How Organizations Sustain and Navigate Between (De)centralization Equilibria: A Process Model

Completed Research Paper

Eduard Hartwich
SnT-Interdisciplinary Centre for Security, Reliability and Trust, University of Luxembourg, Luxembourg, Luxembourg
eduard.hartwich@uni.lu

Alexandra Hoess
SnT-Interdisciplinary Centre for Security, Reliability and Trust, University of Luxembourg, Luxembourg, Luxembourg
alexandra.hoess@uni.lu

Alexander Rieger
SnT-Interdisciplinary Centre for Security, Reliability and Trust, University of Luxembourg, Luxembourg, Luxembourg
alexander.rieger@uni.lu

Tamara Roth
Sam M. Walton College of Business, University of Arkansas, Fayetteville, Arkansas, United States
tr036@uark.edu

Gilbert Fridgen
SnT-Interdisciplinary Centre for Security, Reliability and Trust, University of Luxembourg, Luxembourg, Luxembourg
gilbert.fridgen@uni.lu

Amber Grace Young
Sam M. Walton College of Business, University of Arkansas, Fayetteville, Arkansas, United States
AYoung@walton.uark.edu

Abstract

Finding the 'right' balance between centralization and decentralization in organizational processes, governance, and IT can be difficult. To navigate this tension field, organizations need to find (de)centralization equilibria that are often dynamic and depend on organizational strategy and context. However, little is known about how organizations should respond once an old equilibrium is punctuated or breaks down. In this paper, we thus conduct an inductive multiple-case study to investigate how organizations sustain and transition between (de)centralization equilibria. We synthesize our insights into a process model that paints the transition as an iterative recalibration process subject to centralization and decentralization tensions. Often, this process will require local and temporary compromises. Our work contributes a much-needed process perspective to the IS literature on (de)centralization.

Keywords: Centralization, Decentralization, Equilibrium, Punctuation

Introduction

"The real trick in high reliability systems is somehow to achieve simultaneous centralization and decentralization" (Weick, 1987, p. 124).

The 'golden ratio' between centralization and decentralization is difficult to achieve. While centralized structures can reduce coordination costs of organizational processes and governance mechanisms, they become ineffective once organizations reach a certain size and communication complexity (Mintzberg, 1989; Rediker & Seth, 1995; Siggelkow & Levinthal, 2003). Decentralized structures, in turn, allow organizations to distribute decision-making rights and responsibilities so that 'local' opportunities and requirements can be reflected as they arise (Andersen, 2005; Kahai et al., 2003; Weick, 1987). However, decentralized structures do not come without costs either. Too much decentralization allows subunits to act opportunistically and withhold information from organizational leadership, which not only creates coordination costs (Foss et al., 2010; Grandori, 1997; Rediker & Seth, 1995; Srikanth & Puranam, 2014) but also fuels conflicts of interest (Andersen, 2005; Beck et al., 2018; Wiseman et al., 2012). Larger organizations consequently find themselves in a tension field between centralization and decentralization (Mintzberg, 1989) in which they need to develop a certain (de)centralization equilibrium (Smith & Lewis, 2011).

In today's organizations, it can be difficult to establish such 'equilibria' in organizational processes, governance, and information technology (IT) (Hanelt et al., 2021; Henderson & Venkatraman, 1999; King, 1983). Moreover, organizations are occasionally subject to punctuating events that can challenge stable, existing equilibria and require recalibration or a transition to a new equilibrium (Romanelli & Tushman, 1994; Tushman & Romanelli, 1985). However, organizations often struggle with navigating these changes once an established equilibrium is broken. In particular, there is a need for a greater understanding of how organizations can and should manage the tensions that these recalibrations and transitions bring. We thus ask the following question:

RQ: *How can organizations sustain and navigate between stable (de)centralization equilibria?*

To answer our research question, we conduct an inductive, longitudinal multiple-case study (Eisenhardt & Graebner, 2007; Yin, 2011). Our study focuses on the development and adoption of two cross-organizational IT systems that saw several transitions between centralization and decentralization. The first case revolves around the development and roll-out of Germany's Federal Blockchain Infrastructure Asylum (FLORA), which supports the coordination between the authorities involved in Germany's asylum procedure. The second case studies the development and adoption of the European Blockchain Services Infrastructure (EBSI), which supports the delivery of cross-border public services in Europe. We could gain particularly rich insights into these two cases as authors of this work have been regularly involved with the projects since 2018.

Our contributions are two-fold. First, we derive a process model for the development of stable (de)centralization equilibria, which are characterized by established activity patterns, routines and workflows (Romanelli & Tushman, 1994; Tushman & Romanelli, 1985). Specifically, our model casts the development of equilibria between centralization and decentralization in organizational processes, governance, and IT as an iterative recalibration and transition process that is triggered by punctuating events and shaped by centralization and decentralization tensions. Second, we find that organizational decision-makers can be particularly successful in this process when they allow for local and temporary differences in the degree of (de)centralization.

The rest of the paper is structured as follows. The background section synthesizes the management literature on (de)centralization, the role of IT in supporting (de)centralization equilibria, and the impact of blockchain on (de)centralization. The third section describes our two cases and our data collection and analysis. In the fourth section, we present our emerging process model. The fifth section discusses our model and three complementary conjectures before elaborating on our theoretical contributions, practical implications, and boundary conditions. Section six concludes with a summary of our key insights.

Theoretical Background

Navigating the Tension Field Between Centralization and Decentralization

When organizations start to form, they typically rely on centralized processes and governance mechanisms (Aldrich & Pfeffer, 1976; Mintzberg, 1984). In such centralized structures, decision-making authority is vested with a single entity or a small group of people that also defines and dictates these organizational processes (Ahituv et al., 1989; Mintzberg, 1989; Siggelkow & Levinthal, 2003). As the number of entities with decision-making authority is limited, centralization typically increases operational efficiency and reduces coordination costs (Aulakh & Gencturk, 2000; Mintzberg, 1989; Peppard, 2018; Rediker & Seth, 1995). However, centralization is only practical when the necessary information and competencies reside with or can be transferred to a central authority that is accepted and respected by organizational subunits and when the actions of this authority are transparent (Foss et al., 2010; Grandori, 1997; Mintzberg, 1989; Rediker & Seth, 1995; Srikanth & Puranam, 2014). Once organizations start expanding and grow beyond a certain size (Mintzberg, 1989), centralized organizing often causes overbearing communication costs or even loss of control (Smith & Lewis, 2011).

Unlike centralization, decentralization distributes decision-making authority along an organization's vertical and horizontal dimensions; it leaves decision-making to the discretion of the respective subunits (Mintzberg, 1984, 1989; Siggelkow & Levinthal, 2003). This distributed authority also allows them to define organizational processes locally, foster flexibility, and seize opportunities as they occur (Andersen, 2005; Kahai et al., 2003; Weick, 1987). But decentralized structures come with their own challenges. Organizational subunits may behave opportunistically, create information asymmetries, and are prone to conflicts of interest (Andersen, 2005; Beck et al., 2018; Wiseman et al., 2012). Decentralized structures are also disadvantageous when decentral decision-makers are "incompetent, are not appropriately held to account for their decisions or make decisions that result in problems for other organizational units or for higher management" (King, 1983, p. 321). Decentralized organizing thus typically couples the distribution of decision rights with accountabilities and incentive mechanisms to persuade their decentral subunits to act in a certain way (Moldoveanu & Martin, 2001; Weill, 2004).

