (e.g., developing digital innovations such as blockchain) and exploitation (e.g., achieving project success with everyday operations) simultaneously (He and Wong, 2004).

Blockchain is not the first technology that firms are struggling to adopt. In the past, innovative technology and its disruptive potential have always placed high uncertainty and pressure on firms – such as enterprise resource planning systems (Ozkan et al., 2012) or cloud computing (Plyviou et al., 2014). Technologies have always fundamentally questioned the design of organizations (Henfridsson et al., 2014). As a result, it is a central challenge to researchers that "pervasive digital technology, while being rapidly adopted by organizations, is fundamentally reshaping them" (Yoo et al., 2012, p. 1405).

With the integration of more technology into their business processes (Tilson et al., 2010; Yoo et al., 2010), firms are deviating from their proven, existing, and traditional innovation paths (Henfridsson et al., 2014). As a result, they are undergoing substantial changes and are adopting new identities as digital innovation intercepts with traditional behavior patterns codified in key beliefs, routines, and procedures (Tripsas, 2009). Some of the challenges organizations face when developing and adopting digital innovation have been presented by Svahn et al. (2017): (1) innovation capability: existing versus requisite, (2) innovation focus: product versus process, (3) innovation collaboration: internal versus external, and (4) innovation governance: control versus flexibility. The authors address the different

dilemmas managers face when firms try to align their organizational structure to the development of digital innovation (Svahn et al., 2017). The multitude of challenges contrasts with the narrow definition of digital innovation by Yoo et al. (2010, p. 725) "of new combinations of digital and physical components to produce novel products." We understand digital innovation as a multidimensional change process with necessary changes regarding the organizational dimension, following Fichman et al. (2014, p. 330), where "product, process, or business model [are] perceived as new [and] require some significant changes on the part of adopters." Building on these changes, our research is focused on the factors in the organization that foster organizational adoption. Organizations have to tackle "significant organizational changes to gain intended benefits" (Fichman et al., 2014, p. 333) of digital innovation. The inability to adopt digital innovation and to make adequate changes has been identified as a major cause for failed IT projects (Bostrom and Heinen, 1977) or even for firms going bankrupt (Bower and Christensen, 1995). The pace of digital innovation has been rapid compared to other technological innovations (Yoo et al., 2010) and has decreased the time for adaptation (Henfridsson et al., 2014), putting more pressure on organizations to make needed changes (Westerman et al., 2014).

## 2.3 Conceptual model of organizational adoption

When it comes to the analysis of IT projects, researchers often focus solely on critical success factors such as customization of software, top management support, and training of people. Although we recognize the importance of these for the adoption of digital innovation, we aim to extend this view by considering multiple dimensions and the interplay of the various factors. In our understanding, this is the first time that organizational adoption of blockchain has been studied from a holistic perspective.

We build on previous studies by Delone and McLean (1992), Gallivan (2001), and Basoglu et al. (2007), who explored the applicability of traditional innovation adoption and diffusion models, including TAM (Technology Acceptance Model), and applied the insights gained to organizational adoption. Their particular lens is based on three pillars: user, organization, and technology. These dimensions are aligned by project management to achieve the desired outcome for organizational adoption. We adapt their model to the organizational adoption context and, moreover, recognize the work done by Depietro et al. (1990), who developed the Technology–Organization–Environment (TOE) framework. The overlap between the models reinforces the applicability of some dimensions (technology and organization). Moreover, we enhance our analysis to include the environment dimension, which captures aspects surrounding organizational adoption. Furthermore, we are interested in how the factors within each of the three dimensions are unfolding and interacting to foster organizational adoption. Unlike other researchers (Basoglu et al., 2007), we do not focus on implications on an individual level, such as perceived ease of use and perceived usefulness, as we aim to obtain a perspective on all factors fostering organizational adoption on the organizational level (Figure 1). Blockchain-specific aspects are not included, since we are aiming for a general framework that builds on the existing knowledge of adoption.

