UNIVERSITÄT BAYREUTH

From Adoption-Decision to Adoption: On the Successful Management of Innovating with Emerging IT Using the Example of Blockchain Technology

Dissertation

zur Erlangung des Grades eines Doktors der Wirtschaftswissenschaft

der Rechts- und Wirtschaftswissenschaftlichen Fakultät

der Universität Bayreuth

Vorgelegt

von

Julia Petra Maria Amend

aus

Fulda

Dekan:	Prof. Dr. Claas Christian Germelmann
Erstberichterstatter:	Prof. Dr. Nils Urbach
Zweitberichterstatter:	Prof. Dr. Jens Strüker
Tag der mündlichen Prüfung:	15.10.2024

"Our lessons come from the journey, not the destination."

Don Williams, Jr.

Abstract

Successful IT projects that accomplish their defined scope on time and within budget are the exception rather than the rule. Ensuring project success becomes even more challenging as soon as emergent ITs are in the project focus. One reason is the vibrant innovation discourse that accompanies these technologies and incorporates many compelling stories about their transformative potential, making a neutral assessment of the true business value difficult. Furthermore, emergent ITs are loaded with values that can either resonate or clash with the organizational culture. Another reason is the immaturity of emerging ITs, which complicates successful management, as it entails a lack of best practices, lessons learned, and technical blueprints. Thus, organizations miss guidance to avoid major mistakes and prepare the right decisions upfront during the innovation journey.

This dissertation sheds light on how organizations can make their innovation journey with emerging ITs successful by using blockchain as an example. Following three research goals, I first provide guidance for organizations for the adoption-decision of emerging IT innovations (RG1). Essay 1 provides insights into how emerging ITs can be assessed neutrally, despite the hype; it further stresses the importance of an in-depth analysis of the to-be-solved business problem. I then provide guidance for organizations for the adoption of emerging IT innovations from both a *strategic* perspective (RG2) and an *operative* perspective (RG3). Essays 2, 3, and 4 explore key strategic considerations, while Essays 5 and 6 focus on operative considerations, including the perspectives of IT project and IT portfolio management. All the essays' insights are finally delineated in a three-step approach guided by the three RGs, including dedicated recommendations for successfully managing emerging IT innovations.

With my dissertation, I support organizations on their innovation journeys with emerging ITs by providing guidance for the successful management of emergent IT innovations. The insights are highly relevant, as novel digital technologies will continually emerge, incorporating the potential for initiating the organizations' next innovation journey.

Keywords: IT innovation, digital innovation, emerging IT, blockchain technology, IT adoption, managerial considerations.

Acknowledgments

Not only does my dissertation focus on making a journey successful for organizations, it was also a very valuable, formative journey for me. It was shaped by many ups and downs, making moving forward sometimes exhausting or fairly easy. On this journey, I enjoyed the company of my academic supervisor, Nils Urbach, my co-supervisor, Jens Strüker, and my colleagues and co-authors, who guided and supported me on the way to both the required intermediate goals and the way to the summit – the successful completion of my cumulative dissertation.

As with any journey, the destination is the reason, yet most lessons are learned along the way. I have learned much, from a professional and methodological perspective to experiences, that contributed to personal growth. I would like to express my gratitude to all of you. Further, I am grateful to the University of Bayreuth and Fraunhofer FIT for providing me with an environment that made my journey possible.

Finally, I would like to thank all the wonderful and beloved people around me who accompanied and supported me, and always had my back.

Bayreuth, October 2024

Julia Petra Maria Amend

Table of Contents

Abbreviations and Initializations

AgriDAO	Cooperative-oriented DAO in the agricultural sector
AI	Artificial Intelligence
DI	Digital Innovation
DAO(s)	Decentralized Autonomous Organization(s)
DOI	Diffusion of Innovations
DLT(s)	Distributed Ledger Technology/ies
DP(s)	Design Principle(s)
DSR	Design Science Research
DT(s)	Digital Technology/ies
EU	European Union
FLORA	Federal Blockchain Infrastructure Asylum
GDPR	General Data Protection Regulation of the European Union
IoT	Internet of Things
IS(s)	Information System(s)
IT(s)	Information Technology/ies
KPI(s)	Key Performance Indicator(s)
RG(s)	Research Goal(s)
RQ(s)	Research Question(s)
TOE	Technology-Organization-Environment
TTF	Task-Technology Fit

Introduction to
From Adoption-Decision to Adoption: On the Successful Management of Innovating with Emerging IT Using the Example of Blockchain Technology

Abstract

This thesis seeks to elucidate managerial considerations on how organizations can successfully innovate with emerging IT, for which blockchain technology is the selected example of an emerging IT. The thesis contains six essays, structured along three research goals: Providing guidance for organizations for the adoption-decision of emerging IT innovations (RG1) and providing both *strategic* (RG2) and *operative* (RG3) guidance for organizations for the adoption of emerging IT innovations. In the introduction of my dissertation, I motivate the overall relevance of determining managerial considerations to successfully navigate the innovation journey with emerging IT in organizations (Section 1). I then provide fundamental theoretical foundations (Section 2). I subsequently describe the derivation of the three research goals (Section 3), present the six essays' research designs (Section 4), and summarize their findings (Section 5). I conclude with a discussion of my dissertation's results, limitations, and future research opportunities (Section 6).

Keywords: IT innovation, digital innovation, emerging IT, blockchain technology, IT adoption, managerial considerations.

Table of Contents – Introduction

1 Motivation

While it has long been known that many information technology (IT) projects fail, implying tremendous overruns over planned budgets and/or timelines (Flyvbjerg & Budzier, 2011; The Standish Group, 2020), large-scale IT project failures have not yet been remedied (Flyvbjerg et al., 2022). Ensuring IT projects' success becomes even more complicated when emerging ITs are involved due to their inherent immaturity and high uncertainty (Häckel et al., 2017; Häckel et al., 2018; Rotolo et al., 2015). For organizations, it is difficult to assess an emerging IT's true business value, reliability, and long-term viability (Enholm et al., 2022; Schlecht et al., 2021). Even more, organizations face a lack of standards and restricted interoperability as well as regulations and ecosystems that are just evolving (Hussain & Al-Turjman, 2021; Janssen et al., 2020a; Lu, 2018; Schlecht et al., 2021).

Further, emerging ITs do not come on neutral ground but are loaded with values that can either resonate or clash with an organization's culture (Kappos & Rivard, 2008; Koch et al., 2013; Roth et al., 2022b). Usually, the latter is apparent, increasing employees' change resistance, which finally weakens the technology's potential benefits (Ansari et al., 2010; Canato et al., 2013). Moreover, emerging ITs are usually accompanied by a vibrant innovation discourse, fueled by compelling stories to present an emerging IT as a solution approach to pressing business challenges, as propagated by technology gurus and consulting firms (Shiller, 2020; Swanson & Ramiller, 2004; Swanson & Ramiller, 1997). Such stories are a double-edged sword: On the one hand, they support the sensemaking of emerging ITs and their legitimization for the use or mobilization of actions for development or implementation. On the other hand, they are also vague and do not fit an organization's context well, requiring adaptations of the use case or even the development of one's own use cases (Currie, 2004; Miranda et al., 2015; Miranda et al., 2022; Swanson & Ramiller, 1997). If the discourse sours and these stories become more negative, the successful management of IT innovation projects that target adopting emerging IT (hereafter referred to as "emerging IT innovation projects") will become even more difficult.

Blockchain is a prominent example of an emerging IT (Attaran & Gunasekaran, 2019; Chatterjee & Chatterjee, 2017; Shin, 2019; Zheng & Lu, 2022). Driven by the significant

potentials promised by blockchain technology – see, for instance, Beck (2018) or Lacity (2022) – a multitude of blockchain networks and applications have emerged in both the private and the public sectors in recent years. However, many of these projects have failed and could not achieve their desired outcomes. Some failures have been widely publicized, while others have quietly faded from the spotlight. Only a few projects have been successful and serve as lighthouse projects, such as Walmart Canada's DL Freight (Lacity & Van Hoek, 2021), Chronicled's MediLedger (Mattke et al., 2019), or FLORA by Germany's Federal Office for Migration and Refugees (Amend et al., 2023; Amend et al., 2022; Amend et al., 2024; Amend et al., 2021; Roth et al., 2023).

Given the wide range of new digital technologies that are constantly emerging and rapidly evolving, organizations should know how to achieve success on the innovation journey with emerging ITs if they are to remain competitive. Thus, my dissertation seeks to shed light on *how organizations can successfully manage innovating with emerging IT using the example of blockchain technology*. With my six research essays (hereafter referred to as "essays")[1], that are part of my dissertation, I contribute to finding answers to this overall research aim.

Guided by my overall research aim, I structured my dissertation as follows: I first provide theoretical foundations on innovating with IT, emerging IT and specifically blockchain technology as a prominent example of emerging IT (Section 2). I then describe the derivation of the three research goals (RGs) as the backbone of my dissertation's structure (Section 3). I subsequently outline the research designs of all essays (Section 4), and present each essay's main results and contributions (Section 5). I conclude this introduction by discussing the dissertation's results, limitations, and future research opportunities (Section 6).

[1] As the essays result from joint work with co-authors, I use 'we' when referring to the essays and further use the past tense since those have already been published or have the status "submitted" to a scientific journal.

2 Theoretical Foundations

In this section, I will provide the necessary theoretical foundations for innovating with IT (Section 2.1), emerging IT (Section 2.2), and blockchain technology (Section 2.3) as a representative and selected example of an emerging IT.

2.1 Innovating with IT

In IS research, a multitude of concepts around innovating with IT exists. According to Kohli and Melville (2019), three concepts are crucial: *IT innovation*, *IS innovation*, and *digital innovation*. *IT innovation* focuses on the adoption and diffusion of novel IT-enabled processes, products, and services in organizations (Fichman, 2004; Kohli & Melville, 2019), from which an innovation seeks to adopt an IT artifact that already exists but is new to the organization. *IS innovation* refers to applying IT artifacts that demand major changes to organizations and result in new products, services, and processes (Fichman et al., 2014; Kohli & Melville, 2019; Swanson, 1994). For *digital innovation,* researchers proposed various definitions with different foci. The definitions of Kohli and Melville (2019) as well as Yoo et al. (2010) have a product-centric view, aiming at combining nondigital and digital products to create a new product. Hund et al.'s (2021) definition is broader, unpacking *digital innovation* as "*The creation or adoption, and exploitation of an inherently unbounded, value-adding novelty (e.g., product, service, process, or business model) through the incorporation of digital technology"* (Hund et al., 2021, p. 6).

Through the research of Kohli and Melville (2019), Yoo et al. (2010), and Hund et al. (2021), it seems as if these concepts for *digital innovation* are established and easily distinguishable from one another, yet this is not necessarily true. Other researchers have criticized the "*theoretical ambiguity and potential definition tautology*" regarding the conceptualization of *digital innovation* (Mamonov & Peterson, 2021, p. 3). It also seems that the *digital innovation* concept is more present in IS research than in other research domains (Hund et al., 2021). Further, these concepts and their uses have a time component, implying that IS researchers nowadays tend to use *digital innovation* instead of *IT innovation*, while meaning the same (Baier et al., 2023). Thus, *IT innovation* can be regarded as the "traditional" term (Baier et al., 2023). The same

holds true for the co-existing concepts of *IT* and *digital technology* (DT), for which researchers still lack a clear distinction (Baier et al., 2023). Since I also acknowledge both terms as synonymous, I use the traditional term *IT innovation* in my dissertation, except when describing other researchers' findings. For this case, I use the terms the researchers used in their endeavors – either *IT innovation* or *digital innovation*.

Shaped through the traditional term of *IT innovation*, many models have been proposed for the adoption of IT innovation. Some focus on the individual level, and others on the organizational level. For this dissertation, the adoption of IT innovation from an organizational perspective is relevant. A prominent model with also an organizational focus is the "Diffusion of Innovations" (DOI) theory, proposed by Rogers (1995). In the words of Oliveira and Martins (2011), *"DOI is a theory of how, why and at what rate new ideas and technology spread through cultures, operating at the individual and firm level"* (p. 111). Another example of an established model with an organizational focus is Tornatzky and Fleischer's (1990) technology-organization-environment (TOE) framework, which is mainly identical to DOI theory but additionally includes the perspective of environmental factors (Oliveira & Martins, 2011). Lastly, while Goodhue and Thompson's (1995) theory of task-technology fit (TTF) is less known, it is also a valuable model that contributes to a better understanding of IT adoption. Specifically, TTF theory *"builds on the idea that a technology's use or impact on performance depends on its fit or alignment with the tasks to be performed*" (Roth et al., 2023, p. 4).

Hameed et al. (2012a) consolidated these models, elucidating the terms for the adoption phases and stating that some researchers call these *initiation*, *adoption-decision*, and *implementation* (Pierce & Delbecq, 1977; Rogers, 1995; Rogers et al., 2014; Tornatzky & Fleischer, 1990), while others call them *pre-adoption*, *adoption-decision*, and *post-adoption* (Caron-Fasan et al., 2020; Hameed et al., 2012). As a result of Hameed's (2012a) work, they proposed a new, consolidated model, clustering the determinants for IT innovation adoption along the three phases *initiation*, *adoption-decision*, and *implementation*. They also illustrated that the organizational level is primarily apparent in the early process steps, whereas the individual perspective becomes important in the implementation phase.

A more recent adoption model that also includes the process-oriented view was suggested by Kohli and Melville (2019), implying that digital innovation means steps

to be taken over time. For them, relevant activities are *"initiating (triggers, opportunity identification, decision-making), developing (designing, developing, adopting), implementing (installing, maintaining, training, incentives), and exploiting (maximizing returns, leveraging existing systems/data for new purposes; Cooper & Zmud, 1990)"* (Kohli & Melville, 2019, p. 202). As outcomes, they defined *product, service*, or *process* and, as framing elements, the *external competitive environment* and the *internal organizational environment* in which digital innovation takes place (see Figure 1).

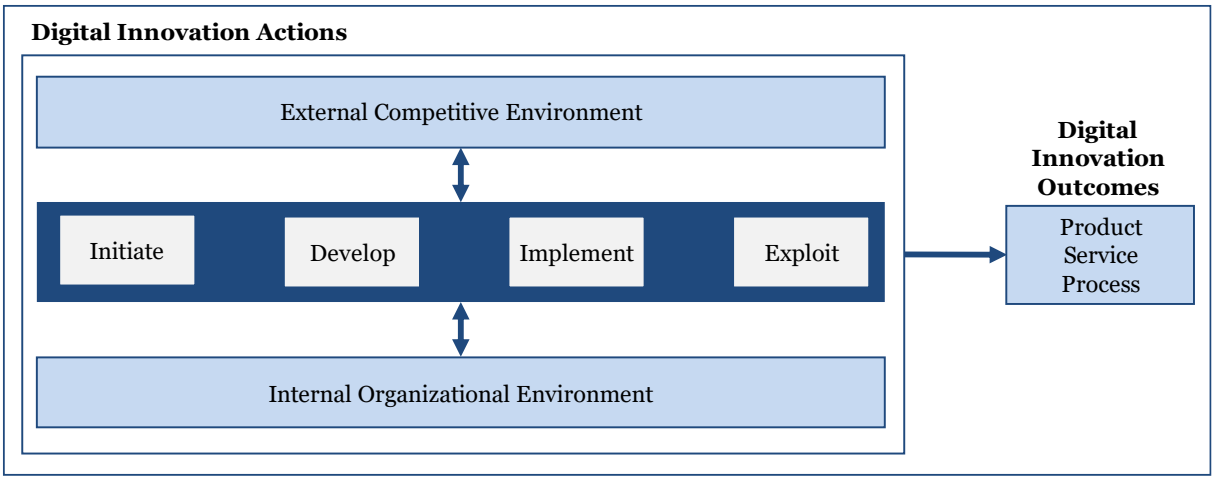

Figure 1: Theoretical framework for digital innovation based on Kohli and Melville (2019).

Besides the inconsistencies in the concepts and the terminology used, the process orientation seems to be an established, common perspective (Hameed et al., 2012; Kohli & Melville, 2019). Yet, those activities *"need not be present in all digital innovation efforts, need not occur in any sequential order and may be difficult to disentangle in practice " (Kohli & Melville, 2019, p. 202)*. Thus, for my dissertation, I summarize the different steps of the IT innovation process into two overarching steps: *adoption-decision* and *adoption*.

2.2 Innovating with Emerging IT

The successful management of the significant organizational changes required by digital innovations to generate business value is a demanding task for organizations (Holotiuk & Moormann, 2018). Thus, organizations are particularly challenged by the pace of DTs, implying that a multitude of DTs continually emerge and rapidly evolve,

decreasing the time for adaptation and innovation (Henfridsson et al., 2014; Holotiuk & Moormann, 2018; Tiwana, 2014; Yoo et al., 2010).

Recent DTs are often found in professional trend reports, in which they are often referred to as *emerging* due to their degree of novelty, such as the Gartner Hype Cycle for Emerging Technologies (Baier et al., 2023). Recent emerging ITs are, for instance, blockchain, generative AI, IoT, or quantum computing (Chipidza et al., 2023; Khan et al., 2022; Shiller, 2020; Sodhi et al., 2022; Vinsel, 2023). These have certain characteristics that distinguish them from contemporary ITs. They are radically novel, have relatively fast growth, have a coherent expert community of practice, and have a prominent impact and inherent uncertainty (Chipidza et al., 2023; Rotolo et al., 2015). Emerging ITs are not yet a must-have, and they can be emergent in one context (domain, place, or application) and be established in another (Halaweh, 2013). In short, they are innovations with the potential for radical change and transformation (Halaweh, 2013).