What makes things complicated for many organizations is that they are neither fully centralized nor fully decentralized. Instead, they find themselves in a dynamic tension field between centralization and decentralization (Siggelkow & Levinthal, 2003; Smith & Lewis, 2011) that requires the negotiation of equilibria. In these equilibria, organizations can leverage the advantages of both structures and balance out their challenges. Once organizational decision-makers accept this equilibrium thinking, they can create flexible organizations and spur a virtuous relationship between both ends of the (de)centralization spectrum (Smith & Lewis, 2011). More specifically, successful organizational leaders "build the management of change into [their organization's] very structure" (Drucker, 1992, p. 97), allowing them to move between different degrees of centralization and decentralization (King, 1983; Siggelkow & Levinthal, 2003).

Such a level of structural malleability, for instance, can enable organizations to initially organize the processes and governance of their sub-units in a decentral manner. This allows them to quickly introduce advancements and innovation to the market and reap benefits from early-mover advantages. Once these advantages fade or are leveled by competitors, organizations often centralize these units to keep costs at bay and reintegrate them with the processes and governance mechanisms of the parent organization (Uhl-Bien & Arena, 2018). Other reasons to realign (de)centralization equilibria can come from changes in organizational management after extended periods of stability (Brown, 1997; Davis & Eisenhardt, 2011; Smith & Tushman, 2005). Whenever organizational leadership changes, the risk of opportunistic behavior in subunits needs to be re-evaluated and potentially requires recentralization as well as adjustment of organizational processes and governance. The management literature refers to such changes as punctuating events (Lyytinen & Newman, 2008; Tushman & Romanelli, 1985), which "substantively disrupt established activity patterns" (Romanelli & Tushman, 1994, p.1141). They may trigger recalibration and eventually "install the basis for new equilibrium periods" (Romanelli & Tushman, 1994, p.1141) that may provoke new challenges and opportunities (Davis & Eisenhardt, 2011).

The Role of Information Technology for (De)centralization Equilibria

Managing such punctuating events may also require adjustments to an organization's IT (Henderson & Venkatraman, 1999; Lyytinen & Newman, 2008). Many organizational leaders manage these adjustments by translating new processes and governance structures into their IT. That is, when they decide to centralize their organization's processes and governance, they also aim for more centralized (macro)structures in the organization's IT to ensure better control. Efforts to decentralize organizational processes and governance, in contrast, often result in the decentralization of IT to mirror the needs and requirements of empowered organizational subunits (Sambamurthy & Zmud, 1999).

However, aligning organizational processes, governance, and IT does not have to be unilateral. New ways of digital organizing typically work in both directions and also require aligning organizational processes and governance mechanisms to IT (Davis & Eisenhardt, 2011). Digital platform ecosystems, for instance, have developed into one of the most common ways of orchestrating different organizations in the co-creation and appropriation of joint value propositions (Constantinides et al., 2018; de Reuver et al., 2018). These ecosystems are powered by digital platforms that blur organizational and hierarchical boundaries (Hein et al., 2020; Jacobides et al., 2018). When platforms have centralized designs, they also introduce a certain degree of centralization to the processes and governance of the platform ecosystem (Hein et al., 2020; T. L. Huber et al., 2017). Other technologies for cross-organizational cooperation, such as blockchain, emphasize decentralized designs (Lacity, 2018), which promote a certain degree of decentralization on (cross-)organizational processes and governance.

These examples demonstrate that IT is not an exclusively stabilizing element in the development of (de)centralization equilibria but show that it can also enable organizations to establish new equilibria, especially in cross-organizational contexts (Zhao et al., 2020). Organizations should thus "not simply seek to identify and adopt the best available technology to restructure the organization" (Henderson & Venkatraman, 1999, p. 481); IT should rather act as a catalyst in an organization's pursuit of stable (de-)centralization equilibria. For this pursuit, organizational processes, governance, and IT need to be malleable (Hanelt et al., 2021; Henderson & Venkatraman, 1999; King, 1983; Mikalef et al., 2021). Malleability in IT is typically achieved through decomposition and modularization of IT components and the implementation of interfaces between these modules (Hanseth & Lyytinen, 2010; Mikalef et al., 2021). Malleable organizational processes are commonly ensured through exchangeable process steps (Hammer, 2014) while malleable governance is characterized by informal and relational practices within formal structures (Gubitta & Gianecchini, 2002; Lumineau et al., 2021).

The truly challenging part, however, is the use of this malleability in response to punctuating events that challenge or break current equilibria (Romanelli & Tushman, 1994). While the IS literature agrees that this response can require changes to organizational processes, governance, or IT, little guidance is available on how organizations can navigate new (de)centralization equilibria once an established equilibrium can no longer be sustained.

The Impact of Blockchain on (De)centralization

Navigating between (de)centralization equilibria is particularly demanding if the underlying IT prescribes a certain degree of (de)centralization. One such example is blockchain technology. Blockchains are decentralized and replicated databases that allow so-called blockchain nodes to directly communicate and interact without an intermediating server or third party (Halaburda, 2018; Halaburda & Mueller-Bloch, 2019; Nakamoto, 2008). They are quite flexible in the degree of decentralization they support. Private permissioned blockchains, for instance, are often less decentralized as they restrict read and write access to a set of pre-registered nodes. Public permissionless blockchains, in turn, impose neither restriction and are often highly decentralized (Beck et al., 2018).

Although blockchains stipulate a certain degree of IT decentralization, they do not necessarily lead to decentralized equilibria (Chen et al., 2021). In fact, research argues that even permissionless blockchains tend to result in rather centralized IT architectures and governance, whereas persmissioned ones may favor decentralization (Bakos et al., 2021). As such, blockchain projects are interesting examples to study how organizations can manage the resulting (de)centralization tensions, as little is known about how such structures are established and how they evolve.

Method and Case Description

To explore how organizations can sustain and navigate between (de)centralization equilibria, we conducted a multiple-case study on the introduction of two blockchain systems (Eisenhardt, 2021; Eisenhardt & Graebner, 2007; Yin, 2017). We selected the two cases for three reasons: 1) they involved the same IT, 2) they are situated in a similar public sector context, and 3) two members of our research team closely accompanied both projects as academic advisor and observer for over five years. This involvement of our team members provided us with particularly rich insights, including unique participant observations and access to relevant project documentation and interview partners. The two cases are complementary since the first case is dominated by centralization tensions, while the second case places a stronger emphasis on decentralization.

Case 1: Germany's Federal Blockchain Infrastructure Asylum (FLORA)

Our first case is the development and roll-out of the Federal Blockchain Infrastructure Asylum, a blockchain-based system that supports the efficient and secure exchange of procedural information between the authorities involved in Germany's asylum procedure. Work on FLORA started in February 2018, and the first pilot was deployed in 2021. Currently, the Federal Office and its partner authorities are rolling out FLORA across Germany's sixteen federal states. Figure 1 provides an overview of FLORA's development trajectory from January 2018 to September 2023.

The FLORA project builds upon Hyperledger Fabric, a private permissioned blockchain framework that supports private sub-chains for each federal state and location. FLORA's nodes (one node per organization) are hosted centrally by the Federal Office but partner authorities are free to host their own node if desired. Read and write access is defined based on each authority's legal responsibility.