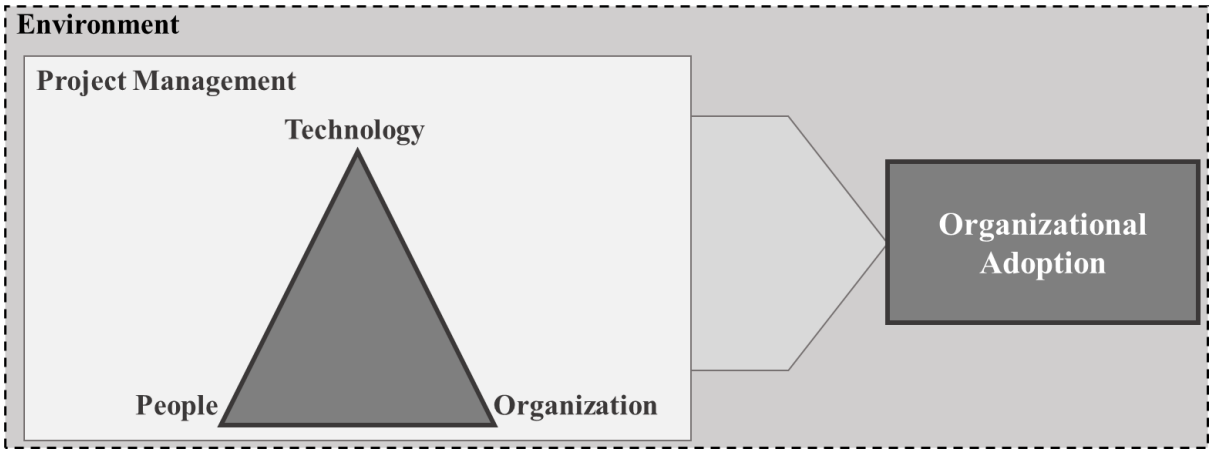


*Figure 1 Conceptual model of organizational adoption.*

### *Technology*

In our framework, the term technology represents the blockchain technology itself and consists of several factors around it. Some of these factors have been analyzed in the context of other technologies, such as the capability of the technology, the flexibility of the system, and the gap between the technology and the organization (Basoglu et al., 2007). In our case, blockchain technology is an evolving technology and, hence, small adaptations to it are interesting. Furthermore, the outlined disruptive impact of the technology, especially in the financial services sector, is associated with anticipated benefits and it is applied in various use cases (Nofer et al., 2017; Wörner et al., 2016). The goal of organizational adoption is to find the best fit between the technology and the organization; thus organizations try to find the most suitable configuration of the technology to ensure the match between technology and their individual requirements (Zhang et al., 2005). The process of achieving this fit has also been observed with other technologies of the same magnitude, including Enterprise Resource Planning (ERP) systems, where organizations evaluate different specifications such as the technologies' maturity, robustness, reliability, and punctuality "to increase the chance of selecting the right system" (Basoglu et al., 2007, p. 90). Different specifications, such as the capability and flexibility of the technology (Bradford and Florin, 2003) or customizing the system (Bingi et al., 1999), are considered to increase the fit.

In the case of blockchain, plenty of IT providers are offering the first systems and many big players have also entered the market – for example, IBM and Accenture. Additionally, numerous consortia within one industry (like Fundchain, which explores business opportunities in the asset management industry) or across industries (like the ChinaLedger Alliance, which adapts and develops blockchain to be applied across several industries) are advancing blockchain. As a result, a multitude of technological standards and configurations of blockchain are emerging. This is making it hard for organizations to choose and undertake adequate adaptations to increase their fit with blockchain.

### *Organization*

Like technology, the organization also includes several factors influencing organizational adoption. In order for an organization to adopt a new technology, changes to the organization have to be implemented – for instance, revised business processes (Bingi et al., 1999). Similar to adaptations of technology, the organization has to make adaptations to improve its fit to new technology like blockchain. Hence, the set-up of teams and the ways of collaboration have to be updated. As blockchain is a technology that leverages its potential in a network with multiple partners, organizations have to enable open innovation processes that equally leverage the exchange across departments, but also across organizations. Building on the research and ideas of "The Duality of Technology" by Orlikowski (1992), we assume that changes to organizations have to be made as technologies are changing. Since blockchain is fairly complex and still comes with a number of challenges (Holotiuk et al., 2018), organizations have to allow for easy collaboration and early involvement of business departments in the development of ideas regarding its application and adoption. Enabling multiple departments to generate ideas and allowing people to contribute to existing projects increase the success rate of organizational adoption (Gallivan, 2001).