In the Gartner Hype Cycle, emerging ITs are not only listed, but their development can be explained, following several stages, from *technology trigger*, a *peak of inflated expectations*, to a *trough of disillusionment* and, in the best case, a move towards the *slope of enlightenment* and the *plateau of productivity* (Gartner, 2023). Gartner's stages are similar to the concepts of Abrahamson and Fairchild (1999) and Wang (2010), describing that these technologies are accompanied by fashion waves, with sharp upswing and downswing phases. Thus, early in their lifecycle, emerging ITs are typically surrounded by a thicket of exaggerated stories about their transformative potential (Abrahamson, 1991; Abrahamson & Fairchild, 1999). These stories are typically inaccurate, especially when they result from broad public discourse, and may be generated to fuel a frenzy around a technology (Shiller, 2020). Nonetheless, many organizational leaders readily buy into these stories and invest irrationally in emerging and often hyped technologies (Häckel et al., 2018). Their motivation may be the fear of missing out on a major performance gain, or a desire to polish their organization's image, which in turn can positively impact their own reputation and remuneration (Wang, 2010; Wang, P., 2010). For instance, when the Bitcoin mania was at its peak in 2017, just by announcing its intention to invest in cryptocurrency companies and rebranding, the Long Island Iced Tea Corp (which became the Long Blockchain Corp) saw its share price rise by 380% (Heaven, 2022). Such moves are risky, as emerging

ITs are typically both immature and poorly understood. Further, exaggerated stories can make ascertaining an emerging IT's real business value difficult. The consequence is often a search for a 'problem' that the technology can address or pursuing risky applications based on a new technology (Elyashiv, 2022).

Adoption becomes even more complicated when the discourse sours and becomes dominated by often equally unbalanced critical voices, which is also typical for such technologies, as they undergo certain fashion waves during their diffusion, characterized by sharp upswing and downswing phases (Abrahamson & Fairchild, 1999; Wang, 2010). As a result, the stories that surround emerging ITs are both an opportunity and a threat. On the one hand, these can facilitate an understanding of how a new technology can be employed to create business value (Swanson & Ramiller, 1997). Besides, they can also provide a common ground for interpreting and legitimizing emerging IT. They can also be valuable for mobilizing actions to realize and apply emerging IT. On the other hand, these stories complicate the neutral assessment of an emerging IT's potential and limitations. Moreover, emerging ITs can also be loaded with values (Kappos & Rivard, 2008; Koch et al., 2013; Roth et al., 2022b). Thus, adopting organizations must be aware that those can either resonate or clash with their organizational culture, supporting successful implementation or posing a major hurdle. When these values clash with an organization's culture, resistance among staff and stakeholders is as likely possible as a decreased willingness to adapt to the new technology, which ultimately undermines the technology's potential benefits (Ansari et al., 2010; Canato et al., 2013). Given these hurdles, only a few emerging IT innovations will become mature and reach the *slope of enlightenment* and the *plateau of productivity* (Fenn & Raskino, 2008; Häckel et al., 2018; Wang, 2010).

2.3 Innovating with Blockchain Technology

The peculiarities of emerging ITs match blockchain technology well. Blockchain has not only been part of Gartner's Hype Cycle since its inception, but many exaggerated stories about blockchain's transformative potential in the public innovation discourse have existed and are still apparent (Iansati & Lakhani, 2017). Blockchain as a distributed ledger technology (DLT) is characterized by decentralization, which allows data to be recorded across nodes, ensuring data security and immutability (Beck et al.,

2018; Rossi et al., 2019). Although its first application, the cryptocurrency Bitcoin, made blockchain famous, it gained even more attention when blockchains could support simple programming logic, known as smart contracts (Lacity, 2022). As these smart contracts and blockchain have had a high media presence, a vast of stories regarding blockchain have emerged (Halaburda et al., 2023; Miranda et al., 2022).

Some stories focused on blockchain's technical capabilities, for instance, enhancing the efficiency and transparency of information-sharing across organizations (Roth et al., 2023; Sarker et al., 2021). Others have concentrated on the underlying values, such as increasing trust in digital interactions (Beck et al., 2018; Utz et al., 2023). Owing to blockchain's ability to support process logic in the form of smart contracts, it was also promoted as useful to automate business processes (Halaburda et al., 2023) or to reduce disputes in cross-organizational process relationships (Ellinger et al., 2024). As a result, blockchain's promises have motivated many organizations to initiate projects, yet they have struggled to realize these.

The reasons are manifold since many barriers to the adoption of blockchain exist, for which various classification proposals are apparent (Janssen et al., 2020b; Schlecht et al., 2021; Toufaily et al., 2021). While these classification proposals for the barriers to the adoption of blockchain are largely consistent with one another, they sometimes use other terminology or summarize the aspects differently. First, technical barriers exist, including hurdles regarding interoperability, standardization, security, data privacy, or scalability (Schlecht et al., 2021; Toufaily et al., 2021). Further, barriers can have a political component since regulations are still missing or compliance with existing laws must be achieved. This was the case for the European Union's General Data Protection Regulation (GDPR) (Akanfe et al., 2024; Schlecht et al., 2021), adding additional complexity during organizations' innovation journeys. Toufaily et al. (2021) regard these political aspects as environmental challenges, aside from ecosystem readiness or network effects and inter-organizational connectedness. Also, organizations must successfully manage economic challenges, resulting from coordination or governance costs (Beck et al., 2018; Schlecht et al., 2021). Finally, socio-cultural challenges pose another major obstacle (Schlecht et al., 2021), including governance and leadership readiness or organizational readiness (Toufaily et al., 2021).

3 Research Goals and Dissertation Structure

In my dissertation, I aim to identify the keys to successfully innovating with emerging ITs, using the example of blockchain technology. Hence, I derived three research goals (RGs) that guide my dissertation and support me in finding answers to my overall research aim. The three RGs are:

(RG1) *Providing guidance for organizations for the adoption-decision of emerging IT innovations.*

(RG2) *Providing strategic guidance for organizations for the adoption of emerging IT innovations.*

(RG3) *Providing operative guidance for organizations for the adoption of emerging IT innovations.*

Guided by the three RGs and the assignment of my essays to those RGs, I structured my dissertation. Figure 2 provides an overview of my dissertation's structure and the six essays.

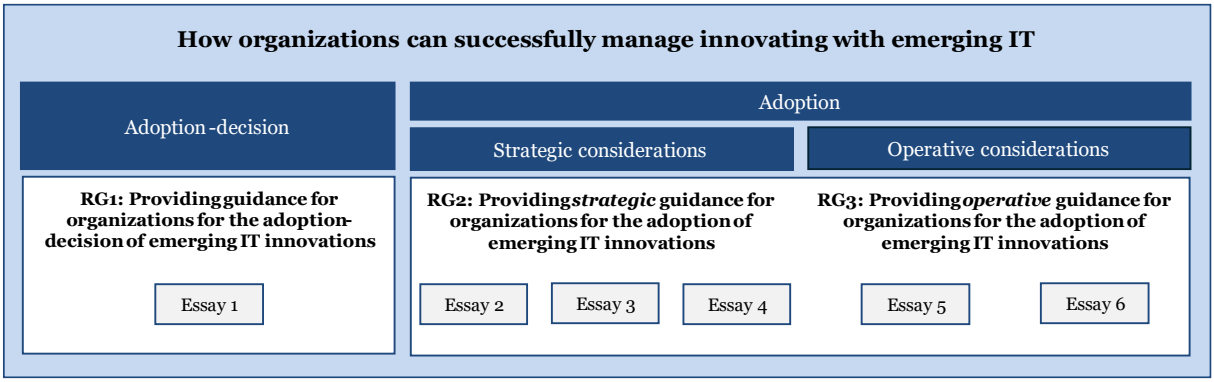

Figure 2: Dissertation structure considering the research goals and the six essays.

I will now describe the rationale of the three RGs and the research questions regarding each essay along the three RGs.

3.1 Providing Guidance for Organizations for the Adoption-Decision of Emerging IT Innovations

Owing to emerging ITs' immaturity, high uncertainty and risk are present, making it difficult for organizations to estimate the organizational impacts of a potential adoption (Häckel et al., 2017; Häckel et al., 2018). These circumstances often leave

organizations with little knowledge of an emerging IT's true business value, technical blueprints, or best practices for addressing the never-raised questions and upcoming challenges (Enholm et al., 2022; Schlecht et al., 2021). Even though innovating with emerging ITs may seem risky or even overly risky, organizations should not be risk-averse per se; instead, they should neutrally assess the potentials and limitations of the to-be-adopted emerging IT. This is particularly important since a successful emerging IT innovation project could help organizations realize competitive advantages in the long term and even optimize their IT project portfolio (Fridgen & Moser, 2013; Häckel et al., 2017). Thus, such a neutral assessment is required to make an investment decision for or against initiating an emerging IT innovation project with awareness and rationality.

Further, it is crucial to gain a deep understanding of the to-be-solved business problem, choose the right technology option, and determine solution objectives as well as evaluation criteria to measure success (Fenn & Raskino, 2008). While this procedure is nothing new for IT projects in general, it becomes even more important when emerging ITs are in focus. Starting with the extensive investigation of the to-be-solved problem prevents organizations from buying into exaggerated promises of emerging ITs propagated in the public innovation discourse and a desperate search for a suitable 'problem' for the favored emerging IT (Elyashiv, 2022). Nonetheless, developing a use case applying the emerging IT in the chosen organizational (problem) context is also a suitable procedure (Fridgen et al., 2018a, 2018b; Hofmann et al., 2020). Moreover, the in-depth analysis of the business problem supports organizations to assess whether an emerging IT and its inherent characteristics can, in fact, sufficiently and successfully address the problem's specifics.

In this early phase of emerging ITs, researchers predominantly take on the responsibility to extensively assess emerging ITs from multiple perspectives to gain a deeper understanding of their potentials and limitations – from both a technical and a business perspective. Thus, researchers produce prototypes and technical blueprints, propose design principles or theories, or provide guidance for the evaluation. An established methodological approach that IS researchers often choose is the Design Science Research (DSR) paradigm (Vom Brocke & Maedche, 2019), for which the thorough determination of the problem is the mandatory first step (Maedche et al., 2019; Vom Brocke & Maedche, 2019; Vom Brocke et al., 2020).

With Essay 1, we followed the DSR paradigm that allowed us to systematically and iteratively design, develop, and evaluate a decentralized autonomous organization (DAO) in the agricultural sector using cooperative principles. This novel yet unprecedented form of organization, the cooperative-oriented DAO, which we named AgriDAO, is governed by smart contracts and is technically enabled by blockchain technology as the underlying infrastructure. We thus explore how an emerging IT (blockchain-enabled DAO) can contribute to solving an urgent real-world problem (lacking cooperation of smallholders in developing countries).

In Essay 1, we asked:

> *How to design an information system that facilitates cooperation of smallholders in developing countries?*

In the case organizations have neutrally assessed the potentials and limitations of an emerging IT and have decided to start the adoption, organizations should be aware of some major hurdles on the innovation journey, for which strategic considerations are required.

3.2 Providing Strategic Guidance for Organizations for the Adoption of Emerging IT Innovations

Spurred on by the big promises of emerging ITs, many organizational leaders in both the public and the private sectors have initiated a plethora of emerging IT innovation projects. Yet failures were more common than success. This is valid across existing emerging ITs, such as blockchain (Alabdulkarim, 2023) or AI (Afzal, 2014; Westenberger et al., 2022; Yampolskiy, 2019). As I selected blockchain as an example of emerging IT, I solely focus on blockchain failures and success stories. A prominent example of failure was TradeLens, a private blockchain application developed by IBM and Maersk for the international container shipment industry (Kjærgaard-Winther, 2022). Other large-scale blockchain failures include the Marco Polo Network (Wragg, 2023b) and Contour (Wragg, 2023a). Independent of the sector, only a few blockchain projects have been successful and made it from the prototype and pilot phases to a productive system, creating true business value. Three prominent successful blockchain applications are Walmart Canada's DL Freight (Lacity & Van Hoek, 2021), Chronicled's MediLedger (Mattke et al., 2019), and FLORA by Germany's Federal Office of Migration and Refugees (Amend et al., 2023; Amend et al., 2022; Amend et

al., 2024; Roth et al., 2023). Researchers and practitioners can learn much from these successful emerging IT innovation projects. For instance, organizations can draw on lessons learned and best practices to avoid some major mistakes, preparing the proper considerations and decisions upfront.

When emerging IT innovation projects succeed, it is very valuable to make their insights widely accessible. FLORA, a project by Germany's Federal Office of Migration and Refugees, is an example of success. The Federal Office innovated with blockchain technology to support coordination and collaboration in the asylum procedure. Specifically, FLORA should enhance information-sharing across various authorities at the federal, state, and municipal levels. With Essays 2, 3, and 4, we provide deep insights into the journey of the Federal Office of Migration and Refugees to innovate with and adopt a private, permissioned blockchain. Specifically, we shed light on the relevant considerations, key decisions, challenges, and solution strategies initiated along the way. Each essay has its own dedicated focus, which I will now delineate.

First, organizations must carefully prepare the setup for an emerging IT innovation project when multiple organizations are involved. This demands that organizations perform a balancing act between being tolerant of errors and defining clear termination criteria (Wheatley & Wilemon, 1999). For instance, cost estimations or governance considerations play an important role in emerging IT innovation projects (Beck et al. 2018; Hameed et al. 2012a; Schlecht et al. 2021). In particular, the thorough preparation of key considerations and the 'right' decisions to jointly develop and maintain a cross-organizational IT system based on blockchain as emerging IT are critical for success. Thus, in Essay 2, we asked:

> *How can a cross-organizational IT system using blockchain technology be developed and maintained?*

Next, the fit between the to-be-adopted technology and its inherent properties regarding the organization's structure and its existing IT systems and processes must be considered. In the literature, this mapping is known as *technical fit* (Ansari et al., 2010; van Grinsven et al., 2016). An established underlying theoretical concept is TTF (Goodhue & Thompson, 1995; Zigurs & Buckland, 1998); yet this theory has not yet incorporated the cross-organizational perspective. Knowing that a technical fit between emerging ITs and adopting organizations is critical for the adoption, we aimed to more closely investigate, why blockchain as emerging IT seems to fit well to federally

structured organizations. Thus, with Essay 3, we aimed to find answers to the following question:

> *Why do organizations in federally structured government systems adopt blockchain?*

Finally, organizations must be aware that ensuring technical fit is crucial yet insufficient for the successful adoption of emerging ITs. The need for *political fit* and *cultural fit* is also urgent (Ansari et al., 2010; Canato et al., 2013; Piazza & Abrahamson, 2020; Roth et al., 2022a). Therefore, organizations must take more into consideration when adopting emerging ITs. This should start with the identification of a suitable use case, which is a challenging task due to the multitude of values associated with emerging ITs (Kappos & Rivard, 2008; Koch et al., 2013; Roth et al., 2022b). Further, their transformative potentials are lively discussed in the public innovation discourse (Shiller, 2020; Swanson & Ramiller, 2004; Swanson & Ramiller, 1997), additionally complicating a neutral technology assessment. Next, the organization's adoption context must be thoroughly investigated regarding structural and cultural barriers and facilitators, which differ widely between the private and the public sectors (Bozeman & Bretschneider, 1986; Heintze & Bretschneider, 2000). Lastly, emerging IT innovation projects are particularly prone to criticism, since the adoption-decision may be influenced not only by performance considerations but also by increasing the public image of the organization or one of the responsible organizational leaders (Wang, 2010). Thus, such projects are often criticized for serving personal and career goals instead of creating true business value, highlighting the necessity to get the relevant stakeholders on board, particularly the top managers and those who have raised harsh criticisms (Hameed et al., 2012).

To elucidate the key non-technical challenges, their resolution strategies as well as lessons learned, in Essay 4 we asked:

> *How can organizations successfully innovate with emerging IT?*

Organizations that only focus on tackling the strategic considerations will very likely struggle to successfully adopting emerging ITs. Even though those strategic considerations are pivotal for success, they are insufficient. Instead, organizations should further know which operative considerations have to be made, taking into account the IT project management and IT portfolio management perspective.

3.3 Providing Operative Guidance for Organizations for the Adoption of Emerging IT Innovations

Organizations should (re)define success for emerging IT innovation projects. It is no secret that IT project failure is more of a rule than an exception. The Standish Group (2020) highlighted that only 35% of all IT projects are successful regarding budget and time. Also, Flyvbjerg et al. (2022) confirmed that project cost overruns remain unresolved. Successfully managing IT projects becomes even more challenging when emerging ITs such as blockchain or AI are involved, because an emerging IT's inherent immaturity and uncertainty complicate their successful management (Häckel et al., 2017; Häckel et al., 2018; Rotolo et al., 2015).

Old paradigms such as the *Iron Triangle* of project management (time, budget, and scope) (Wit, 1988) may not be appropriate or even insufficient for measuring emerging IT innovation projects' success. Even more, recent research questions the Iron Triangle's suitability to measure project success at all (Atkinson, 1999; McLeod et al., 2012; Shenhar et al., 2001). For instance, projects that were finalized on time, within budget, executed as planned, or reached planned performance targets may still be unsuccessful as they may fall short of realizing benefits for organizations or customers (Dvir et al., 2003). Further, Shenhar et al. (2001) stated that the success criteria's importance depends on the degree of technological uncertainty, which is present in emerging technologies (Rotolo et al., 2015) such as blockchain. Yet, the literature has lacked an overview of suitable criteria to measure success in emerging IT innovation projects generally, and specifically in blockchain projects.

Thus, in Essay 5, we asked:

Which success criteria can be used for the evaluation of blockchain projects?

How do success criteria differ in their relative importance?

While an initiated emerging IT innovation project should be successful, organizations must be aware that such projects are embedded in a complex IT portfolio. This means that overall organizational success also depends on the successful management of the IT portfolio as a whole, since interdependencies (e.g. resource conflicts) between IT projects can bring down a single IT project, multiple IT projects, and, in the worst case, the entire IT portfolio (Beer et al., 2015). This interconnectedness of IT projects within an IT portfolio is often referred to as *complex networks* (Beer et al., 2015; Neumeier et

al., 2018; Radszuwill & Fridgen, 2017). In such complex networks, these interdependencies induce a specific type of risk, the so-called *systemic risk* (Ellinas, 2019; Ellinas et al., 2015). Even though systemic risk has been comprehensively investigated in various domains – including the financial sector, critical infrastructures, supply chain networks, IT security in smart factories, and epidemiology – research on analyzing systemic risk in IT portfolios has remained immature (Guggenmos et al., 2019). This is particularly critical since organizations need means to analyze systemic risk in IT portfolios to make a profound project selection decision. For instance, emerging IT innovation projects may seem unattractive at first glance owing to the high number of resources needed and the lack of performance and profit realization in the early stages (Häckel et al., 2018). Yet these may contribute to an organization's long-term competitiveness and performance (Wang, 2010). Thus, it may be reasonable to include these in the IT portfolio (Fridgen & Moser, 2013; Häckel et al., 2017). Even though systemic risk must be thoroughly analyzed for the successful management of IT portfolios, an overview of suitable risk measures for analyzing systemic risk in IT portfolios with a focus on emerging IT innovation projects has been missing.