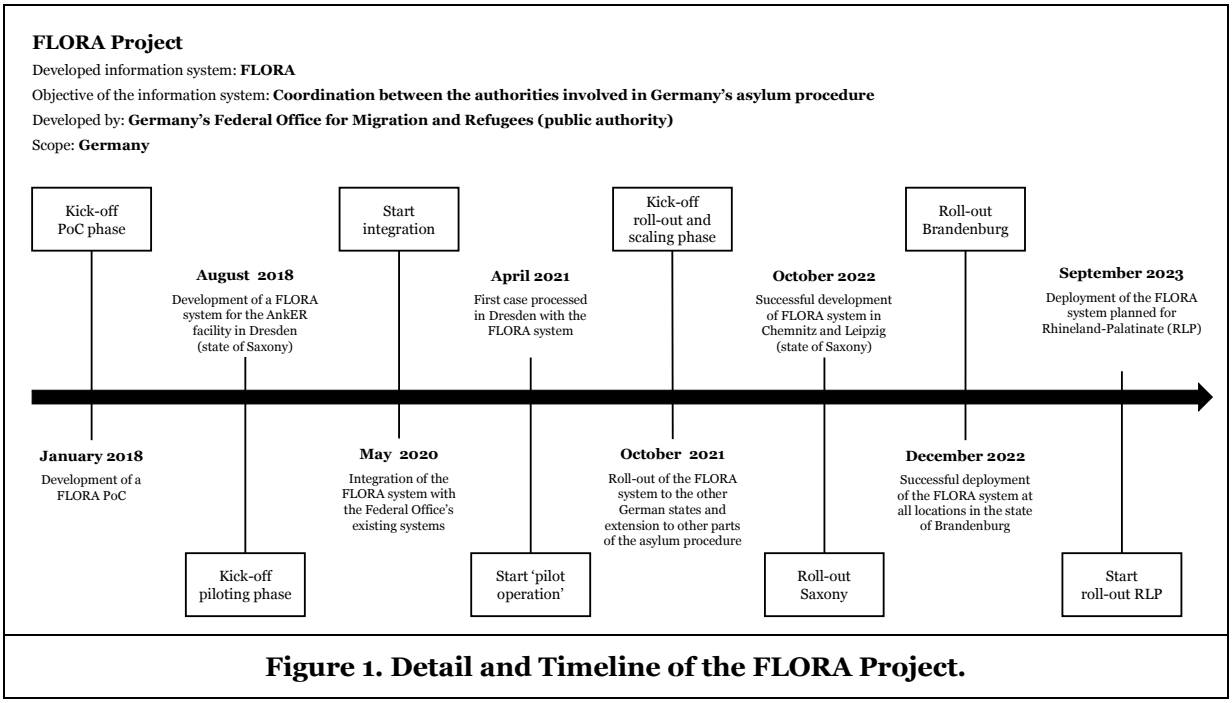

Figure 1. Detail and Timeline of the FLORA Project.

Case 2: European Blockchain Services Infrastructure (EBSI)

Our second case is the European Blockchain Services Infrastructure (EBSI), a blockchain system developed and operated by the European Blockchain Partnership (EBP). The EBP was formed in April 2018 between the European Commission and the EU member states, as well as Norway and Liechtenstein with the intent

to build a blockchain-based system that would support the efficient and secure delivery of cross-border public services. EBSI currently supports the authentication of digital diploma credentials, and deployment in production is scheduled for the second half of 2023. In parallel, the EBP is working on several other use cases, such as social security passports and document traceability. Figure 2 provides an overview of EBSI's development trajectory from April 2018 to September 2023.

In contrast to FLORA, EBSI is hosted decentrally across more than 20 European member states. EBSI relies on a permissioned blockchain based on Hyperledger Besu. Any organization can read data, but only a subset of pre-authorized organizations can host an EBSI node to obtain write and validation rights.

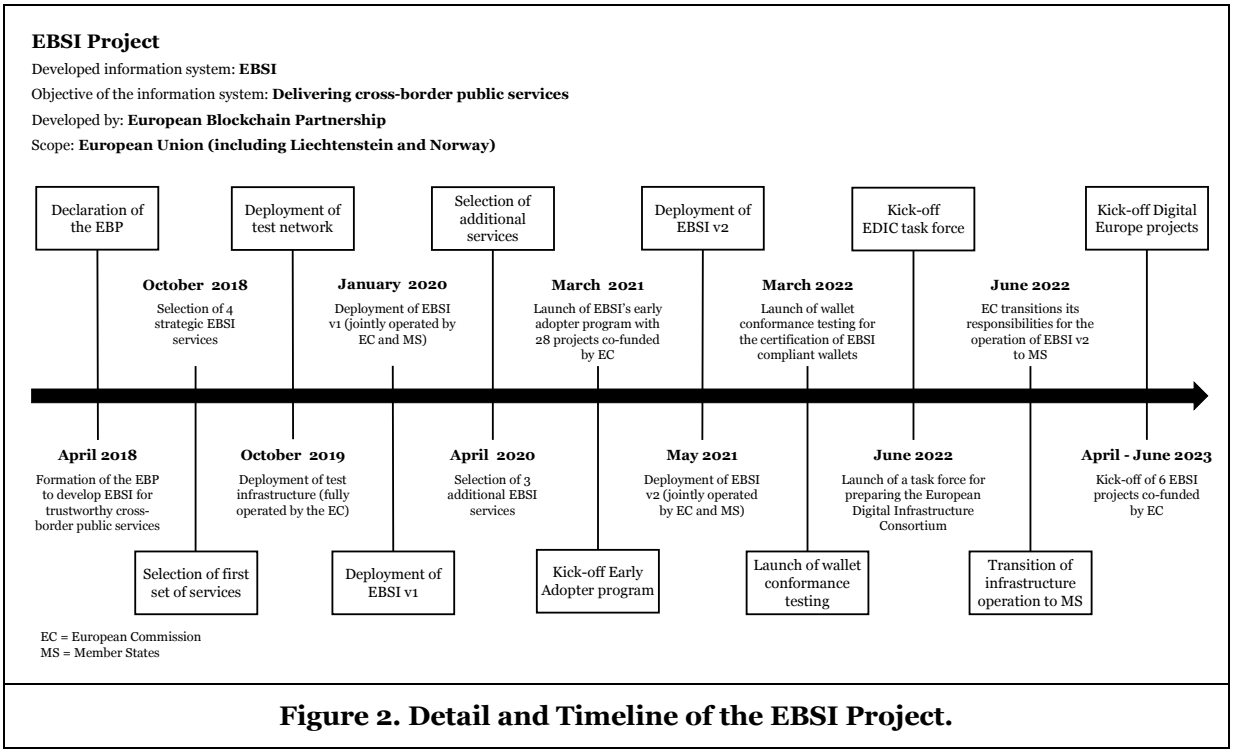

Figure 2. Detail and Timeline of the EBSI Project.

Data Collection

Our first source of case evidence is semi-structured interviews. As the third author accompanied the FLORA project, he regularly conducted explorative interviews to evaluate the emerging system and identify tensions and best practices for developing blockchain projects. During these interviews, tensions between centralization and decentralization became prominent as the project advanced. When we observed similar tensions in an interview study on EBSI's development, we started to specifically explore the changes between centralization and decentralization in a focused set of interviews between March and May 2023. To select informants for the focused interviews, we followed recommendations for informant selection by Huber & Power (1985).