### *People*

Besides technology and organization, people within the organization present influencing factors for the organizational adoption of blockchain. The people of an organization carry out actions leading to organizational adoption. In order to execute their tasks, people need certain skills that enable them to do those tasks, hence adequate skills are needed. With the introduction of a new technology, new skills are required. Furthermore, the application of new technologies in the organization changes the way business requirements can be implemented (as they can be based on new technology). For example, online services allow new forms of customer service, but require organizations to have, first, people with the appropriate skills to implement online services and, second, people who know how customer service can be facilitated based on online service. Activities are directed towards making people more familiar with new technology and strengthening its integration into the organization (Basoglu et al., 2007). Some skills can be transferred from other technologies and also can be applied to blockchain, but other skills needed for blockchain have to be attained from outside. This can be done either through training or by

acquiring new people with the necessary skills for blockchain. Additionally, external partners can support organizational adoption by temporarily lending needed skills to the organization or jointly developing new use cases for blockchain.

***Project management***

Project management in our framework has the role of aligning the three dimensions to create consistency for the organizational adoption of blockchain. Lock (1996) claimed that project management had evolved in order to plan, coordinate, and control the complex and diverse activities of industrial and commercial projects. Blockchain is a fundamental technology and its adoption in organizations will take years. At the moment, there is no experience available on the entire process. However, as with similar implementation projects, such as ERP systems, the adoption process involves all business functions and takes multiple years of effort (Basoglu et al., 2007). Project management allows for control of the factors within the three dimensions – technology, organization, and people – and ensures their alignment for the success of organizational adoption. To do so, responsibilities have to be clearly assigned and the leadership of the project has to be well defined (Zhang et al., 2005). Challenges have to be detected and adequate actions have to be conducted. The tasks have to be distributed among the business functions and people have to be motivated to contribute to the organizational adoption project. Project management has to ensure a fluent interplay of the three dimensions, including providing feedback and finding the right balance between top-down and bottom-up management to remove any (possible) friction between technology, organization, and people (Basoglu et al., 2007).

***Environment***

The environment is a fairly established dimension of organizational adoption and strongly connected with much adoption research based on the TOE framework (Depietro et al., 1990). The dimension covers market development, which influences blockchain. For example, with the further development of blockchain through industry consortia or IT firms, the number of plausible use cases can increase. Additionally, a decision by a regulator can increase the pressure to adopt blockchain, as it might be an accepted standard for certain transactions in the future. Current developments around the standardization of blockchain can lead to new requirements or need for collaboration with other organizations.

# 3 Method

We apply this framework to our research setting of blockchain technology in the financial services sector. This allows us to study the organizational adoption of this technology at an early stage. The financial services sector is among the first to apply blockchain. At the same time, the sector is under constant threat of being disrupted by this technology due to novel opportunities around the improvement of complex financial and cross-border money transactions (Beck et al., 2017), which creates pressure and thus makes the need for changes and adoption particularly apparent. Hence, our research is placed in an interesting setting with promising observations.

To answer the research question of this paper, we applied an empirical approach by conducting a series of in-depth expert interviews. Additionally, we researched all the organizations and analyzed available secondary information. The mixed-method approach based on primary data (interviews) and secondary data (archival data) aims to reduce the methodological bias, enables a triangulation of our findings, and, therefore, "strengthen[s] the validity of inquiry results" (Greene et al., 1989, p. 256). With our methodological approach we were able to gather information from a wide spectrum of organizations. In total, we performed eleven in-depth interviews to better understand how experts in the financial services sector (banks, insurances, financial supervisors, etc.) are approaching the organizational adoption of blockchain technology. Our goal was to distill the influencing factors and match those factors to the corresponding dimension of our framework.

We analyzed industry reports and press releases of firms undertaking actions regarding the adoption of blockchain to gain an overview of the various activities. Next, we identified the experts for our

interviews. It was necessary that these persons work as managers in their organization and are involved in the organization's actions to adopt blockchain technology. We made sure to include diverse backgrounds from business functions and IT units, which are both closely linked to the adoption of digital innovation. Thus our study reflects a broad range of expertise in and knowledge of blockchain. The interviewees were selected based on the following criteria: (1) Interviewees dedicate a substantial part of their working time to blockchain. (2) Interviewees have responsibility over at least one team that dedicates a significant part of its time to blockchain. (3) The interest in blockchain and its application in the financial sector have been well stated. (4) Lastly, interviewees have to demonstrate thorough experience in financial services by either extensive work experience or a relevant management position.