Thus, in Essay 6 we asked:

> *Which risk measures are suitable for analyzing systemic risk in IT portfolios with a focus on emerging IT innovation projects?*

Table 1 again provides an overview of the essays in my dissertation, further enriched with information regarding the research questions, publication outlets, journal rankings, and publication status of the essays. For an overview of other research outcomes, please see Appendix 8.2.

Table 1: Overview of the six essays along the three research goals.

Essay Titles	Research Questions	Publication Outlets	VHB JQ3/ Scopus	Publication Status
RG1: Provide guidance for organizations for the adoption-decision of emerging IT innovations				
Essay 1: Facilitating Cooperation of Smallholders in Developing Countries: Design Principles for Blockchain-Based Cooperatives	How to design an information system that facilitates cooperation of smallholders in developing countries?	Information Systems and e-Business Management	C/ 73%	Published
RG2: Provide *strategic* guidance for organizations for the adoption of emerging IT innovations				
Essay 2: Bringing Government into the Digital Age: Insights from Germany's Asylum Procedure	How can a cross-organizational IT system using blockchain technology be successfully developed and maintained?	MIS Quarterly Executive	B/ 94%	Accepted
Essay 3: Blockchain as a Driving Force for Federalism: A Theory of Cross-Organizational Task-Technology Fit	Why do organizations in federally structured government systems adopt blockchain?	International Journal of Information Management	C/ 99%	Published
Essay 4: Recoding Asylum Management – How Germany's Federal Government Approached Innovation with Emerging IT	How can organizations successfully innovate with emerging IT?	/	/	Submitted to a scientific journal
RG3: Provide *operative* guidance for organizations for the adoption of emerging IT innovations				
Essay 5: You Can't Manage What You Can't Define: The Success of Blockchain Projects beyond the Iron Triangle	RQ1: Which success criteria can be used for the evaluation of blockchain projects? RQ2: How do success criteria differ in their relative importance?	International Conference on Information Systems	A/ n./a.	Published
Essay 6: Do Emerging IT Innovation Projects Endanger Your IT Portfolio? An Overview of Risk Measures to Quantitatively Analyze Systemic Risk in IT Portfolios	Which risk measures are suitable to analyze systemic risk in IT portfolios with a focus on emerging IT innovation projects?	/	/	Submitted to a scientific journal

4 Research Designs

This dissertation consists of six essays, each contributing to answering my overall research aim. I will now present the essays' research designs, for which Table 2 provides an overview.

Table 2: Research designs of the six essays.

Title	Research Designs
RG1: Provide guidance for organizations for the adoption-decision of emerging IT innovations	
Essay 1: Facilitating Cooperation of Smallholders in Developing Countries: Design Principles for a Cooperative-Oriented Decentralized Autonomous Organization	**Design science research:** • Literature analysis as basis for identifying the existing challenges and the practical relevant problem as well as determining the solution objectives • Iterative development of a prototype for a cooperative-oriented DAO • Interviews with experts to evaluate and iterate on the prototype • Determination of design principles to contribute to the existing IS knowledge base
RG2: Provide *strategic* guidance for organizations for the adoption of emerging IT innovations	
Essay 2: Bringing Government into the Digital Age: Insights from Germany's Asylum Procedure	**Longitudinal single-case study:** • Triangulation of three data sources: semi-structured interviews, project documentation, and direct observations • Deriving a deep understanding of key considerations for successfully developing and maintaining a cross-organizational IT system using blockchain as an emerging IT
Essay 3: Blockchain as a Driving Force for Federalism: A Theory of Cross-Organizational Task-Technology Fit	**Longitudinal single-case study:** • Triangulation of three data sources: semi-structured interviews, project documentation, and direct observations • Deriving a deep understanding of adoption drivers of blockchain technology
Essay 4: Recoding Asylum Management – How Germany's Federal Government Approached Innovation with Emerging IT	**Clinical research approach:** • Triangulation of three data sources: semi-structured interviews, project documentation, and direct observations • Deriving a deep understanding of the challenges and resolution strategies along the journey of innovating with emerging ITs
RG3: Provide *operative* guidance for organizations for the adoption of emerging IT innovations	
Essay 5: You Can't Manage What You Can't Define: The Success of Blockchain Projects Beyond the Iron Triangle	**Interview study:** • Semi-structured interviews with blockchain experts to shed light on success dimensions and criteria • Literature analysis in the fields of blockchain and project management to triangulate the conceptualization of blockchain success factors
Essay 6: Do Emerging IT Innovation Projects Endanger Your IT Portfolio? An Overview of Risk Measures to Quantitatively Analyze Systemic Risk in IT Portfolios	**Structured literature review:** • Literature search in top IS and PM journals and scientific databases • Identification of suitable risk measures and evaluation criteria for analyzing systemic risk in IT portfolios with a focus on emerging IT innovation projects

In Essay 1, we utilized the DSR paradigm (Gregor & Hevner, 2013; March & Smith,

1995). The selected research approach allowed us to iteratively design, develop, and evaluate a unique artifact to solve a relevant real-world problem (Hevner, 2007). Specifically, we followed the six steps of the DSR process, as suggested by Peffers et al. (2007): *problem identification and motivation, design objectives, design and development, demonstration, evaluation*, and *communication*. Thus, we started by determining the relevant real-world problem based on a literature analysis, consisting of the core challenges of smallholders and the structural deficits of cooperatives as a potential organizational form. We then determined a set of design objectives using literature from the fields of DAOs, blockchain technology, organization theory, development study, and agriculture research. In the first step, all authors separately reflected on these literature findings to generate design objectives. Afterward, those results were discussed in a joint workshop session. The same procedure was chosen for identifying evaluation criteria. On this basis, we developed our artifact, a cooperative-oriented DAO, which we named AgriDAO, as an initial technical prototype. In the subsequent evaluation, consisting of expert interviews, we targeted the validation of our artifact's effectiveness and technical feasibility, which we used as input to iterate on our artifact. The knowledge gained during this highly iterative DSR process allowed us to finally propose eight design principles for the future development of cooperative-oriented DAOs.

Essays 2 and 3 were longitudinal single-case studies, following the recommendations of Yin (2014). For those two essays, the FLORA project - a blockchain project initiated by the Federal Office of Migration and Refugees - was selected as a case. The FLORA project is a mature project that successfully adopted blockchain as an emerging IT. Since its inception in January 2018, it has gone far beyond the proof of concept and prototype phases. After FLORA's successful pilot phase, it was rolled out across all 16 states of Germany and is used in day-to-day operations. Thus, the FLORA project offers great possibilities to gather rich insights along the innovation and adoption journey of blockchain technology as emerging IT and was selected as a case. The decision to use a single-case study as a research design was guided by Eisenhardt and Graebner (2007), Eisenhardt (1989), and Yin (2014). For the triangulation, we used semi-structured interviews, project documentation, and direct observations as data input, which Yin (2014) recommended as potential sources of evidence.

The focus of Essay 2 was on key considerations for developing and maintaining a cross-

organizational IT system. Our case study's primary data consisted of 98 recorded, semi-structured interviews at different points in the FLORA project. Regarding selecting our interview partners, we paid close attention to covering a broad range of perspectives (i.e. different organizational levels or different degrees of project involvement) (Huber & Power, 1985). We included perspectives from Federal Office employees, external consultants, researchers, and IT service providers. The interviews were semi-structured, for which we prepared an interview guide with non-leading, open questions to strengthen the interviewees' engagement and to be able to talk openly and freely about the case (Myers & Newman, 2007). We adapted our questions to better match the interviewees' roles. We also adapted some questions during the interview process as our understanding of the case improved. For the data analysis, we followed the recommendations of Corbin and Strauss (1990) for grounded theory-building, using a two-stage coding process consisting of an initial open coding followed by axial coding. The interview findings were complemented by two further data sources: First, we could draw on a huge amount of project documentation (1,000+ pages), consisting of conceptual and legal documents (200+ pages), meeting minutes, technical documentation, and user support documents (600+ pages) as well as whitepapers and evaluation reports (200+ pages). Second, we could use our insights gathered through direct observations from regular sprint reviews, project workshops, management meetings, and events.

In Essay 3, we sought to gain a deep understanding of blockchain adoption drivers. Thus, we conducted 25 semi-structured interviews that lasted between 30 and 60 minutes. We also used an interview guide to ensure that the subject area was sufficiently covered (Rubin und Rubin 2012), but remained open to shifting the interview focus in relation to an interviewee's knowledge and expertise (Myers & Newman, 2007). We ensured that we included multiple perspectives on the case, as we included, among others, technical experts and those with strong expertise in the asylum procedure. Further, we considered different hierarchical levels and involved interviewees with close project involvement or a more outsider perspective. Unlike in Essay 2, we used a three-stage coding process of open, axial, and selective coding (Corbin & Strauss, 1990). To complement our findings, we analyzed a huge amount of project documentation (e.g. project documentation on Confluence, technical concepts, functional specifications, or publicly available reports) and gained deep insights through direct observations (e.g. sprint reviews or project workshops).

Regarding Essay 4, we selected a clinical IS research approach to thoroughly investigate the challenges and resolution strategies along the journey of innovating with emerging ITs and, specifically, adopting blockchain technology. Our chosen clinical research case was also the blockchain project initiated by the Federal Office of Migration and Refugees – FLORA. This approach was suitable and intuitive, as three authors provided advisory services to the FLORA project. We worked closely with Federal Office colleagues to successfully navigate the challenges of innovating with blockchain as a prominent example of an emerging IT. Thus, we built strong relationships based on trust, enhancing the practitioners' willingness to share insights (Schein, 2008). Our focus in the FLORA project was to support the Federal Office in finding solutions for the upcoming adoption challenges. This "helping nature" of researchers is common for clinical research (Baskerville et al., 2023; Rousseau et al., 2008), and this deep involvement allowed us to gather rich insights of great value for other researchers and practitioners. Similarly to Essays 2 and 3, we used three data inputs: semi-structured interviews, project documentation, and direct observations. We conducted 98 semi-structured interviews between 2018 and 2023, including a broad range of perspectives on the case. We then used a two-stage coding process, as in Essay 2, again following Corbin and Strauss (1990). We focused on a better understanding of the challenges and resolution strategies of an emerging IT innovation project to navigate these successfully. The first coding stage was open coding, followed by axial coding. We examined 1,000+ pages of project documentation to complement our interview findings and could draw on our direct observations.

In Essay 5, we conducted an interview study through which we aimed to examine success criteria, their dimensions, and project management in blockchain software development projects. Considering this research aim of gathering in-depth information to determine dimensions and potential relationships in a new and complex context, we deemed a qualitative research approach to be appropriate (Miles & Huberman, 1994). Our primary data source was 12 semi-structured interviews to better understand blockchain projects and their success criteria (Myers & Newman, 2007). All the interviewees were specialists in blockchain projects with strong expertise based on their number of projects or leadership roles (Bhattacherjee, 2012). The design of our interview guide, exclusively made up of open-ended questions, encouraged the interviewees to talk freely (Bhattacherjee, 2012; Myers & Newman, 2007). The recorded interviews were transcribed and then analyzed, again following Corbin and

Strauss (1990). To triangulate our conceptualization, we compared our initial categorization to the project management literature (Flick et al., 2004). As a result, we could determine six success dimensions and 29 success criteria. In the next step, we evaluated the relative importance of the dimensions using a five-point Likert scale. We also contacted all our interviewees to ask them for a separate evaluation of all success criteria for their project. Specifically, we provided them with our framework and the success dimensions with their criteria to determine which success criteria were most relevant to them. After iterative discussions with the author team, we determined a numerical evaluation of the relevance of the success dimensions for each blockchain project. Due to the great scope range of these projects, we classified them along their project stage.

Finally, in Essay 6, we sought to determine suitable risk measures to analyze systemic risk in IT portfolios with a focus on emerging IT innovation projects. We performed a structured literature review to identify risk measures as well as evaluation criteria. Specifically, we searched in top PM journals (stream 1), top IS journals (stream 2) and scientific databases (stream 3). For all streams, we used the following search string as query: ("project" OR "IT project" OR "IT portfolio") AND ("systemic risk" OR "cascade failure"). For stream 1, we searched seven top PM journals: *International Journal of Project Management*; *Project Management Journal*; *International Journal of Information Systems and Project Management*; *Project Leadership and Society; Journal of Engineering, Project and Production Management*; *International Journal of Information Technology Project Management;* and *International Journal of Managing Projects in Business*. Only four of the initial 13 potentially relevant studies were relevant after screening the title, abstract, and full text as well as checking duplicates. Regarding stream 2, we utilized the Senior Scholars' Basket of Journals published by the Association for Information Systems (AIS) and considered eleven IS journals: *Decision Support Systems*, *European Journal of Information Systems*, *Information & Management*, *Information and Organization*, *Information Systems Journal*, *Information Systems Research*, *Journal of the AIS*, *Journal of Information Technology*, *Journal of MIS*; *Journal of Strategic Information Systems*; and *MIS Quarterly*. Of the initial 25 studies, none were relevant to our research work. For stream 3, we conducted our search in three major scientific databases: *ScienceDirect; AIS Electronic Library;* and *Institute of Electrical and Electronics Engineers (IEEE Xplore)*. This search yielded 596 studies, four of which were relevant after checking

duplicates and screening titles, abstracts, and the full text. By performing a forward and backward search, guided by Webster and Watson (2002), we could add three more relevant studies to our investigation. While three of these 11 studies focused on risks in projects in general, eight focused on dedicated risk measures for IT portfolios and, therefore, comprised our final literature set. To determine our evaluation criteria, we again built on our structured literature review's findings, predominantly utilizing the research work from Wolf (2015) as inspiration and input that we updated and enriched.

5 Summary of the Essays' Results

This section provides an overview of the six essays' results. All contribute to a better understanding of how organizations can successfully manage innovating with emerging ITs.

5.1 Essay 1: Facilitating Cooperation of Smallholders in Developing Countries: Design Principles for a Cooperative-Oriented Decentralized Autonomous Organization

In Essay 1, we adhered to the DSR approach to iteratively design, develop, and evaluate a cooperation-oriented DAO – our AgriDAO. We utilized the DSR approach as guidance for systematically assessing an emerging IT's potentials and limitations regarding solving a real-world problem. Through an in-depth analysis of the problem based on a literature analysis, we found that smallholders face severe structural obstacles and an environment that prohibits effective and efficient cooperation among them. From this pressing real-world problem, we came up with the concept of decentralized autonomous organizations (DAOs), governed by smart contracts and technically enabled by blockchain technology as the underlying infrastructure, to facilitate cooperation between smallholders. Even though researchers knew much about the benefits of DAOs in various contexts, a DAO that makes use of cooperative principles was new. We designed, developed, and evaluated a cooperative-oriented DAO in the agricultural sector – the AgriDAO. Regarding the evaluation, we sought to investigate effectiveness and technical feasibility, allowing us to rigorously assess an emerging IT's potentials and limitations. We delineated the design knowledge we gained in our research process in eight design principles (DPs).

With this essay, we aimed to enrich the existing design knowledge by introducing a novel artifact and proposing DPs (Seckler et al., 2021). We make three primary contributions: First, our proposed novel artifact, the AgriDAO, provides design guidance for cooperative-oriented DAOs in the agricultural sector. Second, by evaluating our artifact's effectiveness and technical feasibility, we gained insights into the potentials and limitations, which are valuable design inputs for future developments of such organizations. Third, we proposed eight DPs for cooperative-oriented DAOs, which, to our best knowledge, are unprecedented and mark the starting

point for vibrant discourse and thorough exploration of this new organization form by researchers and practitioners.

5.2 Essay 2: Bringing Government into the Digital Age: Insights from Germany's Asylum Procedure

In Essay 2, we aimed to gain a better understanding of key considerations for successfully developing and maintaining a cross-organizational IT system using blockchain as an example of an emerging IT. We regarded FLORA, a blockchain-based inter-governmental IT system, as an appropriate case to gather insights for such cross-organizational IT systems. In a single-case study, we closely examined how the Federal Office overcame the challenges of building a cross-organizational IT system with blockchain as an emerging IT. We also present key decisions along FLORA's implementation journey as well as its architecture, governance, and positive outcomes. This extensive examination enabled us to find the keys to success for cross-organizational IT systems that apply an emerging IT. They are:

- **Recommendation 1: Determine the suitability of decentralized over centralized solutions.** A centralized IT solution often seems to be cost-effective compared to a decentralized approach, but the hidden costs of a centralized IT solution (e.g. caused by coordination and standardization efforts) can be substantial.
- **Recommendation 2: Advocate for modularity to break up multilayered legacy architectures.** Owing to the multiple layers and complexities of legacy systems, a new IT system should emphasize loose coupling and modularity to contribute to maintainability and updatability.
- **Recommendation 3: Start with a Software-as-a-Service model and then gradually move to a flexible integration model.** To not endanger the development and maintenance of a cross-organizational IT system, one organization should take the lead and should be predominantly responsible for the technical and financial concerns (a 'one-for-all' approach).

Our essay contributed to a deeper understanding of how organizations can develop and maintain cross-organizational IT systems using blockchain as an emerging IT. We also elucidated which considerations are key for initiating emerging IT innovation projects.