All interviews were conducted based on interview guides we derived from the respective literature. These were organizational (de)centralization in general (Mintzberg, 1989; Smith & Lewis, 2011; Smith & Tushman, 2005) for the explorative interviews as well as IS-specific (de)centralization (King, 1983; Sambamurthy & Zmud, 1999) for the focused interviews. We audio-recorded and transcribed the interviews using established video conferencing tools. Where interviewees did not consent to be recorded, we took extensive notes. The interviews were conducted in German or English, dependent on the language preferences of the interviewees, and lasted between 30-90 minutes. Table 1 summarizes the explorative and focused interviews on which we built our case study.

Case	Number of Interviews
FLORA	Exploratory Interviews: 15 Focused Interviews: 5
EBSI	Exploratory Interviews: 7 Focused Interviews: 6
Table 1. Interviews	

We complemented these interviews with project documentation and direct observations. The third author has been an academic advisor to both the FLORA and the EBSI projects for more than five years. As part of his role in the FLORA project, he regularly participated in meetings on FLORA's technical and strategic development and observed stakeholders in their use of the emerging FLORA system. In the EBSI project, he served as a technical advisor to the EBP. As part of this role, he similarly attended regular meetings related to the technical and strategic development of EBSI. The second author additionally observed the EBSI project for two years (starting in autumn 2021) for research purposes and to inform Luxembourg's national strategy on blockchain and digital identities. She attended meetings related to EBSI's strategic and technical development and the implementation of EBSI's digital diploma use case. Their involvement gave us unique access to relevant documents (source 2) and provided rich participant observations (source 3). Table 2 summarizes these sources.

Case	Project Documentation	Direct Observations
FLORA	1000+ pages	Third author: 3-4 full days per week working on the FLORA project from Jan 2018 to May 2020 2-3 full days per week working on the FLORA project from Jun 2020 to May 2023 1-2 full days per week working on the FLORA project from Jun 2023 to Sep 2023
EBSI	1000+ pages	Second author: 2-3 days per month observing the EBP from Nov 2021 to September 2023 Third author: 2-3 days per month advising the EBP from Feb 2019 to September 2023
Table 2. Overview of Collected Project Documentation and Observations		

Data Analysis

To analyze our case evidence, we followed best practices for studying multiple cases and coding qualitative data (Corbin & Strauss, 1990; Eisenhardt, 1989, 2021; Eisenhardt & Graebner, 2007). We started our analysis with a within-case analysis to see how centralization and decentralization developed in each of the two cases. Throughout this analysis, two authors openly coded the project documentation and interview transcripts to understand context factors and get a feeling for the overall case setting. In the first round of axial coding, they aggregated their open codes into higher-level categories. They frequently consulted with the whole author team to discuss their codes and triangulate their findings with the second and third author's project insights. We also used these meetings to iterate between the pertinent theories on organizational and IS (de)decentralization and our case data.

Overall, our within-case analysis revealed that the FLORA project was dominated by centralization compromises, which led to mounting tensions as the project progressed. The EBSI project, in turn, iterated

between centralization and decentralization compromises, continuously demanding a recalibration of the equilibrium.

Informed by these insights, we proceeded to a cross-case analysis to compare how the two cases balanced centralization and decentralization over time. For this purpose, two authors conducted a second round of axial coding as well as one round of selective coding. During this second coding process, they again regularly met with their co-authors to discuss the codes, triangulate with the second and third authors' insights, and iterate with the pertinent theories.

Our cross-case analysis produced rich insights into the dynamic nature of (de)centralization equilibria. We found stable equilibria in both projects, i.e., periods characterized by stable activity patterns, routines, and workflows. However, punctuations through changes in organizational strategy or context disrupted these equilibria and demanded new compromises in the degree of (de)centralization that inevitably demanded both projects to establish new equilibria.

Results

Throughout our coding and discussion rounds, a story of recalibration and transition emerged. Both projects started with the vision to establish a decentralized equilibrium that would reflect the federal context of both IT systems. However, the need for quick progress required a certain degree of centralization in various stages of the projects. Some of these centralization 'compromises' needed to be revisited as the projects advanced, creating a dynamic back-and-forth and recalibration of organizational processes, governance, and IT. We now turn to how this back-and-forth played out in each of the two projects.

Navigating (De)centralization in the FLORA Project

Germany's asylum procedure requires close collaboration and information exchange between various organizations at the municipal, state, and federal levels. While the Federal Office for Migration and Refugees plays a pivotal role in issuing decisions about asylum applications, state-level migration, authorities and municipal governments are responsible for the initial registration, distribution, accommodation, care, and eventual integration or repatriation of applicants. Several security agencies conduct background checks, and various health authorities provide medical care. The involved authorities often exchange information via inefficient means such as paper lists, spreadsheets, and fax messages. However, efforts to improve this exchange have proven difficult. Since the federal separation of competencies typically prevents "digital centralization" and redistribution of competencies to a central authority, many authorities involved in the procedure prefer a "decentralized" architecture that requires neither the extension of centralized databases nor the delegation of control to a single authority. An IT service provider to the project explains:

"The decentralization of rights and responsibilities resonates well with the BAMF [...] and the foundation of federal organizing. [In the asylum procedure,] responsibilities must be clearly defined and easy to adapt to the individual cases. More specifically, responsibilities should only be with the competent local authority that is, indeed, responsible and able to assume such responsibilities. This makes the installation of a single authority that first has to delegate responsibilities very unattractive."

To address this need for decentralization, Germany's Federal Office for Migration and Refugees began to explore blockchain technology with a Proof-of-Concept (PoC) in January 2018. The idea was that blockchain could reflect the federal structure of the procedure in a cross-organizational IT architecture. Based on a positive evaluation of the PoC, the BAMF initiated a joint pilot project with Saxony's central immigration authority (LDS) in August 2018 to develop and test the FLORA system in Dresden, Saxony. This part of the project saw the establishment of an equilibrium where governance and especially strategic decision-making was shared between the Federal Office and the LDS. In the words of one of FLORA's project managers:

"We closely collaborated with the LDS from the beginning on, which has been quite special. [...] We had a lot of shared responsibilities and required frequent alignment calls. [...] Ultimately, our AnkER facility in Dresden has been selected for the pilot project [...] since we were convinced of the added value of the FLORA project and all groups, offices, and authorities [within the AnkER facility] saw their visions aligned with the goals of FLORA."

Additionally, the Federal Office envisioned shared development and decentralized hosting of the FLORA system. This vision resonated well with the LDS. However, as the pilot phase progressed, the LDS soon signaled a lack of both the required resources and competencies to participate in the development and hosting of the FLORA system. To not jeopardize the pilot project, the Federal Office's FLORA team ultimately established a compromise. The FLORA team would assume full technical responsibility for the FLORA system and host an LDS instance of the FLORA system on the Federal Office's IT infrastructure. The LDS, in turn, would support the FLORA team with requirements and specifications and participate in strategic decision-making. In the words of a business analyst:

"Sure, the LDS and any other authority could technically host a blockchain node. But many, including the LDS do not really want this. The level of complexity in the governance, not necessarily in the technology, requires a different way of thinking and can be an impediment."