Based on these criteria, we approached potential interviewees via our own network in the financial services sector. Additionally, we scanned workshops and conferences on blockchain to identify potential interviewees. Lastly, we searched for the "responsible manager" for the majority of institutions in the financial services sector in Germany. The focus on the German market is due to two reasons. First, we wanted to conduct the interview in person to ensure high-quality data. Second, the German financial services sector is among the most advanced sectors concerning blockchain and the first applications and experiments are observable (Bartholomew, 2017; Suberg, 2016). The interviewees are listed in Table 1.

| ID | Type of firm | Interviewee position | t in min | Description |
|---|---|---|---|---|
| I1 | Private Bank | Manager – Infrastructure + Industry Initiatives | 60 | I1 is leading a team that has an extensive history in developing risk-tracking systems for the capital markets. Thus, I1 has profound knowledge of different digital technologies, including blockchain. |
| I2 | Retail/ Commercial Bank | Manager – Innovation and Business Operations | 81 | I2 has been working in the banking sector since 1979, with more than 25 years of experience in operations. Since 2015, I2 has been working with blockchain technology, analyzing its disruptive potential for operations. |
| I3 | Online Bank | Manager – Business Development Innovations | 55 | I3 has been leading a team for cross-functional technology innovation projects for several years. The emphasis is on identifying relevant digital technologies and acquiring knowledge on how to leverage them. |
| I4 | Investment Bank | Manager – Market Operations | 58 | I4 works as a chief operating officer at a large investment bank in Germany. Due to his background in physics, he has an in-depth understanding of digital technologies. |
| I5 | Transaction Service Provider | Manager – Project Management Office and New Technologies | 69 | I5 has been working for the strategy unit of a large transaction service provider for more than three years. During that time one of I5's key tasks was to identify blockchain use cases by collaborating with technical experts. |
| I6 | Financial Supervisor | Manager – Banking Supervision New Technologies | 61 | I6 has extensive expertise working in the IT security department of a large financial supervisor focusing on new technologies. I6 started to closely monitor blockchain in 2013 and is part of an international standardization committee for blockchain including more than 70 countries. |
| I7 | Investment Bank | Director – Innovation Analytics and Architecture | 55 | I7 has worked as a director focusing on innovation and architecture for over 2 years after finishing his PhD in Economics and Computer Science. |
| I8 | Retail/ Commercial Bank | Manager – Strategy and Digital Innovations | 52 | I8 was part of a cryptocurrency start-up four years ago and is now co-head of a large blockchain lab in the financial services sector, responsible for identifying new use cases. |
| I9 | Investment Bank | Manager – Product Management and Transactions | 61 | I9 is a highly experienced manager focusing on regulation and innovation. He coordinates the process of developing proof-of-concepts for digital innovations including blockchain technology. |
| I10 | Development Bank | Manager – Co-Head Digital Office | 62 | I10 is co-head of a Digital Office where blockchain represents one of four technology streams to pursue. In close alignment with his team, he developed and implemented the first blockchain use case for his bank. |
| I11 | Specialized Bank | Manager Innovation | 63 | I11 is an alumnus of a leading business school and manages innovation projects involving new technologies, including blockchain. |

*Table 1. List of interviewees, their position, and short description of their profile*

With the interviewees at hand, we followed the recommendations by Eisenhardt (1989) and Yin (2009) and designed a semi-structured interview guideline for the interviews. The questionnaire is aligned to the research framework (Figure 1), but not fixed to it. We wanted to preserve the nature of explorative interviews and developed open-ended questions to ensure the examination of all perspectives and assessments expressed by the interviewees. This approach is justified given the early stage of the adoption and the scarce research on blockchain. We conducted most of the interviews in person and with two researchers to ensure adequate data collection and a reduction of bias. Furthermore, they were carried out in the native language of the interviewees to avoid misunderstandings and to ensure easy communication, which is crucial for explorative interviews. The interviews were recorded at full length and transcribed. The same version of the interview guideline was used to ensure comparability among the interviews. Conducting the interviews lasted from April to September 2017.