5.3 Essay 3: Blockchain as a Driving Force for Federalism: A Theory of Cross-Organizational Task-Technology Fit

In Essay 3, we explored the adoption drivers of blockchain technology. Specifically, we sought to answer why organizations in federally structured government systems adopt blockchain, following a single-case study approach. Through a comprehensive literature review, we identified four organizing principles of federally structured governments (*empowerment, separation of competencies, cooperation and coordination*, and *organizational flexibility*) as well as key technological properties associated with private blockchain (*secure and distributed data storage, selective transparency, reliable information-sharing and process automation*, and *adaptability*). We then analyzed the relationships between these in the FLORA project context based on TTF theory (Goodhue & Thompson, 1995; Zigurs & Buckland, 1998) and found that a close fit exists, which is also known as 'technical fit' in literature. Based on our findings, we proposed the following three propositions:

- **Proposition 1:** In cross-organizational federal contexts, tasks need to be conceptualized more broadly as task structure.
- **Proposition 2:** Private blockchain frameworks offer a close task-technology fit.
- **Proposition 3:** Blockchain technology can function as a socio-technical agent.

We made several theoretical contributions. First, we could demonstrate that blockchain adoption can be desirable even if a trust issue between the involved organizations is absent. Even more, our research showed that TTF can be a key driver of blockchain adoption. Second, through our selected case of blockchain adoption in federally structured contexts, we enriched the body of existing case studies on blockchain adoption. Third, based on our findings, we advocated for more research on blockchain's properties as a more practical perspective instead of focusing too vehemently on blockchain's characteristics, as our identified properties either reinforce or integrate blockchain characteristics.

Aside from these theoretical contributions, we also contributed to practice. First, our insights may support decision-makers in choosing the 'right' technology for a specific adoption context or identifying promising blockchain adoption contexts. Second, we advocate that decision-makers not exclusively focus on tasks and technology to assess the TTF (technical fit); instead, they should also pay close attention to task-related and

technology-related aspects. For instance, a dedicated governance approach may be required to align technical properties with federal organizing principles, making a centralized IT system undesirable even when it would be easier to implement and maintain. Last, decision-makers must be aware of TTF's dynamics, implying that an initial good fit between task and technology may change over time. Thus, TTF must be continually assessed, potentially resulting in adopting the technology in use or reorganization to retain a fit.

5.4 Essay 4: Recoding Asylum Management – How Germany's Federal Government Successfully Approached Innovation with Emerging IT

In Essay 4, we investigated how innovating with an emerging IT, specifically with blockchain technology, can successfully be managed. For our analysis, we built on a six-year clinical research project, the blockchain-based system for Germany's asylum procedure (FLORA) initiated by the Federal Office for Migration and Refugees. We saw that the environment can pose significant barriers to innovation. In the public sector, organizations predominantly struggle with substantial structural and cultural barriers that can endanger IT innovation efforts. As examples of structural barriers tight legal frameworks, complex IT architectures, rigid budgeting procedures, and limited skills and capabilities are worth mentioning. In terms of cultural barriers, a bureaucratic stewardship culture, including risk aversion and resistance to change, is noteworthy. We also found that identifying a use case and getting skeptical stakeholders on board were demanding tasks due to the existing innovation discourse around emerging ITs. We summarized our findings as lessons learned:

- **Lesson learned 1: How to develop a government use case.** The emerging ITs' stories of the public innovation discourse are mostly insufficient to formulate a feasible use case. Nonetheless, such stories can function as initial inspiration, with the need to consider the peculiarities of the adopting organization's context.
- **Lesson learned 2: How to overcome structural barriers.** Owing to emerging ITs' immaturity and uncertainty, never-raised questions arise that

demand well-managed experimentation, iterative trial-and-error processes, and interdisciplinary collaborations within and across organizations.

- **Lesson learned 3: How to overcome cultural barriers.** The cultural heritage of organizations can exacerbate innovation with emerging ITs, as these are accompanied by cultural loadings. Thus, organizations should be aware of the need for cultural sensemaking activities, which is the essence of cultural entrepreneurship. Besides, if organizations desire organizational change, they can highlight certain stories and the incorporated values of an emerging IT.
- **Lesson learned 4: How to secure stakeholder buy-in.** As innovation projects with emerging ITs often face significant skepticism, political entrepreneurship activities are crucial in order to identify criticisms and concerns as early as possible.

Our essay contributed to a deep understanding of the challenges and resolution strategies along the journey of innovating with emerging ITs. Further, we showed that a non-technical fit between technology and an organization is equally important from a strategic perspective and requires careful management.

5.5 Essay 5: You Can't Manage What You Can't Define: The Success of Blockchain Projects Beyond the Iron Triangle

In Essay 5, we explored which success criteria are suitable for evaluating emerging IT innovation projects, focusing on blockchain projects as a representative example of an emerging IT. We further investigated how the success criteria differ regarding their relative importance. To find answers to these questions, we conducted an interview study that included expertise from 12 project managers, IT consultants, and Chief Technology Officers. We incorporated an established framework for project success criteria (Shenhar & Dvir, 2007) to propose a new framework for blockchain projects, structured along six success dimensions: *efficiency*, *impact on customer*, *impact on team*, *impact on environment*, *business and direct success*, and *preparation for future*. For the evaluation of the success dimensions, we included our perspectives and those of the interviewees and first assigned the interviewees' projects to the stages of their implementation (*initiate*, *develop*, *implement*) based on Kohli and Melville (2019). Since we regarded the proposed stage *develop* as too broad, we further categorized it into two additional stages: *prototype* and *pilot*. The first finding

regarding the relative importance of the success dimensions was that *efficiency* was less important than other success dimensions. Further, *impact on the environment* seemed to depend on the project stage; thus, the more mature a project, the higher the importance of this success dimension. Finally, *preparation for the future* seemed important, with a particular focus on the earlier stages.

Again, we made theoretical and managerial contributions. Regarding the theoretical perspective, with our new success dimension *impact on environment*, we created awareness that differences between inter-and intra-organizational projects exist and that organizations initiating blockchain projects as inter-organizational IT innovation projects must think beyond established success criteria. We also enriched existing success dimensions by adding further success criteria, which was the case for the dimension *preparation for future*, where we included *future technology readiness* and *cultural change*. Lastly, we found that our finding regarding the low importance of the dimension *efficiency* differs from the literature on IT projects, where adherence to budget and time is regarded as more important.

We also contributed to practice with Essay 5. First, we advocated for a holistic consideration of the success dimension *impact on customer* so as to take into account blockchain's long-term impacts on an organization instead of solely focusing on the direct (potentially unsatisfactory) output. We also highlighted the importance of the success dimension *impact on environment* for blockchain project evaluations, as value creation predominantly takes place beyond single organizations and in cross-organizational settings, such as consortia for driving innovation initiatives that deal with highly complex and new technologies. We also recommended evaluating blockchain technology in small projects with limited scope and budget to limit potential failure costs. This recommendation also included setting fail-fast principles or showing tolerance to errors while adhering to clear termination criteria. Lastly, although it seems attractive, we raised awareness that organizations and leaders should be careful when positioning themselves as leading-edge in an industry or in public, as high expectations will be generated, which – in the worst case – cannot be sufficiently fulfilled.

5.6 Essay 6: Do Emerging IT Innovation Projects Endanger Your IT Portfolio? An Overview of Risk Measures to Quantitatively Analyze Systemic Risk in IT Portfolios

In Essay 6, we sought to determine suitable risk measures for analyzing systemic risk in IT portfolios with a focus on emerging IT innovation projects. Even though such an overview is pivotal for successfully managing IT portfolios and ensuring overall organizational success, it has yet been missing. Through our structured literature review, we identified eight suitable risk measures, which we clustered into four categories. We then determined seven evaluation criteria, predominantly based on Wolf (2015) but updated and enriched through our literature review findings. We found that none of the eight risk measures could fulfill all the evaluation criteria. Nonetheless, one risk measure –Ellinas's (2019) risk measure of the category *percolation models* –could meet six of the seven evaluation criteria. This risk measure only lacked the simultaneous consideration of positive and negative effects (Criterion 7), which none of the eight risk measures could fulfill. We delineated our findings in three recommendations, which are:

- **Recommendation 1:** Organizations should know how to quantify their IT portfolio.
- **Recommendation 2:** Organizations should select the most appropriate risk measure according to their available data and use case.
- **Recommendation 3:** Organizations should be aware that no currently existing risk measure can consider risk and synergies simultaneously, demanding separate risk analyses and a subsequent reflection on the results.

These three recommendations also represent our practical implications, as they shall support organizational leaders in properly analyzing systemic risk in IT portfolios. Further, we made five theoretical contributions. We first proposed an overview of suitable risk measures to analyze systemic risk in IT portfolios with a focus on emerging IT innovation projects. Such an overview has yet been missing in research. Second, we suggested a set of evaluation criteria, primarily based on Wolf (2015), which has now been updated and enriched. Third, we stressed the importance and provided means for an appropriate risk assessment as a foundation for a more profound and more neutral project selection decision when it comes to emerging IT innovation projects. Fourth, we unpacked the fact that emerging IT innovation projects

cannot be appropriately assessed by existing risk measures since they lack the simultaneous consideration of risks and synergies, which has been unexplored by researchers until now. Fifth and lastly, we strengthened research regarding being mindful in investment and project selection decisions of emerging IT innovation projects and advocated for a more balanced view on emerging IT innovation projects, preventing thoughtless bandwagoning and exaggerated euphoria on the one hand and irrational risk aversion on the other.

6 Discussion and Conclusion

In what follows, I will summarize the content of my dissertation (Section 6.1), discuss its theoretical and practical implications (Section 6.2), and reflect on its limitations as well as future research opportunities (Section 6.3).

6.1 Summary of the Dissertation's Results

I have aimed to elucidate how organizations can successfully manage innovating with emerging ITs using the example of blockchain. As a final result, I will now delineate all gained insights from my dissertation's essays as recommendations and summarize them in a three-step approach. Those recommendations have already been made explicitly in some of my essays (e.g., Essays 2, 4, and 6), while for other essays, I have performed this step in my dissertation since those were solely considered implicitly in the essays (e.g., Essays 1, 3, and 5). First, I will describe the dedicated recommendations, and then present the summarizing figure of the three-step approach.

To find the keys to success for the innovation journey with emerging ITs, I started by shedding light on considerations required for neutrally and systematically assessing emerging ITs and thoroughly preparing the adoption-decision before an emerging IT innovation project is initiated (RG1, including Essay 1). With Essay 1, we demonstrated that a neutral assessment of the emerging IT's potentials and limitations, as well as an in-depth analysis of the to-be-solved business problem, are crucial to thoroughly assess whether the chosen emerging IT can sufficiently and successfully contribute to solving the business problem. Thus, initiating proofs-of-concept or prototypes is a promising approach for assessing a technical solution's suitability for the chosen use case.

The recommendations for preparing the adoption-decision of emerging IT innovations, as *step 1*, are as follows:

- **Recommendation 1.1: Perform a neutral assessment of the emerging IT.** The investment decision demands a systematic, neutral assessment of the potentials and limitations of an emerging IT to avoid irrational decision-making.
- **Recommendation 1.2: Analyze the to-be-solved business problem in-**

depth. Organizations should thoroughly investigate the business problem to grasp all its facets and afterward elicit whether the emerging IT fits the problem.

Next, I targeted delineating the *strategic* managerial considerations needed once the adoption-decision has been taken and an emerging IT innovation project to adopt the emerging IT has been initiated (RG2, including Essays 2, 3, and 4). Through Essay 2, we showed that considerations regarding costs, modular IT architecture approaches, and governance models are pivotal for ensuring emerging IT innovation projects' long-term success when multiple organizations are involved. In Essay 3, we found that TTF (technical fit) is key to success for organizations that seek to adopt emerging IT. Even though technical fit is mandatory, it is not sufficient, and emerging IT innovation projects further demand the careful management of non-technical aspects, such as cultural fit and political fit (Essay 4). This essay also stressed the need for the determination of a proper use case and for getting skeptical stakeholders on board early on, ignoring the stories relating to emerging ITs.

The recommendations for preparing the *strategic* considerations for the adoption of emerging IT innovations, as *step 2*, are:

- **Recommendation 2.1: Always take into account all cost aspects.** A holistic cost analysis of potential technical solution approaches should also include the hidden ones resulting from legal requirements or standardization.
- **Recommendation 2.2: Do not try to solve all the IT architecture and the IT landscape issues on the side.** A modular IT architecture approach with loose coupling contributes to maintainability, updatability, and, over time, breaking down complex IT architectures.
- **Recommendation 2.3: Think about potential governance models early on.** When the initial euphoria has evaporated, organizations must have clarified personal and financial responsibilities.
- **Recommendation 2.4: Ensure a tight fit between the organization and the technology at both the technical and process levels.** The fit between an emerging IT (i.e. technical properties) and an organization (i.e. (cross-) organizational task structure) is pivotal.
- **Recommendation 2.5: Be aware of the need to develop your own use case.** Since the stories surrounding an emerging IT and the existing use cases may not ideally fit the organization, developing an own use case is likely needed.

- **Recommendation 2.6: Be aware of structural innovation barriers.** Structural innovation barriers range from open questions related to legal compliance or interoperability with legacy IT systems to a lack of expertise in the organization.
- **Recommendation 2.7: Be aware of cultural innovation barriers.** Organizations have their own cultural heritage, consisting of values, practices, and ways of working, that can either resonate or clash with the emerging IT.
- **Recommendation 2.8: Getting skeptical stakeholders on board.** Due to the vibrant innovation discourse with exaggerated promises, emerging IT innovation projects often face great skepticism ('just buying into a meritless hype').

Finally, I again targeted the investigation of managerial considerations for the adoption of emerging IT innovations, but now had the *operative* perspective in focus (RG3, including Essays 5 and 6). Thus, in Essay 5, we focused on how the success of blockchain projects as an example of an emerging IT can be measured. We found that measuring success must go beyond the *Iron Triangle* (budget, time, and scope). In addition to this IT project management view, emerging IT innovation projects require a holistic risk assessment through an IT portfolio lens. Those IT projects cannot be regarded as isolated and purely encapsulated but instead are embedded in a complex IT portfolio, consisting of multiple interdependencies. Thus, the overall organizational success depends on the successful management of these interdependencies (Essay 6).

The recommendations for preparing the *operative* considerations for the adoption of emerging IT innovations, as *step 3*, are:

- **Recommendation 3.1: Redefine the measurement of emerging IT innovation projects' success.** Measuring the success of emerging IT innovation projects goes beyond the Iron Triangle and requires a multi-faceted, holistic approach.
- **Recommendation 3.2: Show tolerance for errors, but also define clear termination criteria.** The emerging IT's immaturity requires exploration, experimentation, and trial-and-error procedures. Without clear termination criteria, organizations risk immense budget and time overruns.
- **Recommendation 3.3: Set up small projects with limited scope and budget.** Owing to the high uncertainty and inherent risk of emerging IT

innovation projects, the costs of failure should be restricted as much as possible.

- **Recommendation 3.4: Be aware that the failure of an emerging IT innovation project affects the IT portfolio as a whole.** Due to interdependencies in IT portfolios, the failure of a single IT project can cause tremendous damage to the IT portfolio and the organizational success.
- **Recommendation 3.5: Know how to quantify your IT portfolio.** All risk measures are quantitative and require quantitative data of sufficient quality for their calculations, which organizations must be capable of providing.
- **Recommendation 3.6: Select the most appropriate risk measure according to your available data and use case.** Since risk measures differ regarding the input data, organizations must select the most appropriate one according to their available data and use case.
- **Recommendation 3.7: Perform separate risk analyses for risks and synergies.** Until now, no risk measure can consider risks and synergies simultaneously, requiring separate analyses and reflection on results.

Figure 1 summarizes the three steps and the dedicated recommendations for the journey to the top and how organizations can successfully manage innovating with emerging ITs.

Figure 3: A three-step approach to successfully manage emerging IT innovations.

6.2 Contributions to Theory and Implications for Practice

Through my dissertation's results, I contribute to both research and practice in manifold ways. Thus, I will describe the respective theoretical and practical implications in the following and adhere to Goldkuhl (2004), who stresses the importance of practical implications (besides theoretical contributions) in IS research.

First, for organizations, it is challenging to find answers to whether, when, and to what extent an emerging IT should be adopted (Swanson & Ramiller, 2004; Swanson, 1994). One reason is that these technologies are accompanied by thickets of exaggerated stories about their transformative potentials early in their lifecycle that are both vague and often inaccurate (Miranda et al., 2022; Shiller, 2020; Wang, 2010). Though, many organizational leaders buy into these stories and end up investing in an emerging IT (Wang, 2010; Wang, P., 2010) without neutrally, rationally, and systematically assessing the potential to create true business value. Further, instead of examining an emerging IT's suitability for an existing business problem, many leaders intensively search for a potential problem (Elyashiv, 2022).

Addressing RG1, I sought to provide guidance for organizations for the adoption-decision of emerging IT innovations. To make a profound investment decision for or against an emerging IT, a neutral assessment of the potentials and limitations (also regarding the selected use case) is pivotal. Such an assessment should also include an in-depth analysis of the to-be-solved business problem. Through Essay 1 and the applied DSR research approach, we showed how a neutral and systematic assessment of emerging IT may be conducted through the design, development, and evaluation of a prototype. Thus, we could assess our prototype's effectiveness and technical feasibility as well as its suitability to address the determined business problem. We further demonstrated that a thorough analysis of the business problem is crucial, as a foundation to determine the suitable solution objectives and evaluation criteria. This finding is confirmed by other researchers who have stressed the importance of thoroughly assessing the business process and problem before selecting suitable digital technologies (Baier et al., 2023). Further, with respect to the decision-making, I have strengthened the existing research by advocating mindfulness when considering investments in emerging IT (e.g. Fiol & O'Connor, 2003; Häckel et al., 2017; Häckel et al., 2018; Ramiller & Swanson, 2009; Swanson & Ramiller, 2004) rather than to

irrationally classify an emerging IT as 'black' (the risk-driven perspective) or 'white' (the opportunity-driven perspective).

As a practical implication, I highlight the importance of organizations to neutrally and systematically assess an emerging IT's potentials and limitations. This assessment is the foundation for a subsequent rational decision without being biased by stories and exaggerated promises surrounding an emerging IT. Further, I advocate a thorough investigation of the business problem and an understanding of as many facets as possible. This in-depth analysis is pivotal for the subsequent determination of solution requirements and evaluation criteria and the assessment of whether an emerging IT helps to solve the business problem and can generate true business value.