Through this centralized equilibrium, the FLORA team could quickly respond when the COVID pandemic required temporary changes to parts of the procedure. This success did not go unnoticed by partnering authorities as well as the BAMF's leadership. Toward the end of the pilot phase, the BAMF's president participated in a conference with representatives from several other German states who responded positively to the presentation of FLORA's pilot phase and encouraged him to make FLORA's roll-out a strategic priority. With the partnering authorities' increasing interest in adopting the FLORA system, the Federal Office, once again, evaluated options for more decentralized governance and IT. However, these efforts were punctuated when the states asked for a fast roll out of the FLORA system. In effect, the FLORA team decided to further formalize its (de)centralization compromise. In particular, it developed a software-as-a-service (SaaS) model and prioritized the roll-out to German states that were interested in the pilot's centralized development and hosting model. A consultant to the project explains:

"We currently have a software-as-a-service model, which ultimately means that the BAMF deploys a productive solution for other stakeholders. It doesn't mean, however, that other organizations cannot influence the solution, make remarks, or ask for personalization. It just means, from a purely technical perspective, that the Federal Office hosts the solution. Long-term, the aim is to develop [the model] into the direction of platform-as-a-service […] to push responsibilities back to the competent state authorities."

As the roll-out progressed, however, the FLORA team began to experience tensions with the SaaS equilibrium as coordinating with an increasing number of 'customers' slowed down development. To ease these tensions, the FLORA team recalibrated its governance model by pushing more responsibilities to its local offices and their partner authorities at the state level. For instance, they were given full responsibility for local data management and first-level support. However, this recalibration was challenging as not all local offices and partner authorities were interested in assuming this responsibility. One of FLORA's project managers explains:

"On the one hand, [the local offices and their partner authorities] love the thought of assuming their rightful responsibilities. On the other hand, they want us to map their processes. […] They feel overwhelmed when they cannot simply call and say what they want but have to do it themselves. So, we really need to push them to assume their responsibilities."

Further centralization tensions resulted from the hosting of the FLORA instances. Historically, the Federal Office had to cede operation of its IT infrastructure to the Informationstechnikzentrum Bund (ITZBund), the Federal Government's IT service provider. This legacy meant the Federal Office had to repeatedly apply for new infrastructure services as the roll-out proceeded. ITZBund, in turn, was slow to provide these services due to lengthy bureaucratic processes. The FLORA team thus explored various options for becoming more independent and recalibrating the 'centralized' hosting equilibrium. In the words of one of the project's IT architects:

"In the end, the 'latencies' provided the relevant incentive to decide that the system is operated by the Federal Office itself. That is, only the basic infrastructure of the network, such as IP addresses, DNS names, routing, firewall, is provided by the ITZ-Bund and we, the Federal Office, provide the operating system, on which we build virtual machines to operate our application."

Navigating (De)centralization in the EBSI Project

Much like the Federal Office, the EBP started to explore blockchain in 2018 to deliver digital public services. The EBP's objective was to develop a European Blockchain Services Infrastructure that would allow member states to provide cross-border public services through a shared IT infrastructure. The use of blockchain was deemed particularly suitable for such an infrastructure, as it would allow to replicate the EU's federal structure in a decentralized IT architecture. This idea of decentralization was also reflected in the EBP's initial processes and governance structure. Strategic decisions were made by a policy group composed of one representative for each EBP member state. Technical decisions were made by a technical group that was also composed of member state delegates. Specifications and requirements for the supported public services came from working groups for each service. Member states were free to decide whether they wanted to involve themselves in the technical and service groups. This decentralization of responsibilities allowed the EBP to secure member state support and buy-in in the EBP's early stages. One representative from an EBSI network operator explains:

"I think [decentralization of responsibilities to different working groups] is a viable approach. It allows the EBP to bring experts together and enables in-depth discussions. Because if you had such discussions in the EBP's higher-level policy- and technical groups, those discussions would become blurred and probably even politicized. And when we look back at what we have achieved, it shows that this decentralization made sense because we have made good progress on these use cases."

However, first decentralization tensions occurred when higher echelons in the European Commission pushed for a swift development of a working pilot system in 2019. While the member states supported the European Commission's ambition to accelerate the development of an EBSI pilot system, many hesitated to assume the required responsibilities and costs for this system. To break this impasse, the European Commission realized that a recalibration and transition toward a more centralized equilibrium was needed. They offered to step in and take responsibility for developing EBSI's core features and deploying a pilot network. To support this shift, the EBP granted the European Commission's EBSI team a certain degree of decision-making authority in technical development. A quote by a national policy representative illustrates:

"The degree of centralization was not forced by the European Commission. It was a result of a lack of involvement from the member states. […] The technical development is quite European Commission-centric. Which is, in general, not a good thing. But it's a result of some member states, I don't say, stepping back, but not being so technically committed […] It's a consequence of the fact that the member states didn't want to take [the responsibility]."

The temporary but relatively centralized equilibrium allowed the EBP to quickly set up a pilot system. However, rolling out the system called for further recalibration, especially for decentralized hosting and development of applications that build on the pilot system. To incentivize and financially support this partial 'redecentralization', the European Commission launched an EBSI funding facility. Many of the submitted tenders focused on applications that would use EBSI to support the issuance and verification of digital diplomas. This focus then led to further decentralization needs as digital diplomas required an additional end-user component, a so-called digital wallet. Soon, the EBSI team felt they did not have the necessary expertise and mandate to develop these wallets. To mitigate these centralization tensions, they created another funding facility and invited private IT companies to contribute the wallets. This decentralized development process required additional control mechanisms. To account for these, the EBSI team defined a set of technical specifications and a certification program. One national EBP policy representative reflects:

"The basic idea is to operate an infrastructure. But for that infrastructure, we had to find a boundary after which we open it [the development of applications] to the market. The important thing is that you find this line and you provide some APIs or other channels for open communication, and then it's a good thing to leave it to the market and to private organizations. It's a good choice because, in this case, competition […] can really have a good impact. I think, if we wanted to create a unique wallet realized by the European Commission, we had to wait too long. Probably upon release, the wallet would have been technically outdated. It's ok that the infrastructure and the requirements for it have had this [centralized] story. While on the upper-levels, like the wallets and so on, we have to [decentralize] it to the market."

This recalibration allowed the EBP to foster EBSI's adoption and progress on the development of digital diplomas. Consequently, the EBSI team began to work on a rollout strategy for a production-ready system. Once again, this strategic prioritization turned out to punctuate the existing equilibrium. In effect, the EBP realized that launching EBSI in production would require increased operational responsibilities of the member states. Yet, the member states felt unable to take full responsibility for an infrastructure they cannot fully control and that is distributed and operated across different organizations and member states. Given these constraints, the EBP started transitioning to a new equilibrium. That is, they started to incorporate the EBP into a newly established European Digital Infrastructure Consortium (EDIC) that would be co-financed and jointly governed by the participating member states. The EDIC would act as an overarching central entity accountable for the development and operation of EBSI. One representative from the European Commission explains:

"That's why we want to support the follow-up of this initiative [the EBP] through a new instrument [EDIC], where it will be less the European Commission that is in the driving seat […] We want the member states to continue their cooperation and to be more the driver of this initiative, with the European Commission staying in the role of the policy support and also financial support. But with the member states taking over our responsibilities in this initiative. That's something we are now preparing with the EBP, and we hope that this will be a way to ensure the continuity of EBSI."