Based on the framework, we developed a coding scheme and derived indicative codes for *technology*, *organization*, *people*, *project management*, and *environment*, based on their definition and theoretical conceptualization. Additionally, we created the "emerging codes" code to capture new observations that were not covered by the definitions so far. The coding of the transcribed interviews was done using MaxQDA v.12.3. We identified 702 descriptive coded segments. These segments represent the actions undertaken by organizations to adopt blockchain technology. Coding was done to "organize and make sense of the qualitative data" (Basit, 2003, p. 152) and to understand the organizational adoption. The coding was highly iterative and involved studying each interview individually as well as in combination with the other interviews. Based on coded segments from the interviews, we derived the influencing factors for the organizational adoption of blockchain. We then went back to the archival data to gain a deeper understanding of influencing factors and how they are unfolding in the firms in our sample. This helped to critically reflect on the factors.

# 4 Findings

In this section, we present the factors that we identified by applying our framework of organizational adoption (introduced in section 2) to the organizations in our sample. We distill a set of actions to derive the influencing factors and match the factors to the corresponding dimensions in our framework. The influencing factors are presented in bold and direct citations from the interviews are shown in italic.

## 4.1 Technology

Experts argue that blockchain technology can replace existing technology by demonstrating superior features regarding business requirements, such as speed, security, or quality, and showing major financial benefits in terms of cost saving due to lower running costs in the future (Nofer et al., 2017). These anticipated benefits create huge potential for the technology in the financial services sector. Still, **problems around prototypes** have also been presented by experts as an influencing factor for organizational adoption. These are due to *"challenges to align with the counterparty regarding data exchange and data format"* (I3) for blockchain transactions. With further adaptation to blockchain, experts are expecting higher **efficiency**. Increased efficiency is anticipated, as *"transaction costs are expected to decrease"* (I6) with blockchain. Furthermore, *"settlement process[es] are going to be faster"* (I7), which is going to improve the efficiency further. However, experts believe that **implementation** is challenging (I4). Compared to other factors, implementation is also considered to "*be a minor problem*" (I2), however. The tension between these two statements shows that the complexity of blockchain creates fewer difficulties to some organizations (maybe oriented to smaller use cases) and greater difficulties to other organizations that find it hard to keep up with the pace of development. Moreover, the **role of IT** presents a further factor around the technology. The majority of experts consider that blockchain should be placed in the traditional IT department, as it is a new technology. However, some experts also put forward that *"as business is identifying use cases, they should be the one drafting the concept and then ask IT for help"* (I5). With new technologies the role of IT has always been changing and *"many changes have ever since been observed"* (I9) with blockchain

too. Consequently, the role of IT *"is changing regardless of blockchain"* (I8). Changes observable connected to blockchain are in the direction of *"greater interdisciplinarity"* and a *"more strategic role of IT"* (I2). With the changing role of IT, the **interplay of IT and business** as a factor for organizational adoption is changing and business *"is since interacting differently with IT"* (I8). Although blockchain is a new technology, we observed many cases where "*business is in charge instead of IT*" (I2) in relation to the new technology – which is surprising, but supports the factor of the 'new' role of IT.