Second, the path to creating business value through emerging ITs is rather unprecedented, and researchers have just begun to capture their potential (e.g. Åström et al., 2022; Raftopoulos & Hamari, 2023; Schlecht et al., 2021; Toufaily et al., 2021). Additionally, various researchers have also identified and categorized a vast of innovation barriers (e.g. Janssen et al., 2020a; Schlecht et al., 2021; Toufaily et al., 2021). Since only a few emerging IT innovation projects generally, and specifically blockchain projects, have been successful (i.e. have developed into a productive system), organizations lack best practices, lessons learned and technical blueprints for the never-raised questions (Enholm et al., 2022; Schlecht et al., 2021). Closing this knowledge gap is pivotal to supporting organizations in avoiding some major mistakes and preparing the proper considerations and decisions upfront for the adoption of emerging IT innovations.

Regarding RG2, I sought to provide *strategic* guidance for organizations for the adoption of emerging IT innovations. Essays 2, 3, and 4 closely examined FLORA as an example of a successful emerging IT innovation project. Due to its success, it serves as a lighthouse project from which other organizations can learn much. With Essays 2, 3, and 4, we provided insights into lessons learned and recommendations for successfully innovating with blockchain as a representative example of an emerging IT. Specifically, we elucidated how upcoming challenges during the adoption could be successfully navigated and what key strategic considerations and decisions arose along the journey. Through our gained insights, I stressed the need to establish both a technical and a non-technical fit, i.e. a political fit and a cultural fit (Ansari et al., 2010). Besides, I highlighted the importance of the *external competitive environment* and the

internal organizational environment on the innovation journey's success, which Kohli and Melville (2019). stated as elements of digital innovation. I further raised awareness for the *internal organizational environment* and *external competitive environment* functioning as boundaries in which emerging IT innovation can take place. Moreover, I strengthened the necessity of cultural sensemaking and the reduction of cultural dissonance, as postulated by Roth et al. (2022b), implying that either the stories surrounding an emerging IT must be adapted to fit the organizational culture or the organizational values must be transformed to fit the values incorporated in the emerging IT.

As a practical implication, I recommended that organizations should be aware of establishing a fit at the technical, political, and cultural levels between an emerging IT and the organization. Besides, at first glance, it seems that the *internal organizational environment* and *external competitive environment* are solely barriers to emerging IT innovations instead of drivers. Yet, given this bi-directionality of establishing fit, organizations can also utilize these dissonances to initiate transformation processes and organizational change.

Third, measuring IT projects' success is still often based on old paradigms, such as the *Iron Triangle*. Yet, its appropriateness is already regarded with skepticism by some researchers, who have called for a more holistic assessment (e.g. Dvir et al., 2003; Shenhar et al., 2001). Further, organizational success depends not only on a single IT project's success but also on multiple IT project success stories. Specifically, organizations must be successful at managing the interdependencies between IT projects in an IT portfolio. Here, an emerging IT innovation project can have a huge impact on the IT portfolio: it can endanger the entire IT portfolio or, in contrast, may even optimize it (Fridgen & Moser, 2013).

Concerning RG3, I focused on providing *operative* guidance for organizations for the adoption of emerging IT innovations. Thus, I examined how emerging IT innovation projects' success can be measured using the example of blockchain (Essay 5) and how systemic risk of IT portfolios can be quantitatively analyzed to also ensure IT portfolio-level success (Essay 6). Through Essay 5, we found that the literature fell short regarding a holistic assessment of success. For instance, we identified a new success dimension, namely *impact on environment*, which was missing in the literature (e.g. Shenhar & Dvir, 2007). Summarizing all our findings, we proposed a matrix of suitable

success dimensions and success criteria for blockchain projects, enabling an initial glimpse of the multiple facets of success. Further, we sensed that emerging IT innovation projects' success could also be accelerated through collaboration in consortia or various communities to exchange knowledge or work on standards, which is known as 'open innovation', as a suitable approach to jointly tackle the upcoming challenges of emerging IT (Lacity, 2018). With Essay 6, we provided insights into how organizations can quantitatively analyze their IT portfolios. Specifically, we provided the highly needed overview of suitable risk measures for quantitatively analyzing systemic risk in IT portfolios with a focus on emerging IT innovation projects, which had been missing in the literature. We further proposed a set of criteria to evaluate risk measures in IT portfolios as an update and enrichment of Wolf's research (2015). Finally, we could explore that no risk measure fulfills all evaluation criteria and that all lack the simultaneous consideration of risks and synergies, which is particularly critical for emerging IT innovation projects and has not been discovered in research so far.

Regarding practical implications, I sought to raise awareness for organizations to consider IT project success more holistically and bear in mind that some IT projects look like failures but still may have successful facets. For instance, an emerging IT innovation project may contribute to the expansion of knowledge or to a better understanding of the technology and its potential. I further recommended defining clear termination criteria early on, setting up projects of limited scope and budget, and following a fail-fast strategy to restrict the potential costs of failure. Organizations should also consider a change in the predominant paradigm for private sector organizations, namely competition, and should instead see competitors as potential partners for joint endeavors to successfully innovate with emerging ITs. Further, organizations should properly manage the (too high) expectations and promises that accompany emerging ITs, and should be careful regarding the highly ambitious intention to self-position as leading-edge. Finally, I have raised awareness around emerging IT innovation projects being just one part of the IT portfolio, leading to the assertion that organizations must successfully manage their IT portfolio and existing interdependencies if they are to ensure overall organizational success. That implies that organizations should know how they can quantify their IT portfolio, be capable of providing the quantitative data required for the risk measures, and know their targeted use case. These considerations are crucial to determining the most suitable risk measure for organizations according to their available data and targeted use case,

calculating various IT portfolio constellations and supporting project selection decisions.

In sum, owing to the immaturity of emerging ITs, best practices, lessons learned, and technical blueprints are usually absent. Instead, many stories about their transformative potential are apparent, which are often vague and inaccurate. Further, only a few successful emerging IT innovation projects generally, and specifically blockchain projects, existed that could function as lighthouse projects for how to successfully innovate with emerging ITs. With my dissertation, I have filled this knowledge gap by elucidating the key managerial considerations during both the adoption-decision and adoption of emerging IT innovations.

6.3 Limitations

As with every research endeavor, my dissertation also faces limitations, which I will now briefly present, structured along the three RGs.

Regarding RG1, the DSR approach applied in Essay 1 is well established in research and was suitable to show organizations how the potentials and limitations of an emerging IT regarding the selected use case and the to-be-solved business problem can be systematically assessed. Yet, DSR cannot directly be transferred into practice and requires adaptations when organizations would like to make use of this approach. Even though some researchers have suggested some new, more practice-driven DSR approaches, this question remains open: *how well do they really fit into organizations' contexts, their ways of doing, and the software development, innovation management and project management approaches they use?*

Regarding RG2, I can state three limitations. First, only one example was closely examined owing to the chosen research design – a single-case study (Essay 2 and 3) and a clinical IS research approach (Essay 4). However, the case was carefully selected. Due to its long duration and successful ending (FLORA became a productive system rolled out across all of Germany's 16 states), it is a lighthouse project worthy of close investigation. The gained insights, such as challenges faced or lessons learned, are very valuable for other organizations when they consider starting the first or just another innovation journey with an emerging IT. Second, blockchain was the chosen example of an emerging IT. At the time of writing, other emerging ITs would also have been

available and worth investigating. As blockchain was a representative example of an emerging IT, I selected it. Indeed, there may be some peculiarities that are unique to blockchain, but the majority of insights will be well-transferrable and applicable to other emerging ITs. Third, with the selected case, I focused on the public sector. However, insights are also relevant for the private sector, and only some need to be translated first. For instance, the structural innovation barriers will very likely differ between the public and the private sectors.

Concerning RG3 and particularly the IT project management perspective, blockchain was exemplarily examined to determine and evaluate the success dimensions and criteria. Thus, an open question remains: *which insights would be the same or different for other emerging ITs?* We also did not answer how our determined success matrix can be translated into practice. Specifically, it remains unsolved whether measures or key performance indicators (KPIs) exist that would be appropriate to operationalize our success dimensions and criteria. Regarding the IT portfolio management perspective, we determined a systematic overview of suitable risk measures for analyzing systemic risk in IT portfolios with a focus on emerging IT innovation projects. Yet, we did not include insights from practice. Thus, it is unclear which data and what data quality organizations really have, and which risk measures could be used at all.

6.4 Future Research

Through my dissertation, I found answers on how organizations can successfully manage innovating with emerging ITs and delineated the gained insights as recommendations in a three-step approach. Nonetheless, my results and limitations can and should stimulate future research. Thus, I will now present three promising research opportunities.

First, I posited the DSR research paradigm as a suitable approach for a neutral and systematic assessment of emerging ITs. The DSR paradigm, which we adhered to in Essay 1, is well-known and established in IS research (Gregor & Hevner, 2013; A. Hevner & Chatterjee, 2010; March & Smith, 1995; Vom Brocke et al., 2020). DSR is often chosen to solve a practically relevant problem in a novel, unprecedented way (Hevner, 2007), which is relevant to both research and practice. Due to its relevance in practice, some researchers have started including a more practice-oriented view in

DSR but have stayed fairly close to research. For instance, Goldkuhl and Sjöström (2018) proposed a practice-oriented DSR approach called *Practice Design Research*. Walter (2019) suggested another methodological approach to design and instantiate an IS for evaluation in practice-oriented research, while Conboy et al. (2015) integrated agile software development into the DSR process and named it the *Agile Design Science Research Methodology*. Just a few researchers adapted the DSR approach in a way that makes it potentially suitable and applicable in practice (i.e. for organizations), for instance, combining design thinking with DSR (Dolak et al., 2013). As already stated as a limitation, it is unexplored how well DSR and the more practice-driven DSR approaches fit organizations' contexts, their ways of doing, and the software development, innovation management and project management approaches they use. This unresolved question holds great potential for researchers.

Next, I selected blockchain technology as an example to explore how organizations can successfully manage innovating with emerging ITs. At the time of writing, blockchain has already gone through various hype phases. However, notably, there has not been and will never be 'the one' blockchain. Instead, various applications have been developed, which differ in their maturity and their assigned hype phases or their stories. The same holds true for AI. Nonetheless, many blockchain and AI applications are now fairly mature, and a multitude of projects have been initiated in various domains across sectors. However, only a few emerging IT innovation projects have succeeded and developed into productive IT systems. Thus, there is a long list of large-scale IT project failures, even ones closely examined by researchers (e.g. Afzal, 2014; Alabdulkarim, 2023; Westenberger et al., 2022; Yampolskiy, 2019), while best practices and lessons learned on how to successfully manage emerging IT innovations are rare. I remain convinced that blockchain, as the chosen example in my dissertation, is representative and that the majority of insights will be well-transferrable. However, this dedicated technology focus opens research opportunities, as the commonalities and differences between emerging ITs should be thoroughly investigated as a basis to make profound statements regarding the generalizability of my dissertation's insights.

Lastly, I highlighted the importance of redefining 'success' for emerging IT innovation projects. Well-established and broadly known definitions of project success fall short regarding emerging IT's peculiarities. That is, they are often based on old project management paradigms (e.g. the *Iron Triangle*). Although some researchers have

begun to criticize this approach and have called for a more holistic assessment of success, even for classical IT projects (e.g. Dvir et al., 2003; Shenhar et al., 2001), this paradigm shift has not yet fully taken place in research and practice. For instance, when an IT project is labeled a failure, the reasons highlighted are still predominantly budget or time overruns (e.g. Flyvbjerg & Budzier, 2011; Flyvbjerg et al., 2022; The Standish Group, 2020). With our proposed matrix of success dimensions and criteria in Essay 5, we sought to create a starting point for lively discussions in research and practice regarding the question of which facets project success can have and how they differ in their importance. We did not answer how this matrix could be operationalized, as already described as a limitation. Thus, researchers could investigate how organizations can apply our success dimensions and criteria, and which measures and KPIs are suitable for operationalizing these. This operationalization would be pivotal to bringing these research insights into practical operation and to generate true practical value for organizations. It would further drive the awareness in organizations to consider IT project success more holistically.

My dissertation was mainly motivated by the fact that emerging ITs can have huge organizational impacts, but making a rational adoption-decision and driving the adoption of emerging IT innovations is challenging. Organizations are already struggling with the 'classical' challenges of making IT projects successful (e.g. to be on budget or in time) and are even more challenged when they innovate with emerging ITs. That is, many stories about their transformative potential are promoted in the public innovation discourse while best practices, lessons learned, and technical blueprints are absent. Further, emerging ITs do not arrive on neutral ground but are loaded with values. Thus, organizations face strong challenges: On the one hand, they wish to experiment and innovate with emerging ITs and be a pioneer and leading edge. On the other hand, the road to successfully innovating with such technologies remains fairly underexplored. Thus, from both a theoretical and practical perspective, it was worth investigating the major challenges and key managerial considerations. With my dissertation, I addressed this knowledge gap and provided valuable guidance along the innovation journey with emerging ITs. Even though blockchain, as the chosen example of an emerging IT in my dissertation, is already fading away, novel emerging ITs will continually emerge, for which organizations again face similar challenges. Thus, the insights provided by my dissertation will also be relevant and valuable for future innovation journeys with emerging ITs.

7 References

Abrahamson, E. (1991). Managerial Fads and Fashions: The Diffusion and Rejection of Innovations. *Academy of Management Review*, *16*(3), 586–612.

Abrahamson, E., & Fairchild, G. (1999). Management Fashion: Lifecycles, Triggers, and Collective Learning Processes. *Administrative Science Quarterly*, *44*(4), 708–740.

Afzal, M. H. B. (2014). Large Scale IT Projects: Study and Analysis of Failures and Winning Factors. *IETE Technical Review*, *31*(3), 214–219.

Akanfe, O., Lawong, D., & Rao, H. R. (2024). Blockchain technology and privacy regulation: Reviewing frictions and synthesizing opportunities. *International Journal of Information Management*, *76*.

Alabdulkarim, Y. (2023). A Review of Blockchain Use Cases and Recent Failures in the Enterprise. In *Proceedings of the 3rd International Conference on Computing and Information Technology (ICCIT)* (pp. 641–646). IEEE.

Amend, J., Arnold, L., Feulner, S., Fridgen, G., Köhler, F., Ollig, P., Rieger, A., & Roth, T. (11/2022). *Opportunities and challenges of using blockchain technology in public administration: Insights from the FLORA project of Germany's Federal Office for Migration and Refugees*.

Amend, J., Feulner, S., Rieger, A., Roth, T., Guggenberger, T., & Fridgen, G. (2024). Bringing Government into the Digital Age: Insights from Germany's Asylum Procedure. *MIS Quarterly Executive*.

Amend, J., van Dun, C., Fridgen, G., Köhler, F., Rieger, A., Stohr, A., & Wenninger, A. (2021). Using Blockchain to Coordinate Federal Processes: The Case of Germany's Federal Office for Migration and Refugees. In N. Urbach, M. Röglinger, K. Kautz, R. A. Alias, C. Saunders, & M. Wiener (Eds.), *Digitalization Cases Vol. 2. Mastering Digital Transformation for Global Business* (pp. 85–100).

Ansari, S. M., Fiss, P. C., & Zajac, E. J. (2010). Made to Fit: How Practices Vary As They Diffuse. *Academy of Management Review*, *35*(1), 67–92.

Åström, J., Reim, W., & Parida, V. (2022). Value creation and value capture for AI business model innovation: A three-phase process framework. *Review of Managerial Science*, *16*(7), 2111–2133.

Atkinson, R. (1999). Project management: cost, time and quality, two best guesses and a phenomenon, its time to accept other success criteria. *International Journal of Project Management*, *17*(6), 337–342.

Attaran, M., & Gunasekaran, A. (2019). Blockchain-enabled technology: The emerging technology set to reshape and decentralise many industries. *International Journal of Applied Decision Sciences*, *12*(4), 424–444.

Baier, M.-S., Berger, S., Kreuzer, T., Oberländer, A. M., & Röglinger, M. (2023). What Makes Digital Technology? A Categorization Based on Purpose. *Communications of the Association for Information Systems*, *52*, 332–384.

Baskerville, R., Vom Brocke, J., Mathiassen, L., & Scheepers, H. (2023). Clinical research from information systems practice. *European Journal of Information Systems*, *32*(1), 1–9.

Beck, R. (2018). Beyond Bitcoin: The Rise of Blockchain World. *Computer*, *51*(2), 54–58.

Beck, R., Müller-Bloch, C., & King, J. L. (2018). Governance in the Blockchain Economy: A Framework and Research Agenda. *Journal of the Association for Information Systems*, 1020–1034.

Beer, M., Wolf, T., & Garizy, T. Z. (2015). Systemic risk in IT portfolios–an integrated quantification approach. In *Proceedings of the 36th International Conference on Information Systems (ICIS),* Fort Worth, Texas, USA.

Bhattacherjee, A. (2012). *Social science research: Principles, methods, and practices.*

Bozeman, B., & Bretschneider, S. (1986). Public management information systems: Theory and prescription. *Public Administration Review*, 475–487.

Canato, A., Ravasi, D., & Phillips, N. (2013). Coerced Practice Implementation in Cases of Low Cultural Fit: Cultural Change and Practice Adaptation During the Implementation of Six Sigma at 3M. *Academy of Management Journal*, *56*(6), 1724–1753.

Caron-Fasan, M.-L., Lesca, N., Perea, C., & Beyrouthy, S. (2020). Adoption of enterprise social networking: Revisiting the IT innovation adoption model of Hameed et al. *Journal of Engineering and Technology Management*, *56*.

Chatterjee, R [Rishav], & Chatterjee, R [Rajdeep] (2017). An Overview of the Emerging Technology: Blockchain. In *Proceedings of the 3rd International Conference on Computational Intelligence and Networks (CINE),* Odisha, India.

Chipidza, W., Li, Y., Mashatan, A., Turetken, O., & Olfman, L. (2023). Quantum Computing and IS - Harnessing the Opportunities of Emerging Technologies. *Communications of the Association for Information Systems*, *52*, 480–499.

Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, *13*(1), 3–21.

Currie, W. L. (2004). The organizing vision of application service provision: a process-oriented analysis. *Information and Organization*, *14*(4), 237–267.

Denner, M.-S., Püschel, L. C., & Röglinger, M. (2018). How to exploit the digitalization potential of business processes. *Business & Information System Engineering*, *60*, 331–349.