Although all EBP member states considered this transition necessary, many refrained from financially committing to EDIC as a founding member. Some member states were particularly concerned about the long-term perspective of EBSI and an investment in a highly controversial technology that has proven over time to have considerable (technical) limitations. Other member states were hesitant to be a 'first mover'. As a result, only one-third of the member states committed to becoming founding members of EDIC. The limited participation in EDIC caused an (unforeseen) centralization of EBSI's governance as compared to the previously decentralized approach – in particular, the EBP policy and technical groups – that governed EBP and EBSI since their inception. One representative from an EBSI network operator describes:

"All member states, almost all, support EDIC. I don't think I've heard any critical voice saying no we don't. Maybe a couple of member states are not decided yet. Everybody supports it [EDIC], but nobody wants to fund it, that's very clear. That's the crux. […] And there is also the risk that we don't know what will happen after 3 years. That risk exists, of course. But as I understand it, you can join the EDIC and you can also leave again, there is some flexibility."

The IT architecture of EBSI should, in turn, remain decentralized among different node operators in the member states according to detailed service-level agreements, including well-defined terms and conditions for node operation as well as IT security requirements. However, complying with these service-level agreements appeared to be challenging for some pilot network operators who lacked the required IT security certification. Obtaining such a certification can be costly and requires substantial organizational changes. Consequently, the EBSI team feared that a secure and production-grade EBSI would again lead to an unduly centralized network. To mitigate this risk, the EBSI team once again adapted its approach. More specifically, they initiated another funding facility – this time for hosting productive instances and developing complementary productive applications. One national EBP policy representative reflects:

"This is a risk. If these requirements [for the node operation] prove to be too strict and too strong. They impair the enlargement of the number of nodes. This is, of course, an issue. […And] it's quite expensive to set up and operate a node. This is an issue."

Summary

In both projects, the initial vision was to develop an IT system that follows dominant federal organizing structures and a strict decentralization of responsibilities. However, the Federal Office and the EBP had to compromise on decentralization early on because the (political) need for quick progress required a more centralized approach. Over time, the limitations of these centralization compromises and a range of punctuating events required an iterative recalibration and a transition to new (de)centralization equilibria. The FLORA project opted to maintain and recalibrate its centralization compromise and, ultimately, establish a more centralized equilibrium than initially envisioned. The EBP, in turn, attempted to mitigate mounting (de)centralization tensions by iterating between centralization and decentralization, regularly pushing back temporarily centralized responsibilities to the member states.

Discussion

We started our study by observing that large organizations are trapped in a tension field between centralization and decentralization (Mintzberg, 1984, 1989; Smith & Lewis, 2011; Weick, 1987). While the tension field is well researched, little is known about how organizations can navigate this tension field and establish new stable (de)centralization equilibria in their organizational processes, governance, and IT once an old equilibrium is punctuated. We thus conducted a multiple-case study on two projects that saw the establishment, recalibration, and transition between several such equilibria. Our analysis unpacks how changes in organizational strategy or context will typically punctuate (de)centralization equilibria. These punctuating events make the old equilibrium unstable and require organizations to embark on an iterative recalibration of their organizational processes, governance, and IT to reach a new stable equilibrium.

A Process Model for the Development of Dynamic (De)centralization Equilibria

Our insights can be translated into a process model (Cloutier & Langley, 2020) that captures the dynamic development of (de)centralization equilibria in organizational processes, governance, and IT (Figure 3). Drawing on centralization and decentralization literature in the fields of management (Mintzberg, 1984, 1989; Romanelli & Tushman, 1994; Smith & Lewis, 2011; Smith & Tushman, 2005) and IS (Andersen, 2005; Kahai et al., 2003; King, 1983; Sambamurthy & Zmud, 1999), our model describes the iterative recalibration of organizational processes, governance, and IT in response to punctuating events (Lyytinen & Newman, 2008; Romanelli & Tushman, 1994). It highlights that the recalibration process is guided by observations of centralization or decentralization tensions.

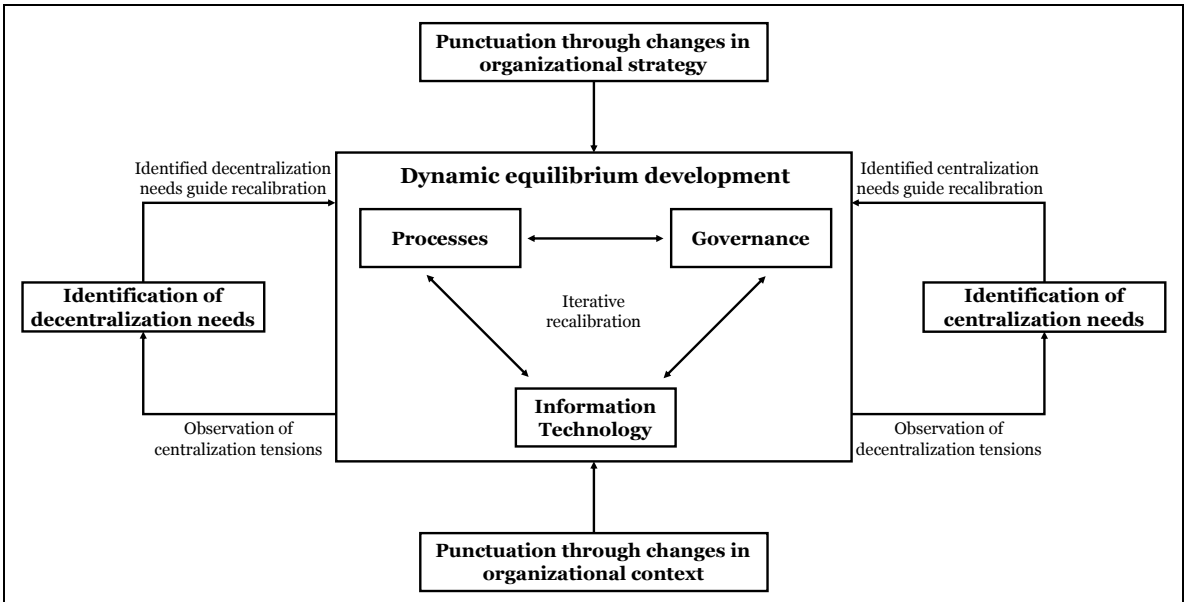

Figure 3. A Process Model for the Dynamic Development of (De)centralization Equilibria in Organizational Processes, Governance, and IT.

Successful navigation of such identification and recalibration processes requires organizations to be malleable in their processes, governance, and IT (Hanelt et al., 2021; Henderson & Venkatraman, 1999; King, 1983; Mikalef et al., 2021). This malleability is particularly crucial when organizations need to react quickly to punctuating changes in their strategic direction (Aldrich & Pfeffer, 1976; Smith & Tushman, 2005) or their organizational context (Ahituv et al., 1989; Sambamurthy & Zmud, 1999). Changes in strategic priorities, for example, may necessitate organizations to shift their governance from a centralized to a more decentralized structure or vice versa. For instance, as our cases demonstrate, strategies that call for a rapid system roll-out, may result in centralization needs. Resource constraints of a central entity, in

turn, may provoke decentralization needs when the system grows. Such shifts often require adjustments to organizational processes and IT to mirror these new governance structures. However, our cases also demonstrate that such shifts are typically temporary. As time passes, new punctuating events may trigger further recalibration or the transition to new equilibria. Thus, we derive the following conjecture:

Conjecture 1: (De)centralization equilibria are inherently temporary and stability results from the ability to recalibrate and transition between equilibria.