## 4.2 Organization

In order to group relevant knowledge, experts have set up a **separate entity** in the organization for blockchain. These entities are used for *"nothing else than to deal with blockchain technology and develop new ideas and new use cases"* (I1). Further, they are spreading the topic of blockchain across the organization to build the awareness of possible changes, to find talents for internal blockchain projects, and to source ideas for potential use cases. Even though blockchain is the subject of a great deal of hype at the moment, most experts see the topic as a long-term project for which they need to prepare the organization. These entities act as a **nucleus** that helps people to create ideas and allows people to learn. Afterwards, ideas can spread from the nucleus throughout the organization. Moreover, we observed that experts are aware that the technology can only be successfully developed if the knowledge of many people is harvested and the ideas are widely discussed within the organization; however, the reality is that the development of blockchain is left to a small and isolated team which has only a limited degree of exchange with the rest of the organization (I4). Hence, the nucleus can also be of a temporary character, as the idea of *"yearly Innovation Bootcamps"* shows (I7). Or it can be a virtual construct of *"virtual corners where people can discuss ideas on blockchain"* (I5). To increase the success of the nucleus for organizational adoption, **integration** is important, meaning that how well information can be exchanged across the organization or spread from colleague to colleague helps distribute knowledge throughout the organization. Although the expertise might be concentrated in the nucleus, *"ideas and use cases for blockchain are generated by 'walking' through the organization and encouraging exchange on use cases"* (I8). At the same time, ideas from the nucleus have to be played back into the organization via *"affiliates which [are] distributed within the organization"* (I8). Different vehicles are being used to encourage **informal exchange** about blockchain. These measures range from *"informal meet & greets where people can join and also apply for a presentation"* (I9) to *"regular meetings outside the daily working hours"* (I11). There is also **formal exchange,** which builds on more traditional measures such as *"a newsletter or an online community in the intranet where people can exchange"* (I7). Often these more formal channels are used to submit ideas about blockchain and experts have used *"dedicated email addresses to gather whatever might be interesting"* (I11) on the matter of blockchain. Additionally, *"idea and innovation tools are used to allow employees their thoughts and proposal about blockchain"* (I2). **Cross-functional teams** consisting of different skills and functional backgrounds, including *"operation, IT, HR, communications, and legal"* (I4), have been identified as a factor for organizational adoption. The advantage of these teams is that they are *"highly diverse"* (I8), which allows them to have a well-rounded view on blockchain and *"people have volunteered to join"* (I8) them. Experts observe that often there is fear within the organization about the possible implications of blockchain. That is why the blockchain entities within the organization try to change the **attitude** towards blockchain by education and training. The goal is to create an attitude which fosters an interest in the technology and makes people voluntarily think about possible applications in their domains.

## 4.3 People

Experts mention that the general theme of the people dimension is to attain new talent or find adequate talents within the organization. The lack of appropriate skills on the labor market becomes particularly apparent with the skills needed for the adoption of blockchain. Hence, most of the factors address actions to overcome this lack in talent. For example, experts are building on **external partners** as a factor to support their organizational adaptation of blockchain. Through partners like universities, they *"try to get in touch with young people with fresh and new ideas"* (I5). Additionally, concepts such as *"active*

*networking and open innovation are used"* (I3) to get in touch with ideas from outside the organization. In contrast, external partners (like customers) can also be a 'push' for the organization to accelerate its ambitions towards blockchain, as *"customers have high expectation and expect organizations to understand what blockchain is or otherwise the organizations lose relevance in the eye of the customer"* (I8). Additionally, the connection and exchange with **fintechs** are mentioned as an important factor. Fintechs are important because they provide new ideas to financial institutions and the experts in the institutions can then *"assess if the ideas can be implemented"* (I4). Experts emphasize that banks and fintechs are complementary, as *"fintechs think in days whereas banks think in years and combining this creates mutual benefits"* (I9). Furthermore, experts mention that dedicated **partnerships** (in contrast to external partners, these are long-term and fixed agreements) are important to attain the right knowledge and skills for blockchain. These partnerships are also a platform for exchanging ideas and knowledge. Consortia are an established form of partnership and a large number of our experts mentioned being involved in consortia such as R3. Partnerships are also established outside the financial services sector to find *"partners (in particular large corporates) for blockchain prototype and to pilot first applications"* (I8). The **distributed knowledge** on blockchain among people is an important factor. Organizations realized early on that *"there are many people within the organization that have something to do with blockchain"* (I8). However, the first experiences with blockchain are diverse, ranging from *"Bitcoin miners to physicist"* (I1). Still, to manage and align the different backgrounds and knowledge, for instance between the business and IT, *"creates difficulties"* (I7). People working on digital projects like blockchain *"are usually young people with a high affinity to technology"* (I9). Whereas the knowledge on blockchain might be contracted there, it is *"completely missing in the business departments"* (I4) of some organizations. **Excitement** presents an important factor to encourage people to join blockchain projects and actively contribute to the adoption of blockchain. Experts stress that next to technical knowledge, people also need to bring *"openness and curiosity"* (I5) to projects regarding blockchain. Hence, people working on blockchain currently in organizations are characterized by *"high intrinsic motivation with a willingness for extra hours"* (I2). Often experts apply self-selection mechanisms based on these traits to get the 'right' people for the project.