Dvir, D., Raz, T., & Shenhar, A. J. (2003). An empirical analysis of the relationship between project planning and project success. *International Journal of Project Management*, *21*(2), 89–95.

Ellinas, C. (2019). The Domino Effect: An Empirical Exposition of Systemic Risk Across Project Networks. *Production and Operations Management*, *28*(1), 63–81.

Ellinas, C., Allan, N., Durugbo, C., & Johansson, A. (2015). How Robust Is Your Project? From Local Failures to Global Catastrophes: A Complex Networks Approach to Project Systemic Risk. *PLOS ONE*, *10*(11).

Ellinger, E. W., Gregory, R. W., Mini, T., Widjaja, T., & Hefridsson, O. (2024). Skin in the game: The transformational potential of decentralized autonomous organizations. *MIS Quarterly*, *48*(1).

Elyashiv, T. (2022). The VC FOMO Problem: The Time-To-Deal Race is Leaving Many Disoriented and Others Well-Positioned. *The Street*.

Enholm, I. M., Papagiannidis, E., Mikalef, P., & Krogstie, J. (2022). Artificial Intelligence and Business Value: A Literature Review. *Information Systems Frontiers*, *24*(5), 1709–1734.

Fenn, J., & Raskino, M. (2008). *Mastering the hype cycle: How to choose the right innovation at the right time*. Harvard Business Press.

Fichman, R. (2004). Going Beyond the Dominant Paradigm for Information Technology Innovation Research: Emerging Concepts and Methods. *Journal of the Association for Information Systems*, *5*(8), 314–355.

Fichman, R., Dos Santos, B., & Zheng, Z. (2014). Digital Innovation as a Fundamental and Powerful Concept in the Information Systems Curriculum. *MIS Quarterly*, *38*(2), 329–354.

Fiol, M. C., & O'Connor, E. J. (2003). Waking up! Mindfulness in the face of bandwagon. *Academy of Management Review*, *28*(1), 54–70.

Flick, U., Kardorff, E. von, & Steinke, I. (2004). *A companion to qualitative research* (1st ed.). SAGE.

Flyvbjerg, B., & Budzier, A. (2011). Why Your IT Project Might Be Riskier Than You Think. *Harvard Business Review*, *89*(9), 23–25.

Flyvbjerg, B., Budzier, A., Lee, J. S., Keil, M., Lunn, D., & Bester, D. W. (2022). The Empirical Reality of IT Project Cost Overruns: Discovering A Power-Law Distribution. *Journal of Management Information Systems*, *39*(3), 607–639.

Fridgen, G., Lockl, J., Radszuwill, S., Rieger, A., Schweizer, A., & Urbach, N. (2018a). A Solution in Search of a Problem: A Method for the Development of Blockchain Use Cases. In *Proceedings of the 24th American Conference on Information Systems (AMCIS),* New Orleans, Louisiana, USA.

Fridgen, G., Lockl, J., Radszuwill, S., Rieger, A., Schweizer, A., & Urbach, N. (2018b). Solution-based Innovation : A Method for Emerging Technology Use Case Development. In *Proceedings of the 26th European Conference on Information Systems (ECIS),* Portsmouth, UK.

Fridgen, G., & Moser, F. (2013). Using IT fashion investments to optimize an IT innovation portfolio's risk and return. *Journal of Decision Systems*, *22*(4), 298–318.

Gartner. (2023). *Gartner Hype Cycle: Interpreting technology hype*. https://blogs.gartner.com/avivah-litan/2022/07/22/gartner-hype-cycle-for-blockchain-and-web3-2022/.

Goldfarb, B., & Kirsch, D. A. (2020). *Bubbles and Crashes: The Boom and Bust of Technological Innovation*. Stanford University Press.

Goldkuhl, G. (2004). Meanings of pragmatism: Ways to conduct information systems research. *Action in Language, Organizations and Information Systems*, 13–26.

Goodhue, D. L., & Thompson, R. L. (1995). Task-Technology Fit and Individual Performance. *MIS Quarterly*, *19*(2), 213–236.

Gregor, S., & Hevner, A. (2013). Positioning and Presenting Design Science Research for Maximum Impact. *MIS Quarterly*, *37*(2), 337–355.

Guggenmos, F., Hofmann, P., & Fridgen, G. (2019). How ill is your IT Portfolio? : Measuring Criticality in IT Portfolios Using Epidemiology. In *Proceedings of the 40th International Conference on Information Systems,* Munich, Germany.

Häckel, B., Lindermeir, A., Moser, F., & Pfosser, S [Stefan] (2017). Mindful Engagement in Emerging IT Innovations. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, *48*(1), 53–74.

Häckel, B., Pfosser, S [S], Dominic, S., & Voit, C. (2018). Determining optimal strategies for investments in an emerging IT innovation. In *Proceedings of the 26th European Conference on Information Systems (ECIS),* Portsmouth, UK.

Halaburda, H., Levina, N., & Semi, M. (2023). Digitization of Transaction Terms within TCE: Strong Smart Contract as a New Mode of Transaction Governance. *MIS Quarterly*, *48*(2), 825–846.

Halaweh, M. (2013). Emerging Technology: What is it? *Journal of Technology Management & Innovation*, *8*(3), 19–20.

Hameed, M. A., Counsell, S., & Swift, S. (2012). A conceptual model for the process of IT innovation adoption in organizations. *Journal of Engineering and Technology Management*, *29*(3), 358–390.

Heaven, W. D. (2022). Generative AI is changing everything. But what's left when the hype is gone? *MIT Technology Review*.

Heintze, T., & Bretschneider, S. (2000). Information technology and restructuring in public organizations: Does adoption of information technology affect organizational structures, communications, and decision making? *Journal of Public Administration Research and Theory*, *10*(4), 801–830.

Henfridsson, O., Mathiassen, L., & Svahn, F. (2014). Managing Technological Change in the Digital Age: The Role of Architectural Frames. *Journal of Information Technology*, *29*(1), 27–43.

Hevner, A. (2007). A three cycle view of design science research. *Scandinavian Journal of Information Systems*, *19*(2).

Hofmann, P., Jöhnk, J., Protschky, D., & Urbach, N. (2020). Developing Purposeful AI Use Cases – A Structured Method and Its Application in Project Management. In *Proceedings of the 15th International Conference on Wirtschaftsinformatik (WI).*

Holotiuk, F., & Moormann, J. (2018). Organizational Adoption of Digital Innovation: the Case of Blockchain Technology. In *Proceedings of the 26th European Conference on Information Systems (ECIS),* Portsmouth, UK.

Huber, G. P., & Power, D. J. (1985). Retrospective reports of strategic-level managers: Guidelines for increasing their accuracy. *Strategic Management Journal*, *6*(2), 171–180.

Hund, A., Wagner, H.-T., Beimborn, D., & Weitzel, T. (2021). Digital innovation: Review and novel perspective. *The Journal of Strategic Information Systems*, *30*(4).

Hussain, A. A., & Al-Turjman, F. (2021). Artificial intelligence and blockchain: A review. *Transactions on Emerging Telecommunications Technologies*, *32*(9).

Iansati, M., & Lakhani, K. R. (2017). The truth about blockchain. *Harvard Business Review*, *95*(1), 118–127.

Janssen, M., Weerakkody, V., Ismagilova, E., Sivarajah, U., & Irani, Z. (2020a). A framework for analysing blockchain technology adoption: Integrating institutional, market and technical factors. *International Journal of Information Management*, *50*, 302–309.

Janssen, M., Weerakkody, V., Ismagilova, E., Sivarajah, U., & Irani, Z. (2020b). A framework for analysing blockchain technology adoption: Integrating institutional, market and technical factors. *International Journal of Information Management*, *50*, 302–309.

Kappos, A., & Rivard, S. (2008). A Three-Perspective Model of Culture, Information Systems, and Their Development and Use. *MIS Quarterly*, *32*(3), 601-634.

Khan, A. A., Laghari, A. A., Shaikh, Z. A., Dacko-Pikiewicz, Z., & Kot, S. (2022). Internet of Things (IoT) Security With Blockchain Technology: A State-of-the-Art Review. *IEEE Access*, *10*.

Kjærgaard-Winther, C. (2022). A.P. Moller - Maersk and IBM to discontinue TradeLens, a blockchain-enabled global trade platform. https://www.maersk.com/news/articles/2022/11/29/maersk-and-ibm-to-discontinue-tradelens

Koch, H., Leidner, D. E., & Gonzalez, E. S. (2013). Digitally enabling social networks: resolving IT–culture conflict. *Information Systems Journal*, *23*(6), 501–523.

Kohli, R., & Melville, N. P. (2019). Digital innovation: A review and synthesis. *Information Systems Journal*, *29*(1), 200–223.

Lacity, M. (2018). Addressing key challenges to making enterprise blockchain applications a reality. *MIS Quarterly Executive*, *17*(3).

Lacity, M. (2022). Blockchain: From Bitcoin to the Internet of Value and beyond. *Journal of Information Technology*, *37*(4), 326–340.

Lacity, M., & Van Hoek, R. (2021). How Walmart Canada Used Blockchain Technology to Reimagine Freight Invoice Processing. *MIS Quarterly Executive*, *20*(3).

Lichti, C. W., & Tumasjan, A. (2023). “My Precious!”: A Values-Affordances Perspective on the Adoption of Bitcoin. *Journal of the Association for Information Systems*, *24*(3), 629–663.

Lu, Y. (2018). Blockchain and the related issues: a review of current research topics. *Journal of Management Analytics*, *5*(4), 231–255.

Maedche, A., Gregor, S., Morana, S., & Feine, J. (2019). Conceptualization of the Problem Space in Design Science Research. In *Proceedings of the 14th International Conference on Design Science Research in Information Systems and Technology (DESRIST),* Worcester, MA, USA.

Mamonov, S., & Peterson, R. (2021). The role of IT in organizational innovation – A systematic literature review. *The Journal of Strategic Information Systems*, *30*(4), 101696.

March, S. T., & Smith, G. F. (1995). Design and natural science research on information technology. *Decision Support Systems*, *15*(4), 251–266.

Mattke, J., Hund, A., Maier, C., & Weitzel, T. (2019). How an enterprise blockchain application in the US pharmaceuticals supply chain is saving lives. *MIS Quarterly Executive*, *18*(4).

McLeod, L., Doolin, B., & MacDonell, S. G. (2012). A Perspective-Based Understanding of Project Success. *Project Management Journal*, *43*(5), 68–86.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook* (2. ed. [Nachdr.]. SAGE.

Miranda, S. M., Kim, I., & Summers, J. D. (2015). Jamming with Social Media. *MIS Quarterly*, *39*(3), 591–614.

Miranda, S. M., Wang, D. D., & Tian, C. A. (2022). Discoursive fields and the diversity-coherence paradox: An ecological perspective on the blockchain community discourse. *MIS Quarterly*, *46*(3).

Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: Examining the craft. *Information and Organization*, *17*(1), 2–26.

Neumeier, A., Radszuwill, S., & Garizy, T. Z. (2018). Modeling project criticality in IT project portfolios. *International Journal of Project Management*, *36*(6), 833–844.

Peffers, K., Tuunanen, T., Rothenberger, M. A., & Chatterjee, S. (2007). A Design Science Research Methodology for Information Systems Research. *Journal of Management Information Systems*, *24*(3), 45–77.

Piazza, A., & Abrahamson, E. (2020). Fads and Fashions in Management Practices: Taking Stock and Looking Forward. *International Journal of Management Reviews*, *22*(3), 264–286.

Pierce, J. L., & Delbecq, A. L. (1977). Organization Structure, Individual Attitudes and Innovation. *Academy of Management Review*, *2*(1), 27–37.

Radszuwill, S., & Fridgen, G. (2017). Forging a Double-Edged Sword: Resource Synergies and Dependencies in Complex IT Project Portfolios. In *Proceedings of the 38th International Conference on Information Systems (ICIS),* Seoul, South Korea.

Raftopoulos, M., & Hamari, J. (2023). Human-AI Collaboration in Organisations: a Literature Review on Enabling Value Creation. In *Proceedings of the 31st European Conference on Information Systems (ECIS),* Kristiansand, Norway.

Ramiller, N. C., & Swanson, E. B. (2009). Mindfulness routines for innovating with information technology. *Journal of Decision Systems*, *18*(1), 13–26.

Rogers, E. M. (1995). *Diffusion of innovations*. The Free Press.

Rogers, E. M., Singhal, A., & Quinlan, M. M. (2014). Diffusion of Innovations. In *An Integrated Approach to Communication Theory and Research* (pp. 432–448). Routledge.

Rossi, M., Mueller-Bloch, C., Thatcher, J. B., & Beck, R. (2019). "Blockchain Research in Information Systems: Current Trends and an Inclusive Future Research Agenda". *Journal of the Association for Information Systems*, *20*(9), 1388–1403.

Roth, T., Rieger, A., Utz, M., & Young, A. (2022a). The Role of Cultural Fit in the Adoption of Fashionable IT: A Blockchain Case Study. In *Proceedings of the 43rd International Conference on Information Systems (ICIS)*.

Roth, T., Rieger, A., Utz, M., & Young, A. (2022b). The Role of Cultural Fit in the Adoption of Fashionable IT: A Blockchain Case Study. In *Proceedings of the 43rd International Conference on Information Systems (ICIS)*.

Roth, T., Stohr, A., Amend, J., Fridgen, G., & Rieger, A. (2023). Blockchain as a driving force for federalism: A theory of cross-organizational task-technology fit. *International Journal of Information Management*, *68*.

Rotolo, D., Hicks, D., & Martin, B. R. (2015). What is an emerging technology? *Research Policy*, *44*(10), 1827–1843.

Rousseau, D. M., Manning, J., & Denyer, D. (2008). 11 Evidence in Management and Organizational Science: Assembling the Field's Full Weight of Scientific Knowledge Through Syntheses. *Academy of Management Annals*, *2*(1), 475–515.

Sarker, S., Henningsson, S., Jensen, T., & Hedman, J. (2021). The Use Of Blockchain As A Resource For Combating Corruption In Global Shipping: An Interpretive Case Study. *Journal of Management Information Systems*, *38*(2), 338–373.

Schein, E. H. (2008). Clinical Inquiry/Research. In P. Reason & H. Bradbury (Eds.), *The SAGE Handbook of Action Research* (pp. 266–279). SAGE Publications Ltd.

Schlecht, L., Schneider, S., & Buchwald, A. (2021). The prospective value creation potential of Blockchain in business models: A delphi study. *Technological Forecasting and Social Change*, *166*.

Seckler, C., Mauer, R., & Vom Brocke, J. (2021). Design science in entrepreneurship: Conceptual foundations and guiding principles. *Journal of Business Venturing Design*, *1*(1-2).

Shenhar, A. J., & Dvir, D. (2007). *Reinventing project management: The diamond approach to successful growth and innovation*. Harvard Business School Press; McGraw-Hill.

Shenhar, A. J., Dvir, D., Levy, O., & Maltz, A. C. (2001). Project Success: A Multidimensional Strategic Concept. *Long Range Planning*, *34*(6), 699–725.

Shiller, R. J. (2020). *Narrative economics: How stories go viral & drive major economic events : With a new preface by the author* (First paperback edition, 2020). Princeton University Press.

Shin, D. D. (2019). Blockchain: The emerging technology of digital trust. *Telematics and Informatics*, *45*.

Sodhi, M. S., Seyedghorban, Z., Tahernejad, H., & Samson, D. (2022). Why emerging supply chain technologies initially disappoint: Blockchain, IoT, and AI. *Production and Operations Management*, *31*(6), 2517–2537.

The Standish Group. (2020). *CHAOS 2020: Beyond Infinity Report*.

Swanson, & Ramiller (2004). Innovating Mindfully with Information Technology. *MIS Quarterly*, *28*(4), 553.

Swanson, E. B. (1994). Information Systems Innovation Among Organizations. *Management Science*, *40*(9), 1069–1092.

Swanson, E. B., & Ramiller, N. C. (1997). The Organizing Vision in Information Systems Innovation. *Organization Science*, *8*(5), 458–474.

Tiwana, A. (2014). Separating Signal from Noise: Evaluating Emerging Technologies. *MIS Quarterly Executive*, *13*(1).

Tornatzky, L. G., & Fleischer, M. (1990). *The Process of Technological Innovation*. Lexington books.

Toufaily, E., Zalan, T., & Dhaou, S. B. (2021). A framework of blockchain technology adoption: An investigation of challenges and expected value. *Information & Management*, *58*(3).

Utz, M., Johanning, S., Roth, T., Bruckner, T., & Strüker, J. (2023). From ambivalence to trust: Using blockchain in customer loyalty programs. *International Journal of Information Management*, *68*.

van Grinsven, M., Heusinkveld, S., & Cornelissen, J. (2016). Translating Management Concepts: Towards a Typology of Alternative Approaches. *International Journal of Management Reviews*, *18*(3), 271–289.

Vinsel, L. (2023). Don't Get Distracted by the Hype Around Generative AI. *MIT Sloan Management Review*, *64*(3).

Vom Brocke, J., & Maedche, A. (2019). The DSR grid: six core dimensions for effectively planning and communicating design science research projects. *Electronic Markets*, *29*, 379–385.

Vom Brocke, J., Winter, R., Hevner, A., & Maedche, A. (2020). Special Issue Editorial –Accumulation and Evolution of Design Knowledge in Design Science Research: A Journey Through Time and Space. *Journal of the Association for Information Systems*, *21*(3), 520–544.

Wang (2010). Chasing the Hottest IT: Effects of Information Technology Fashion on Organizations. *MIS Quarterly*, *34*(1), 63.

Wang, P. (2010). The surprising impact of fashions in information technology. *MIT Sloan Management Review*, *51*(4).

Westenberger, J., Schuler, K., & Schlegel, D. (2022). Failure of AI projects: understanding the critical factors. *Procedia Computer Science*, *196*, 69–76.

Wheatley, K. K., & Wilemon, D. (1999). From emerging technology to competitive advantage. In *Proceedings of the Portland International Conference on Management of Engineering and Technology (PICMET),* Portland, Oregon, USA.