Our cases demonstrate how important it is for organizations to navigate equilibria, recalibrations, and transitions carefully. The nature of the tensions organizations will face during transitions depends on the desired degree of centralization or decentralization (Andersen, 2005; King, 1983; Sambamurthy & Zmud, 1999). If the new equilibrium, for example, is to be characterized by strong centralization in one or multiple elements, these changes may lead to substantial coordination or communication costs across organizational subunits (Andersen, 2005; Kahai et al., 2003; Mikalef et al., 2021; Sambamurthy & Zmud, 1999). Identifying such tensions will guide the redesign of the new equilibrium in a more decentralized way and initiate an iterative process of recalibration and re-evaluation. Similar tensions occur when a target equilibrium is situated at the decentralized end of the spectrum. Tensions related to the loss of control over subunits (Beck et al., 2018; Moldoveanu & Martin, 2001; Weill, 2004) or a void in accountabilities as in the cases of FLORA and EBSI, in turn, can emphasize the need to centralize and push for a recalibration of the equilibrium. Hence, we propose as our second conjecture:

Conjecture 2: Punctuations or imbalances in the equilibrium create (un)foreseen needs for counterbalancing organizational processes, governance, and/ or IT.

To accommodate the dynamic recalibration of organizational processes, organizations must allow for local and temporary nuances in their (de)centralization equilibria. Decentralized organizations that aim to establish a decentralized IT system cannot always rely on their existing structures from the onset, as subunits may often be unable or unwilling to take the lead (Andersen, 2005; Beck et al., 2018; Wiseman et al., 2012). In such cases, centralization may not only be essential for filling accountability voids but also for proceeding quickly (Aulakh & Gencturk, 2000; Mintzberg, 1989; Peppard, 2018; Rediker & Seth, 1995). In effect, decentralized organizations may accept local or temporary centralization compromises to enable a transition to a more decentralized equilibrium later. Finding the right time for this transition, however, is essential to avoid undue centralization tensions. Centralized development, for instance, may increasingly impede the roll-out and extension once decentralized IT systems exceed a certain size. Moreover, increased decentralized use can make it hard to maintain centralized accountability. When (de)centralization compromises lead to escalating tensions, organizations may re-evaluate their local and temporal compromises. Accordingly, we derive our third conjecture:

Conjecture 3: To achieve stable (de)centralization equilibria, organizations must allow for dynamism and regularly revisit local and temporary compromises.

Theoretical Contributions

Our research first contributes to the IS literature on (de)centralization by demonstrating that sustaining (de)centralization equilibria in organizational processes, governance, and IT is inherently dynamic. More specifically, our work emphasizes that organizations evolve in response to punctuating events that require an iterative recalibration and transition to a new temporary equilibrium. This process perspective builds on insights into the realization of stable decentralized IT structures and the relevance of malleability (Henderson & Venkatraman, 1999; King, 1983; Mikalef et al., 2021; Sambamurthy & Zmud, 1999). At the same time, it extends these insights by examining the process, i.e., dynamic transitions between (de)centralization equilibria, organizations use to resolve tensions. Moreover, our process perspective highlights that (de)centralization equilibria are not persistent. We explain how organizations can work toward a new equilibrium by making changes to organizational processes, governance, or IT when changes in organizational strategy or context destabilize the old equilibrium (Romanelli & Tushman, 1994).

Secondly, our research adds to management literature on decentralization by demonstrating that the establishment of (de)centralization equilibria requires an IT perspective (Ahituv et al., 1989; Siggelkow & Levinthal, 2003). We emphasize that IT does and should play an important role in sustaining desirable (de)centralization equilibria in today's organizations. However, this does not establish IT as more important than organizational processes or governance. All three are of equal importance and require

careful individual and joint consideration in the pursuit of stable equilibria (Romanelli & Tushman, 1994; Smith & Tushman, 2005). Yet, we observe that the selection of the underlying IT can create baseline tensions and impact the development of (de)centralization equilibria. Blockchains, for example, stipulate a certain degree of decentralization, which may conflict with centralized processes and governance structures. This may require compromises and frequent recalibration.

Third, our research contributes both to the IS and management literature on (de)centralization by connecting the two literatures and unpacking *how* organizations can successfully navigate the recalibration and transition between old and new equilibria. Our study demonstrates that organizations must allow and embrace temporary compromises in these processes. Moreover, organizations will often not be able to apply the same degree of (de)centralization to all units, since not all units possess the same maturity or competence level. As such, we confirm and corroborate the insights of Smith & Tushman (2005) and Smith & Lewis (2011) that dynamic compromises between centralization and decentralization can be utilized to benefit organizations.

Practical Implications

The practical implications of our study are two-fold. First, our research sheds light on how organizational leaders can rebalance the degree of (de)centralization in their organization's processes, governance, and IT in response to changes in strategy or the organizational context. Additionally, our work highlights that any change in the degree of (de)centralization can entail an iterative recalibration or transition process. Organizational leaders should be careful when choosing overly centralized or decentralized structures, as either choice will introduce tensions that may require costly recalibration or transition at a later point. Moreover, organizational leaders are well advised to minimize the number of punctuating events that require an iterative recalibration.

Second, our paper provides organizational leaders with decision support on how to navigate these iterative recalibration and transition processes best. We highlight that organizational leaders should avoid applying a one-size-fits-all approach. Instead, they should consider, allow, and accept local and temporary differences. Especially temporary compromises may be essential to build a stable equilibrium. However, organizational leaders should be aware that such compromises will not be tolerated indefinitely and that other changes in strategy or organizational context may occur that will demand resolving such compromises earlier than expected. Thus, temporal compromises need to be constantly re-evaluated. This minimizes the risk of organizational leaders to mismanage their organizations and create long-term imbalances in their (de)centralization equilibria, which might result in more frequent and costly recalibration.

Boundary Conditions

Boundary conditions are essential to theoretical insights, including those developed from multiple-case study research, as they help define the scope and applicability of the developed theoretical insights (Eisenhardt, 2021). We identify three such boundary conditions for our process model and conjectures in terms of domain, prevalent organizational structures, and technology.

First, both cases are public sector projects, which might limit the generalizability and transferability of our insights. Public organizations are typically not driven by profitability considerations and market pressure. As such, they might have more margin for maneuvering when allowing for local and temporary differences between their organizational subunits while trying to find a (de)centralization equilibrium. Companies might not always have this level of freedom as market pressures may restrict them and stifle attempts to 'experiment' with different levels of centralization (Weick, 1987).

Second, both cases are situated in a federally organized context, which naturally places them between centralized and decentralized structures. This second boundary condition emphasizes the transferability of our findings to strongly centralized or strongly decentralized organizations. Our model cannot predict whether organizations that find themselves on one end of the (de)centralization continuum would be willing to – at least temporarily – commit (de)centralization compromises and search for new stable equilibria. Yet as both centralized and decentralized structures each present opportunities and limitations, we argue that organizations at either end of the (de)centralization continuum will sooner or later face punctuating events that may cause them to compromise on parts of their existing structures to ensure successful organizing (Smith & Lewis, 2011; Smith & Tushman, 2005).