However, there is a great deal of work left to do on the people dimension and factors remain with much future potential. Experts expect a further increase in the **need for developers**. There will be *"more developers needed than business experts"* (I8) for the adoption of blockchain. To attract new talent, organizations have to create an *"environment where developers feel that they can achieve something"* (I8). To deal best with new technologies like blockchain it is *"beneficial to incorporate skills of a nerd"* (I11) in all people. Furthermore, people need to be enabled to develop the right **mindset** for adopting blockchain. The mindset needs to value change over being dependent on existing systems. It also has to include the will *"to research and explore"* (I8) around blockchain. Moreover, it has to incorporate the *"will to do things differently"* and *"to generate ideas even if they are not perfect at the moment"* (I5), anchoring the blockchain idea in people's minds or, as one expert put it, *"all progressive-thinking people in the organization are using the word blockchain regularly and incorporate that in their ideas"* (I11). The mindset needs to include an *"entrepreneurial spirit to consequently develop your own thing"* (I8). People joining the organizations fulfill the requirement to bring the **combined knowledge** of *"technical know-how as well as business skills"* (I5). To improve the business based on blockchain, people with *"knowledge about the technical architecture as well as business architecture, so called 'Blockchain-Enabled-Business Architects' are needed"* (I1).

## 4.4 Project management

Project management aligns the different activities within the organization to achieve better organizational adoption. It often includes managers from the organization or even members of the board. Still, most of the activities we observed are originating **bottom-up**. That means they are driven from the lower levels of the hierarchy. The more inclusive approach allows more people to be integrated (I11). Consequently, activities are distributed through the organization and *"everybody who feels motivated and has fun can join"* (I7). Via the bottom-up approach it is also possible to *"pick more people up and*

*encourage them to think about the application of blockchain"* (I8). However, the role of project management also includes aligning these activities. Hence, aligning activities is strongly executed from **top-down**. This might seem as a contrast to the previous factor, but is needed to *"group all activities together and keep an overview of the ongoing developments"* (I9). On top of that, project management acts as a *"steering committee for new ideas"* (I9). Generally speaking, both approaches are applied in the organization for different activities (I8) and again present an interesting tension within influencing factors. Blockchain is a 'hype topic' and, hence, there is no need to extrinsically trigger **motivation**. People are *"excited to be able to contribute and help with something new"* (I9). However, project management has to work hard to keep the motivation high to ensure people keep working on the project. This is done by *"showing appreciation and making the results of blockchain teams visible"* (I1). This is particularly important as we observed that, although people are dedicating time and effort, most of the activities in the adoption are based on **voluntariness**. Blockchain is driven *"as an independent initiative without working hours"* (I11). Although participation in the project happens mainly on a voluntary basis, the **anchoring of the responsibility** is often assigned to top-level management (I5). However, some experts state that top management lacks knowledge about blockchain, which hinders its adoption. Consequently, experts stress the importance of well-informed top management.

## 4.5 Environment

For the environment dimension, we gathered the factors that experts concern developments outside their own organization regarding blockchain. Often these developments cannot be influenced by the experts, but it provides the frame and often limits the actions they can execute internally. The first factor is **standardization**. There are many types of blockchain available on the market. Consequently, experts are unsure *"if blockchain will become a standard in the banking industry"* (I2). Although that seems unlikely, the uncertainty within the market slows down adoption in the organization. Experts want to be prepared if the market imposes standards based on blockchain and *"that in the future some products can only be traded on the blockchain"* (11). Accordingly, experts foster the organizational adoption to achieve a level of readiness for the new technology. However, experts fear that *"if standards are not established"* (I4), the European financial services sector will lose out against other markets. Furthermore, we find the need for **use cases** as a second factor. Currently, the industry is not providing sufficient use cases which present potential applications within the organization. Still, there are *"no other use cases than bitcoin"* (I5) known to some experts in the financial services sector. Use cases are few, as people are often thinking too big in consortia such as R3 and use cases are not aligned to real business. Interestingly, most of the *"use cases in the retail business are cash"* (I8), which presents a major hurdle as all blockchain projects involving cash *"have to include the regulator such as the EZB"* (I8). Next, blockchain is a technology on a global scale and **internationalization** is an important factor. On the one hand, the technology is not only being developed in Germany or Europe and organizations have to observe international developments to stay at the top of the market. On the other hand, international financial institutions feel the pressure from different markets, as *"there is a lot of development in the Asian market"* (I1) and *"the conditions are changing more quickly in Asia"* (I4). Furthermore, experts expressed **uncertainty** as a factor for the adoption of blockchain. High uncertainty largely characterizes the actions of adoption and some organizations *"are waiting and are observing the technology"* (I7). Firms are expressing high uncertainty regarding whether it is the right time to adopt this digital innovation and how this could be done. The technology is still at an early and premature stage, which allows no clear picture regarding the timeline of its development. Experts describe the technology as being *"ambivalent"* (I5). On the one hand, due to the disruptive potential of blockchain, the technology is viewed *"more as a threat than a chance which creates a 'Sense of Urgency' in the sector"* (I2). This bad image is further supported by *"a lot of false advertising"* (I5) about the technology. Especially in the past, Bitcoin was seen solely as a currency for dubious payments over the internet, creating distrust in the phenomenon. On the other hand, the financial services sector is characterized by high requirements regarding privacy and offers advanced and high-performing systems which are unlikely to be replaced by blockchain, although blockchain *"could provide [a] second, parallel system"* (I3).