Wit, A. de (1988). Measurement of project success. *International Journal of Project Management*, *6*(3), 164–170.

Wolf, T. (2015). Assessing the criticality of IT projects in a portfolio context using centrality measures. In *Proceedings of the 12th International Conference on Wirtschaftsinformatik (WI),* Osnabrück, Germany.

Wragg, E. (2023a). *Contour to shut down as bank shareholders pull funding*.

Wragg, E. (2023b). *Marco Polo brings in liquidators as funds run dry*.

Yampolskiy, R. V. (2019). Predicting future AI failures from historic examples. *Forsight*, *21*(1), 138–152.

Yin, R. K. (2014). *Case study research: Design and methods* (4. ed.). *Applied social research methods series: Vol. 5*. SAGE.

Yoo, Y., Henfridsson, O., & Lyytinen, K. (2010). Research Commentary —The New Organizing Logic of Digital Innovation: An Agenda for Information Systems Research. *Information Systems Research*, *21*(4), 724–735.

Zheng, X. R., & Lu, Y. (2022). Blockchain technology – recent research and future trend. *Enterprise Information Systems*, *16*(12).

Zigurs, I., & Buckland, B. K. (1998). A Theory of Task/Technology Fit and Group Support Systems Effectiveness. *MIS Quarterly*, *22*(3), 313–334.

8 Appendix

8.1 Declarations of Co-Authorship and Individual Contributions

The co-authors' contributions to the essays were as follows:

Essay 1: Facilitating Cooperation of Smallholders in Developing Countries: Design Principles for a Cooperative-Oriented Decentralized Autonomous Organization

This research paper was co-authored by Tobias Guggenberger, Patrick Troglauer, Nils Urbach, and Martin Weibelzahl. They contributed as follows:

Julia Amend (leading co-author)

Julia Amend initiated and co-developed the research project. She contributed by developing the paper's theoretical foundations. Further, she engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. She also participated in research discussions, and provided feedback on the paper's content and structure. During the revision process, she took a leading role in adjusting the paper's content and structure against the backdrop of the provided reviewer feedback. Thus, Julia Amend's co-authorship is reflected in the entire research project.

Patrick Troglauer (subordinate co-author)

Patrick Troglauer also initiated and co-developed the research project. He contributed by developing the paper's theoretical foundations. Further, he engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions, and provided feedback on the paper's content and structure. Thus, Patrick Troglauer's co-authorship is reflected in the entire research project.

Tobias Guggenberger (subordinate co-author)

Tobias Guggenberger also initiated and co-developed the research project. He contributed by developing the paper's theoretical foundations. Further, he engaged in textual elaboration, especially in the methodology, results, and discussion sections. He also participated in research discussions, and provided feedback on the paper's content

and structure. Thus, Tobias Guggenberger's co-authorship is reflected in the entire research project.

Nils Urbach (subordinate co-author)

Nils Urbach co-developed the research project. He provided mentorship and feedback on the paper's content and structure. He also engaged in the textual elaboration with respect to reviewing and editing of the entire manuscript both over the course of the initial submission and the revision process. Thus, Nils Urbach's co-authorship is reflected in the entire research project.

Martin Weibelzahl (subordinate co-author)

Martin Weibelzahl also co-developed the research project. He provided mentorship and feedback on the paper's content and structure. He also engaged in the textual elaboration with respect to reviewing and editing of the entire manuscript both over the course of the initial submission and the revision process. Thus, Martin Weibelzahl's co-authorship is reflected in the entire research project.

Essay 2: Bringing Government into the Digital Age: Insights from Germany's Asylum Procedure

The research paper was co-authored by Julia Amend, Simon Feulner, Alexander Rieger, Tamara Roth, Tobias Guggenberger, and Gilbert Fridgen. The authors contributed as follows:

Julia Amend (co-author)

Julia Amend initiated and co-developed the research project. She participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. Further, she engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. She also participated in research discussions and co-shaped the paper's content and structure. Thus, Julia Amend's co-authorship is reflected in the entire research project.

Simon Feulner (co-author)

Simon Feulner also initiated and co-developed the research project. He participated in regular discussion rounds and contributed to developing the paper's theoretical

foundations, content, and structure. Further, he engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions and co-shaped the paper's content and structure. Thus, Simon Feulner's co-authorship is reflected in the entire research project.

Alexander Rieger (co-author)

Alexander Rieger co-developed the research project. He participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. Further, he engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions and co-shaped the paper's content and structure. Thus, Alexander Rieger's co-authorship is reflected in the entire research project.

Tamara Roth (co-author)

Tamara Roth co-developed the research project. She participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. Further, she engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. She also participated in research discussions and co-shaped the paper's content and structure. Thus, Tamara Roth's co-authorship is reflected in the entire research project.

Tobias Guggenberger (co-author)

Tobias Guggenberger co-developed the research project. He participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. Further, he engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions and co-shaped the paper's content and structure. Thus, Tobias Guggenberger's co-authorship is reflected in the entire research project.

Gilbert Fridgen (co-author)

Gilbert Fridgen participated in selected research discussions, provided feedback on the paper's content and structure, and reviewed the manuscript. Thus, Gilbert Fridgen's coauthorship is reflected in the entire research project.

Essay 3: Blockchain as a Driving Force for Federalism: A Theory of Cross-Organizational Task-Technology Fit

The research paper was co-authored by Tamara Roth, Alexander Stohr, Julia Amend, Alexander Rieger, and Gilbert Fridgen. The co-authors contributed as follows:

Tamara Roth (Lead co-author)

Tamara Roth initiated and co-developed the research project. She participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. She further participated in data curation and formal analysis. Also, she engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. She also participated in research discussions and co-shaped the paper's content and structure. Thus, Tamara Roth's co-authorship is reflected in the entire research project.

Alexander Stohr (Lead co-author)

Alexander Stohr initiated and co-developed the research project. He participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. He was further responsible for data collection. Also, he engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions and co-shaped the paper's content and structure. Thus, Alexander Stohr's coauthorship is reflected in the entire research project.

Julia Amend (Subordinate co-author)

Julia Amend participated in data curation and formal analysis. She also participated in research discussions and co-shaped the paper's content and structure. Thus, Julia Amend's co-authorship is reflected in the entire research project.

Gilbert Fridgen (Subordinate co-author)

Gilbert Fridgen co-supervised the research project, participated in selected research discussions, and provided feedback on the paper's content and structure. He further reviewed and edited the manuscript. Thus, Gilbert Fridgen's co-authorship is reflected in the entire research project.

Alexander Rieger (Subordinate co-author)

Alexander Rieger was responsible for project administration and co-supervision. He

further participated in selected research discussions and provided feedback on the paper'scontent and structure. Also, he reviewed and edited the manuscript. Thus, Alexander Rieger's co-authorship is reflected in the entire research project.

Essay 4: Recoding Asylum Management – How Germany's Federal Government Approached Innovation with Emerging IT

The research paper was co-authored by Julia Amend, Simon Feulner, Alexander Rieger, Tamara Roth, and Nils Urbach. The co-authors contributed as follows:

Julia Amend (co-author)

Julia Amend initiated and co-developed the research project. She participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. Further, she engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. She also participated in research discussions and co-shaped the paper's content and structure. Thus, Julia Amend's co-authorship is reflected in the entire research project.

Simon Feulner (co-author)

Simon Feulner also initiated and co-developed the research project. He participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. Further, he engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions and

co-shaped the paper's content and structure. Thus, Simon Feulner's co-authorship is reflected in the entire research project.

Alexander Rieger (co-author)

Alexander Rieger co-developed the research project. He participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. Further, he engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions and co-shaped the paper's content and structure. Thus, Alexander Rieger's co-authorship is reflected in the entire research project.

Tamara Roth (co-author)

Tamara Roth co-developed the research project. She participated in regular discussion rounds and contributed to developing the paper's theoretical foundations, content, and structure. Further, she engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. She also participated in research discussions and co-shaped the paper's content and structure. Thus, Tamara Roth's co-authorship is reflected in the entire research project.

Nils Urbach (co-author)

Nils Urbach participated in selected research discussions, provided feedback on the paper's content and structure, and reviewed the manuscript. Thus, Nils Urbach's coauthorship is reflected in the entire research project.

Essay 5: You Can't Manage What You Can't Define: The Success of Blockchain Projects Beyond the Iron Triangle

The research paper was co-authored by Tobias Guggenberger, Jens-Christian Stoetzer, Lukas Theisinger, Julia Amend, and Nils Urbach. The co-authors contributed as follows:

Tobias Guggenberger (co-author)

Tobias Guggenberger initiated and co-developed the research project. He contributed by developing the paper's theoretical foundations. Further, he engaged in textual

elaboration, especially in the introduction, theoretical background, methodology, discussion, and conclusion sections. He also participated in research discussions, and provided feedback on the paper's content and structure. Thus, Tobias Guggenberger's co-authorship is reflected in the entire research project.

Jens-Christian Stoetzer (co-author)

Jens-Christian Stoetzer co-developed the research project. He contributed by conducting and analyzing the expert interviews. Further, he engaged in textual elaboration, particularly in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions, and provided feedback on the paper's content and structure. Thus, Jens-Christian Stoetzer's co-authorship is reflected in the entire research project.

Lukas Theisinger (co-author)

Lukas Theisinger initiated and co-developed the research project. He contributed by conducting and analyzing the expert interviews. Further, he engaged in textual elaboration, particularly in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions, and provided feedback on the paper's content and structure. Thus, Lukas Theisinger's co-authorship is reflected in the entire research project.

Julia Amend (co-author)

Julia Amend supervised the research project and provided mentorship. Further, she participated in research discussions, provided feedback on the paper's content and structure, and engaged in textual elaboration. Thus, Julia Amend's co-authorship is reflected in the entire research project.

Nils Urbach (co-author)

Nils Urbach supervised the research project and provided mentorship. Further, he participated in research discussions, provided feedback on the paper's content and structure, and engaged in textual elaboration. Thus, Nils Urbach's co-authorship is reflected in the entire research project.

Essay 6: Systemic Risk Might Endanger Your IT Project Portfolio – A Critical Overview of Risk Measures

The research paper was co-authored by Julia Amend, Florian Guggenmos, Nils Urbach, and Gilbert Fridgen. The co-authors contributed as follows:

Julia Amend (leading co-author)

Julia Amend initiated and co-developed the research project. She contributed by developing the paper's theoretical foundations. Further, she engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. She also participated in research discussions, and provided feedback on the paper's content and structure. During the submission process, she took a leading role in adjusting the paper's content and structure against the backdrop of the provided reviewer feedback. Thus, Julia Amend's co-authorship is reflected in the entire research project.

Florian Guggenmos (subordinate co-author)

Florian Guggenmos also initiated and co-developed the research project. He contributed by developing the paper's theoretical foundations. Further, he engaged in textual elaboration, especially in the introduction, theoretical background, methodology, results, discussion, and conclusion sections. He also participated in research discussions, and provided feedback on the paper's content and structure. Thus, Florian Guggenmos's co-authorship is reflected in the entire research project.

Nils Urbach (subordinate co-author)

Nils Urbach co-developed the research project. He provided mentorship and feedback on the paper's content and structure. He also engaged in the textual elaboration with respect to reviewing and editing of the entire manuscript. Thus, Nils Urbach's co-authorship is reflected in the entire research project.

Gilbert Fridgen (subordinate co-author)

Gilbert Fridgen co-developed the research project. He provided mentorship and feedback on the paper's content and structure. He also engaged in the textual

elaboration with respect to reviewing and editing of the entire manuscript. Thus, Gilbert Fridgen's co-authorship is reflected in the entire research project.

8.2 Other Research Outcomes

Table 3: Overview of additional publications.

Publication Titles	VHB JQ3 ranking	Publication Status
Amend, J., Kaiser, J., Uhlig, L., Urbach, N., & Völter, F. (2021). What Do We Really Need? A Systematic Literature Review of the Requirements for Blockchain-based E-government Services. In *Proceedings of the 16th International Conference on Wirtschaftsinformatik (WI)*.	C	Published
Amend, J., Eymann, T., Kauffmann, A. L., Münch, T. & Troglauer, P. (2022). Deriving Facilitators for Electronic Health Record Implementation: A Systematic Literature Review of Opportunities and Challenges. In *Proceedings of the 30th European Conference on Information Systems (ECIS)*.	B	Published
Amend, J., Fridgen, G., Rieger, A., Roth, T. & Stohr, A. (2021). The Evolution of an Architectural Paradigm: Using Blockchain to Build a Cross-Organizational Enterprise Service Bus. In *Proceedings of the 54th Hawaii International Conference on System Sciences (HICSS)*.	C	Published
Amend, J., Van Dun, C., Gilbert, F., Köhler, F., Rieger, A., Stohr, A. & Wenninger, A. (2021). Using Blockchain to Coordinate Federal Processes: The Case of Germany's Federal Office for Migration and Refugees. In *Digitalization Cases Vol. 2. Mastering Digital Transformation for Global Business*.	n./a.	Published
Amend, J., Arnold, L., Fabri, L., Feulner, S., Fridgen, G., Harzer, L., Karnebogen, P., Köhler, F., Ollig, P., Rieger, A., Schellinger, B., Schmidbauer-Wolf, G.M. (2022). Federal Blockchain Infrastructure Asylum (FLORA). Piloting and evaluation oft he FLORA support system in the context of the AnkER facility Dresden. Whitepaper of Germany's Federal Office for Migration and Refugees.	n./a.	Published
Amend, J., Arnold, L., Feulner, S., Fridgen, G., Köhler, F., Ollig, P., Rieger, A., & Roth, T. (2022). Opportunities and challenges of using blockchain technology in public administration – Insights from the FLORA project of Germany´s Federal Office for Migration and Refugees. Whitepaper of Germany's Federal Office for Migration and Refugees.	n./a.	Published
Amend, J., Federbusch, M., Fridgen, G., Köhler, F., Rieger, A., Schlatt, V., Sedlmeir, J., Stohr, A. & van Dun, C. (2021). Digitalisierung der Bescheinigungsprozesse im Asylverfahren mittels digitaler Identitäten. Eine Machbarkeitsstudie des Bundesamtes für Migration und Flüchtlinge. Whitepaper of Germany's Federal Office for Migration and Refugees.	n./a.	Published
Gramlich, V., Principato, M., Schellinger, B., Sedlmeir, J., Amend, J., Stramm, J., Zwede, T., Strüker, J. & Urbach, N. (2022). Decentralized Finance (DeFi) – Foundations, Applications, Potentials, and Challenges. Fraunhofer Whitepaper.	n./a.	Published

Essay 1: Facilitating Cooperation of Smallholders in Developing Countries: Design Principles for a Cooperative-Oriented Decentralized Autonomous Organization[2]

Authors

Amend, Julia; Troglauer, Patrick; Guggenberger, Tobias; Urbach, Nils; Weibelzahl, Martin

Abstract

Climate change and an increasing food demand due to a growing world population pose significant challenges for agriculture. Smallholders play a decisive role in establishing a sustainable and efficient future agricultural system since they already provide up to 80% of food in developing countries. However, they often face severe obstacles, especially in developing countries, hampering effective and efficient cooperation and productivity. Even though organizations in the form of cooperatives could help overcome some of the challenges of facilitating smallholders' cooperation, they still suffer from structural problems. Further, in many countries, a lack of formal mechanisms to enforce contractual agreements exists. Given such challenges, decentralized autonomous organizations (DAOs) have already proven to provide alternative forms of governance independent of formal contracts or intermediaries. Therefore, this study follows the design science research paradigm to design, develop, and evaluate a decentralized autonomous organization in the agricultural sector that makes use of cooperative principles. This cooperative-oriented DAO is governed by smart contracts and technically enabled by blockchain technology as the underlying infrastructure. Through our developed and evaluated artifact, the AgriDAO, we guide researchers and practitioners on how such a cooperative-oriented DAO could look to

---

[2] This essay has been published as:

Amend, J., Troglauer, P., Guggenberger, T., Urbach, N. & Weibelzahl, M. (2023). Facilitating cooperation of smallholders in developing countries: design principles for cooperative-oriented decentralized autonomous organization, Information Systems and e-Business Management, pp. 1-31.

solve existing problems related to smallholders and cooperatives. Additionally, we present eight design principles that will guide the development of cooperative-oriented DAOs. Finally, our research shall initiate lively discussion and extensive exploration of this new form of organization.

Keywords

Decentralized autonomous organization, Blockchain-based governance, Cooperatives, Smallholders' cooperation, Design Principles

Essay 2: Bringing Government into the Digital Age: Insights from Germany's Asylum Procedure[3]

Authors

Amend, Julia; Feulner, Simon; Rieger, Alexander; Roth, Tamara; Guggenberger, Tobias; Fridgen, Gilbert

Abstract

Governments spend billions to bring their services into the digital age. But government IT projects can be challenging when the law requires cooperation across multiple levels of government while each level must maintain distinct IT systems. This article examines how Germany's Federal Office for Migration and Refugees successfully navigated these challenges when it implemented FLORA, an inter-governmental IT system that supports the coordination of asylum procedures. FLORA improves the exchange and quality of procedural information, accelerates the procedure by up to 50 percent, and mitigates error and data privacy concerns. Based on our insights into the FLORA project, we provide three recommendations for successfully building inter-governmental IT systems.

Keywords

Government services, Government IT systems, Decentralized IT architecture, Private blockchain, Asylum management

[3] This essay has been accepted for publication in MISQ Executive.

Essay 3: Blockchain as a Driving Force for Federalism: A Theory of Cross-Organizational Task-Technology Fit[4]

Authors

Roth, Tamara; Stohr, Alexander; Amend, Julia; Fridgen, Gilbert; Rieger, Alexander

Abstract

Digital technologies play an important role for the delivery of many public services. However, selecting and adopting the 'right' digital technologies is often challenging, especially for federally structured governments. Universal factors for successful adoption are hard to establish, and the particularities of federalism, such as the separation of competencies, complicate technology selection. Nevertheless, blockchain technology seems to flourish in these environments. Through a single-case study on the blockchain project of Germany's Federal Office for Migration and Refugees, we unpack one essential factor for this success: the fit between (cross-) organizational task structure and technological properties. This fit earns the Federal Office's project considerable credit and traction with stakeholders and partner authorities – not least because it supports the argument that the digitalization of federal systems is possible without 'digital centralization' and redistribution of competencies. Our task-technology fit analysis contributes to a better understanding of the adoption of blockchain in the public sector. It also provides the foundation for an extended task-technology fit theory for federally structured, cross-organizational contexts.