# 5 Discussion and Conclusion

It becomes clear that our factors encapsulate the organizational adoption of blockchain. However, it is also clear that the factors are by no means unidirectional. Instead, the factors often create a field of tension along with different configurations. This goes as far as different approaches in the financial services sector being chosen and actions of organizations actually present two ends of a continuum for some factors. For example, initial considerations around blockchain have sometimes been assigned to business (I5) and sometimes to IT (I7). Next, the balance between exploration (new blockchain-based solutions) and exploitation (daily tasks) creates further tension. During our study we have not only seen euphoric experts. We have also recognized a great deal of criticism of the current hype of blockchain as well as much skepticism about the actual potential of the technology (Salmony, 2016). Consequently, the organizational adoption of blockchain becomes even more important as organizations have to be able to assess the technology for their needs. By no means is organizational adoption defined by a clear end where the technology is fully used in the organization. It is rather an ongoing, multitudinous process of technology innovation and organizational change management (Markus and Tanis, 2000).

The contributions of our study are twofold. First, we see a strong managerial relevance, since firms are currently undergoing great transformations due to blockchain. The relevance of innovative and disruptive technologies such as blockchain is of the utmost importance not only to IS researchers, but equally to managers. Hence, a thorough understanding of digital innovations like blockchain and their adoption is needed. Our analysis of organizational adoption can guide managerial actions regarding changes in the organization and support the decision-making of managers. Therefore, it is not only the technical aspects of these innovations that should be stressed in the current discussion on blockchain. A one-sided discussion of technological specifications should be avoided, and the focus should be equally placed on the people and organizations who have to adopt these digital innovations. Second, scholars can gain a deep insight into the adoption of digital innovation in organizations. We are contributing to the emerging topic of blockchain and the increasing need for academic research on the topic. In our understanding, this is one of the first studies which address the adoption of digital innovation and in particular the organizational adoption of blockchain. Furthermore, studying the dissemination of digital innovation on the basis of blockchain technology allows scholars to learn more about upcoming disrupting technologies and their organizational adoption. Moreover, our study provides an understanding of the organizational changes connected with the adoption of digital innovation. Consequently, our research can support researchers to develop new models for technology adoption in a digital age and to make comparisons to other technologies. Future research may use the identified factors and develop stages of adoption to allow for a classification of approaches to blockchain adoption.

Our study is limited, in the sense that the number of interviews is low, but not the number of cases. Consequently, future research could deepen our insights across different cases. Increasing the number of interviews per case reduces potential bias by the experts. Our study could be extended in two dimensions. First, an extended version of our research could look at the interplay between factors and validate it using a Delphi study. An analysis of how our factors could be translated into measures for organizational adoption would be promising. Second, more interviews along multiple points in time would be interesting. This would allow for a longitudinal study that provides changes over time and factors could be analyzed regarding the stage of organizational adoption. We are among the first researchers to explore the phenomenon of blockchain in the financial services area. However, although our study was conducted in the financial sector, we argue for a fairly high generalizability of our results, as we are less focused on concrete applications (which might be industry specific) than on organizational adoption. The financial services sector serves as a good starting ground, since firms here are regarded as among the most affected (Nofer et al., 2017) and, hence, the adoption of blockchain is indispensable and the first actions are observable. Our insights help to advance the research stream of blockchain and connect it with existing and more established research fields. We are moving the discussion forward by building on the concept of organizational adoption (Damanpour and Schneider, 2006) and applying it to digital innovation (Fichman et al., 2014; Yoo et al., 2012).

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