Keywords

Blockchain, Public sector, Federalism, Organizing principles, Task-technology fit

---

[4] This essay has been published as:

Roth, T., Stohr, A., Amend, J., Fridgen, G. & Rieger, A. (2023). Blockchain as a driving force for federalism: A theory of cross-organizational task-technology fit, International Journal of Information Management, 68.

Essay 4: Recoding Asylum Management – How Germany's Federal Government Approached Innovation with Emerging IT[5]

Authors

Amend, Julia; Feulner, Simon; Rieger, Alexander; Roth, Tamara; Urbach, Nils

Extended abstract

While digital innovations in public services can contribute to faster, cheaper, and more citizen-centered services (Eggers et al., 2024), governments are struggling to bring their services into the digital age (Amend et al., 2024; Goh & Arenas, 2020; Pahlka, 2023).

This is mainly due to structural and cultural barriers that impede digital innovation. For instance, governments are characterized by overly complex processes and top-down decision-making, complex IT architectures, and bureaucratic stewardship thinking (Goh & Arenas, 2020; Scott et al., 2016). Emerging technologies – such as blockchain or generative AI (Shiller, 2020; Vassilakopoulou et al., 2023; Vinsel, 2023) – add additional complexity for governments seeking to successfully drive digital innovation. First, the technologies' immaturity (Rotolo et al., 2015) complicates the assessment of the true business value (Enholm et al., 2022; Schlecht et al., 2021). Second, exaggerated stories about the emerging technologies' transformative potentials are frenetically discussed in the public discourse and are predominantly used to fuel hype around a technology (Miranda et al., 2022; Shiller, 2020; Wang, 2010). Finally, the adoption of emerging technologies becomes even more complicated when public perceptions of an emerging technology shift from exaggerated euphoria to equally unbalanced criticism (Swanson & Ramiller, 2004; Swanson & Ramiller, 1997).

To gain a better understanding of how organizations can successfully manage to innovate with emerging ITs, we ask:

---

[5] At the time of writing this dissertation, this essay is submitted to a scientific journal.

How can organizations successfully innovate with emerging ITs?

To answer this question, we adhered to a clinical IS research approach (Baskerville et al., 2023) and thoroughly investigated the clinical case of Germany's Federal Office for Migration and Refugees, where blockchain as an emerging IT was selected to technically support the coordination of authorities involved in the asylum procedure through sharing relevant procedural information. From its inception in early 2018 until its rollout in several German states in 2024, we could draw on a tremendous wealth of experience, making FLORA a particularly rich case worth investigating in detail how governments can successfully innovate with emerging ITs.

Following the recommendations of Yin (2014), we included three data sources: interviews, documentation, and direct observations. Specifically, we conducted 98 interviews at different points during 2018 and 2023. As we sought to consider a broad range of perspectives regarding the selection of interview partners, we spoke to persons in the Federal Office, state-level partner authorities, and IT service providers. All the interviews were semi-structured, allowing us to encourage the interviewees to talk openly and take the conversation in their preferred direction. Further, we analyzed more than 1,000 pages of project documentation, considering conceptual and legal documents (200+ pages), meeting minutes, technical documentation, and user support documents (600+ pages), as well as white papers and evaluation reports (200+ pages). Finally, we complemented our insights with three co-authors' direct observations. They were asked to provide advisory services to the Federal Office to work on strategies to navigate the challenges of innovating with emerging ITs. Thus, they collaborated with colleagues from the Federal Office daily and participated in regular sprint reviews, management meetings, workshops, and events. The three co-authors' support helped build strong and trustful relationships with the project team and the stakeholders, which was beneficial for the interviews, as the interviewees tended to speak openly about critical questions.

Regarding our data analysis, we focused on gaining a better understanding of the barriers and resolution strategies for successfully innovating with emerging ITs. We followed Corbin and Strauss (1990), performing a two-stage coding process: we started with open coding to identify early themes and moved on with axial coding to investigate relevant constructs, relationships, and theoretical explanations. To support our coding process and manage the data volume, we used the software MAXQDA.

Based on our data, we could thoroughly investigate FLORA's challenges and resolution strategies, which formed the foundation to determine four lessons learned that can strongly guide organizations along their innovation journey with emerging ITs: (1) How to develop a government usage case. (2) How to overcome structural barriers. (3) How to overcome cultural barriers. (4) How to secure stakeholder buy-in. These four postulated lessons learned represent the practical contribution of our research essay.

Keywords

Emerging IT, Blockchain, Clinical IS research, Government innovation, Structural barriers, Cultural barriers

References

Amend, J., Feulner, S., Rieger, A., Roth, T., Guggenberger, T., & Fridgen, G. (2024). Bringing Government into the Digital Age: Insights from Germany's Asylum Procedure. *MIS Quarterly Executive*.

Baskerville, R., vom Brocke, J., Mathiassen, L., & Scheepers, H. (2023). Clinical research from information systems practice. *European Journal of Information Systems*, 32(1), 1–9.

Corbin, J., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluation criteria. *Qualitative Sociology*, 13(1), 3–21.

Eggers, W. D., Dinnessen, F., Kono, T., Price, M., & Rodrigues, G. (2024). *Government at warp speed: How agencies are accelerating public service delivery and reducing burdens on citizens and businesses.* https://www2.deloitte.com/us/en/insights/industry/public-sector/government-trends.html#government-at-warp-speed

Enholm, I. M., Papagiannidis, E., Mikalef, P., & Krogstie, J. (2022). Artificial Intelligence and Business Value: a Literature Review. *Information Systems Frontiers*, 24, 1709–1734.

Goh, J. M., & Arenas, A. E. (2020). IT value creation in public sector: How IT-enabled capabilities mitigate tradeoffs in public organisations. *European Journal of Information Systems*, 29(1), 25–43.

Miranda, S. M., Wang, D., & Tian, C. (2022). Discursive Fields and the Diversity - Coherence-Paradox: An Ecological Perspective on the Blockchain Community Discourse. *MIS Quarterly*, 46(3), 1421-1452.

Pahlka, J. (2023). *Recoding America: Why Government Is Failing in the Digital Age and How We Can Do better*. Metropolitan Books.

Rotolo, D., Hicks, D., & Martin, B. R. (2015). What is an emerging technology? *Research Policy*, 44(10), 1827–1843.

Schlecht, L., Schneider, S., & Buchwald, A. (2021). The prospective value creation potential of Blockchain in business models: A delphi study. *Technological Forecasting and Social Change*.

Scott, M., DeLone, W., & Golden, W. (2016). Measuring eGovernment success: A public value approach. European Journal of Information Systems, 25(3), 187–208.

Shiller, R. J. (2020). *Narrative Economics: How Stories Go Viral and Drive Major Economic Events*. Princeton University Press.

Swanson, & Ramiller (2004). Innovating Mindfully with Information Technology. *MIS Quarterly*, 28(4).

Swanson, E. B., & Ramiller, N. C. (1997). The organizing vision in information systems innovation. *Organization Science*, 8(5), 458–474.

Vassilakopoulou, P., Haug, A., Salvesen, L. M., & Pappas, I. O. (2023). Developing human/AI interactions for chat-based customer services: lessons learned from the Norwegian government. *European Journal of Information Systems*, 32(1), 10–22.

Vinsel, L. (2023). Don't Get Distracted by the Hype Around Generative AI: Tech bubbles are bad information environments. *MIT Sloan Management Review*.

Wang, P. (2010). Chasing the Hottest IT: Effects of Information Technology Fashion on Organizations. *MIS Quarterly*, 34(1), 63–85.

Yin, R. (2014). *Case Study Research Design and Methods*, Sage.

Essay 5: You Can't Manage What You Can't Define: The Success of Blockchain Projects Beyond the Iron Triangle[6]

Authors

Guggenberger, Tobias; Stoetzer, Jens-Christian; Theisinger, Lukas; Amend, Julia; Urbach, Nils

Abstract

Companies across industries aim to disseminate blockchain through respective projects that evaluate, design, or implement use cases. However, blockchain poses novel challenges in carrying out such projects due to its novelty and complexity. Companies use success criteria to constantly evaluate projects. Even though literature provides frameworks for the general evaluation of projects, no research yet investigated if success criteria fundamentally differ for blockchain projects due to the characteristics of the technology. Therefore, we assess success dimensions and criteria, deduced and evaluated from an in-depth interview study with blockchain experts from 12 different projects. We contribute to the theory on blockchain project management by introducing a new success dimension and specific success criteria for blockchain projects. Our findings help to elaborate the value of blockchain in companies and novel possibilities to evaluate respective projects. We provide additional insights by assessing their relative importance and discussing implications for theory and practice.

Keywords

Blockchain, Project Management, Project Success, Success Criteria

---

[6] This essay has been published as:

Guggenberger, T., Stoetzer, J.-C., Theisinger, L., Amend, J. & Urbach, N. (2021). You Can't Manage What You Can't Define: The Success of Blockchain Projects Beyond the Iron Triangle. In Proceeedings of the 42nd International Conference on Information Systems (ICIS).

Essay 6: Systemic Risk Might Endanger Your IT Portfolio – A Critical Overview of Risk Measures[7]

Authors

Amend, Julia; Guggenmos, Florian; Urbach, Nils; Fridgen, Gilbert

Extended abstract

IT project failure is more the rule than the exception (The Standish Group, 2020; Flyvbjerg & Budzier, 2011; Flyvbjerg et al., 2022). When emerging ITs are involved, the successful project management becomes even harder, as they are characterized by high uncertainty and risks owing to their inherent immaturity (Häckel et al., 2017; Häckel et al., 2018; Khan et al., 2022; Rotolo et al., 2015). Thus, organizations struggle to assess emerging ITs' true potential business value or to adequately address never-raised questions due to the lack of best practices or technical blueprints (Enholm et al., 2022; Schlecht et al., 2021). While at first glance, emerging ITs seem to only hold high risks, they also hold immense opportunities for organizations' long-term competitiveness, making integrating emerging IT innovation projects into the IT portfolio extremely worthwhile (Häckel et al., 2017; Fridgen & Moser, 2013).

Further, organizations must know that organizational success means multiple IT project success stories and that the success of just one emerging IT innovation project is desirable but insufficient for overall organizational success. That is, all IT projects – emerging IT innovation projects and classical IT projects – form part of a complex IT portfolio with many interdependencies that organizations must also be capable of successfully managing (Micán et al., 2020). These interdependencies mean that one IT project can affect others and, in the worst case, can lead to domino effects or so-called cascade failures, inducing systemic risk (Ellinas et al., 2015; Ellinas, 2019). Thus, organizations must know their IT portfolio – with all the IT projects and existing interdependencies – well if they are to make sound project selection decisions

[7] At the time of writing this dissertation, this essay is submitted to a scientific journal.

(Karrenbauer & Breitner, 2022; Bathallath et al., 2016; Kundisch & Meier, 2011).

Organizations must also perform a systemic risk analysis before making project selection decisions, i.e. they must create multiple risk scenarios for the various IT portfolio constellations (Bai et al., 2023; Beer et al., 2023; Guggenmos et al., 2019). However, a thorough systemic risk analysis requires in-depth data of appropriate quality on the interdependencies between single IT projects, which represents a major challenge for organizations (Micán et al., 2020; Guggenmos et al., 2019; Hill et al., 2000; Cooley et al., 2012). Even if organizations had all data of sufficient quality, the current research lacks an overview of suitable risk measures for analyzing systemic risk in IT portfolios. Thus, we ask:

> *Which risk measures are suitable for analyzing systemic risk in IT portfolios with a focus on emerging IT innovation projects?*

To answer this question, we performed a structured literature review to identify a set of suitable risk measures and corresponding evaluation criteria. We searched top journals in the fields of project management (PM) and information systems (IS), as well as three well-known science databases (ScienceDirect, AIS Electronic Library, and IEEE Xplore). Our search query was as follows: ("IT project" OR "project" OR "IT portfolio") AND ("systemic risk" OR "cascade failure"). Our search yielded 634 studies. After checking for duplicates, screening title, abstract, keywords and, if required, full text, and performing a forward and backward search, we identified eight risk measures.

We categorized these eight risk measures into four categories and performed a criteria-based evaluation to clarify which risk measure fits specific use cases. We then delineated our findings as three recommendations to support organizational leaders in analyzing systemic risk in IT portfolios with a dedicated focus on emerging IT innovation projects: (1) Organizations should know how to quantify their IT portfolio. (2) They should select the most appropriate risk measures according to their available data and use case. (3) They should be aware that no currently available risk measure is able to consider risks and synergies simultaneously, demanding separate risk analyses and subsequent reflection on the results. These recommendations represent our practical contribution.

We have made multiple primary theoretical contributions: We have provided an overview of suitable risk measures, which, to date, have been missing. Further, we

updated and enriched an existing set of evaluation criteria to evaluate risk measures in the context of IT portfolios. Third, to protect organizations against irrational investment decisions spurred by the stories in the vibrant innovation discourse, we have provided means for a quantitative IT portfolio assessment as a foundation for better-founded and more neutral decisions regarding initiating emerging IT innovation projects. Fourth, we raised awareness that, besides risks, emerging IT innovation projects also hold great opportunities. Yet, in our study, no risk measure could simultaneously consider risks and synergies, indicating that nowadays risk measures detect inherent risks but neglect synergies. Thus, if organizations perform well regarding their IT portfolio management and already use risk measures, it is very likely that they will exclude emerging IT innovation projects when following the results of their quantitative assessment. Finally, we advocated for mindfulness regarding emerging IT innovation adoption decisions, avoiding thoughtless bandwagoning driven by exaggerated euphoria or paralysis by fear of the risks of emerging IT innovations.

Keywords

Emerging IT innovation project, IT portfolio, Systemic risk, Risk measure, Evaluation criteria

References

Bai, L., Han, X., Zhang, Y., & Xie, X. (2023). Optimal Project Portfolio Selection Considering Cascading Failure Among Projects. *IEEE Transactions on Engineering Management*, 1–11.

Bathallath, S., Smedberg, Å., & Kjellin, H. (2016). Managing project interdependencies in IT/IS project portfolios: a review of managerial issues. *International Journal of Information Systems and Project Management*, 4(1), 67–82.

Beer, M., Fridgen, G., Müller, H.-V., & Wolf, T. (2013). Benefits Quantification in IT Projects. *Wirtschaftsinformatik*.

Cooley, D. M., Galik, C. S., Holmes, T. P., Kousky, C., & Cooke, R. M. (2012). Managing dependencies in forest offset projects: Toward a more complete evaluation of reversal risk. *Mitigation and Adaptation Strategies for Global Change*, 17(1), 17–24.

Ellinas, C. (2019). The domino effect: an empirical exposition of systemic risk across project networks. *Production and Operations Management*, 28(1), 63–81.

Ellinas, C., Allan, N., Durugbo, C., & Johansson, A. (2015). How robust is your project? From local failures to global catastrophes: A complex networks approach to project systemic risk. *PloS One*, 10(11).

Enholm, I. M., Papagiannidis, E., Mikalef, P., & Krogstie, J. (2022). Artificial Intelligence and Business Value: A Literature Review. *Information Systems Frontiers*, 24(5), 1709–1734.

Flyvbjerg, B., & Budzier, A. (2011). Why your IT project may be riskier than you think. *Harvard Business Review*, 89, 23–25.

Flyvbjerg, B., Budzier, A., Lee, J. S., Keil, M., Lunn, D., & Bester, D. W. (2022). The Empirical Reality of IT Project Cost Overruns: Discovering A Power-Law Distribution. *Journal of Management Information Systems*, 39(3), 607–639.

Fridgen, G., & Moser, F. (2013). Using IT fashion investments to optimize an IT innovation portfolio's risk and return. *Journal of Decision Systems*, 22(4), 298–318.

Guggenmos, F., Hofmann, P., & Fridgen, G. (2019). How ill is your IT Portfolio?– Measuring Criticality in IT Portfolios Using Epidemiology. In *Proceedings of the 40th International Conference on Information Systems (ICIS)*, Munich, Germany.

Häckel, B., Lindermeir, A., Moser, F., & Pfosser, S. (2017). Mindful engagement in emerging IT innovations. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, 48(1), 53–74.

Häckel, B., Pfosser, S., Stirnweiß, D., & Voit, C. (2018). Determining optimal strategies for investments in an emerging IT innovation. In *Proceedings of the European Conference on Information Systems (ECIS)*, Portsmouth, UK.

Hill, J., Thomas, L., & Allen, D. (2000). Experts' estimates of task durations in software development projects. *International Journal of Project Management*, 18(1), 13–21.

Karrenbauer, C., & Breitner, M. H. (2022). Value-driven IT Project Portfolio Management: Process Model, Evaluation Framework, and Decision Support. In *Proceedings of the International Conference on Information Systems (ICIS)*, Copenhagen, Denmark.

Khan, A. A., Laghari, A. A., Shaikh, Z. A., Dacko-Pikiewicz Zdzislawa, & Kot, S. (2022). Internet of Things (IoT) Security With Blockchain Technology: A State-of-the-Art Review. *IEEE Access*.

Kundisch, D., & Meier, C. (2011). IT/IS project portfolio selection in the presence of project interactions–review and synthesis of the literature. In *Proceedings of the 10th International Conference on Wirtschaftsinformatik (WI)*, Zürich, Switzerland.

Micán, C., Fernandes, G., & Araújo, M. (2020). Project portfolio risk management: a structured literature review with future directions for research. *International Journal of Information Systems and Project Management*, 8(3), 67–84.

Rotolo, D., Hicks, D., & Martin, B. R. (2015). What is an emerging technology? *Research Policy*, 44(10), 1827–1843.

Schlecht, L., Schneider, S., & Buchwald, A. (2021). The prospective value creation potential of Blockchain in business models: A delphi study. *Technological Forecasting and Social Change*.

The Standish Group. (2020). *CHAOS 2020: Beyond Infinity Report*. The Standish Group.