Third, both projects focus on developing blockchain-based systems, which naturally imposes a certain degree of decentralization. This third boundary condition, thus, affects the transferability of our results to equilibria build around more inherently centralized IT. However, a closer look at both cases suggests that our model may not be limited to blockchain. While both systems were initially built around blockchain, the blockchain components have become less important over time and have been complemented by various other components and technologies as development proceeds. Furthermore, many of the observed (de)centralization tensions occurred independently of blockchain technology. This leads us to surmise that our insights can also be transferred to IT systems that do not build on blockchain.

Conclusion

Our study demonstrates that establishing a (de-)centralization equilibrium in organizational processes, governance, and IT is a dynamic process that requires constant recalibration and sometimes transitions to new equilibria. Based on insights from two blockchain projects, we derive a process model that describes this recalibration and transition. Our model details that punctuations through changes in organizational strategies and context, as well as tensions inherent to centralization and decentralization, can trigger an iterative recalibration process and the transition to a new (de)centralization equilibrium. Navigating this transition can require local or temporal compromises.

Acknowledgements

This research was funded in part by the Luxembourg National Research Fund (FNR) and PayPal, PEARL grant reference *13342933/Gilbert Fridgen*, as well as the Luxembourg National Research Fund (FNR) in the FiReSpARX (grant reference *14783405*) project, and Luxembourg's Ministry for Digitalisation. We also acknowledge the support of the European Union (EU) within its Horizon 2020 programme, project MDOT (Medical Device Obligations Taskforce), grant agreement *814654,* that made this paper possible. For the purpose of open access, the authors have applied a Creative Commons Attribution 4.0 International (CC BY 4.0) license to any Author Accepted Manuscript version arising from this submission.

References

Ahituv, N., Neumann, S., & Zviran, M. (1989). Factors affecting the policy for distributing computing resources. *MIS Quarterly*, *13*(4), 389–401. **https://doi.org/10.2307/248722**

Aldrich, H. E., & Pfeffer, J. (1976). Environments of organizations. *Annual Review of Sociology*, *2*(1), 79–105. **https://doi.org/10.1146/annurev.so.02.080176.000455**

Andersen, T. J. (2005). The performance effect of computer-mediated communication and decentralized strategic decision making. *Journal of Business Research*, *58*(8), 1059–1067. **https://doi.org/10.1016/j.jbusres.2004.02.004**

Aulakh, P. S., & Gencturk, E. F. (2000). International principal–agent relationships: Control, governance and performance. *Industrial Marketing Management*, *29*(6), 521–538. **https://doi.org/10.1016/S0019-8501(00)00126-7**

Bakos, Y., Halaburda, H., & Mueller-Bloch, C. (2021). When permissioned blockchains deliver more decentralization than permissionless. *Communications of the ACM*, *64*(2), 20–22. **https://doi.org/10.1145/3442371**

Beck, R., Müller-Bloch, C., & King, J. (2018). Governance in the Blockchain Economy: A Framework and Research Agenda. *Journal of the Association for Information Systems*, *19*(10). **https://aisel.aisnet.org/jais/vol19/iss10/1/**

Brown, C. V. (1997). Examining the emergence of hybrid IS governance solutions: Evidence from a single case site. *Information Systems Research*, *8*(1), 69–94. **https://doi.org/10.1287/isre.8.1.69**

Chen, Y., Richter, J. I., & Patel, P. C. (2021). Decentralized Governance of Digital Platforms. *Journal of Management*, *47*(5), 1305–1337. **https://doi.org/10.1177/0149206320916755**

Cloutier, C., & Langley, A. (2020). What makes a process theoretical contribution? *Organization Theory*, *1*(1), 1–32. **https://doi.org/10.1177/2631787720902473**

Constantinides, P., Henfridsson, O., & Parker, G. G. (2018). Introduction—Platforms and Infrastructures in the Digital Age. *Information Systems Research*, *29*(2), 381–400. **https://doi.org/10.1287/isre.2018.0794**

Corbin, J. M., & Strauss, A. (1990). Grounded theory research: Procedures, canons, and evaluative criteria. *Qualitative Sociology*, *13*(1), 3–21. **https://doi.org/10.1007/BF00988593**

Davis, J. P., & Eisenhardt, K. M. (2011). Rotating leadership and collaborative innovation: Recombination processes in symbiotic relationships. *Administrative Science Quarterly*, *56*(2), 159–201. **https://doi.org/10.1177/0001839211428131**

de Reuver, M., Sørensen, C., & Basole, R. C. (2018). The Digital Platform: A Research Agenda. *Journal of Information Technology*, *33*(2), 124–135. **https://doi.org/10.1057/s41265-016-0033-3**

Drucker, P. F. (1992). The New Society of Organizations. *Harvard Business Review*, *20*(7), 281–293.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, *14*(4), 532–550. **https://doi.org/10.5465/amr.1989.4308385**

Eisenhardt, K. M. (2021). What is the Eisenhardt Method, really? *Strategic Organization*, *19*(1), 147–160. **https://doi.org/10.1177/1476127020982866**

Eisenhardt, K. M., & Graebner, M. E. (2007). Theory Building From Cases: Opportunities And Challenges. *Academy of Management Journal*, *50*(1), 25–32. **https://doi.org/10.5465/amj.2007.24160888**

Foss, N. J., Husted, K., & Michailova, S. (2010). Governing knowledge sharing in organizations: Levels of analysis, governance mechanisms, and research directions. *Journal of Management Studies*, *47*(3), 455–482. **https://doi.org/10.1111/j.1467-6486.2009.00870.x**

Grandori, A. (1997). Governance structures, coordination mechanisms and cognitive models. *Journal of Management & Governance*, *1*(1), 29–47. **https://doi.org/10.1023/A:1009977627870**

Gubitta, P., & Gianecchini, M. (2002). Governance and flexibility in family-owned SMEs. *Family Business Review*, *15*(4), 277–297. **https://doi.org/10.1111/j.1741-6248.2002.00277.x**

Halaburda, H. (2018). Blockchain revolution without the blockchain? *Communications of the ACM*, *61*(7), 27–29. **https://doi.org/10.1145/3225619**

Halaburda, H., & Mueller-Bloch, C. (2019). *Will We Realize Blockchain's Promise of Decentralization?* **https://hbr.org/2019/09/will-we-realize-blockchains-promise-of-decentralization**

Hammer, M. (2014). What is business process management? In *Handbook on business process management 1: Introduction, methods, and information systems* (pp. 3–16). Springer. **https://doi.org/10.1007/978-3-642-45100-3_1**

Hanelt, A., Bohnsack, R., Marz, D., & Antunes Marante, C. (2021). A systematic review of the literature on digital transformation: Insights and implications for strategy and organizational change. *Journal of Management Studies*, *58*(5), 1159–1197. **https://doi.org/10.1111/joms.12639**

Hanseth, O., & Lyytinen, K. (2010). Design theory for dynamic complexity in information infrastructures: The case of building internet. *Journal of Information Technology*, *25*, 1–19. **https://doi.org/10.1057/jit.2009.19**

Hein, A., Schreieck, M., Riasanow, T., Setzke, D. S., Wiesche, M., Böhm, M., & Krcmar, H. (2020). Digital platform ecosystems. *Electronic Markets*, *30*(1), 87–98. **https://doi.org/10.1007/s12525-019-00377-4**

Henderson, J. C., & Venkatraman, H. (1999). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, *38*(2.3), 472–484. **https://doi.org/10.1147/SJ.1999.5387096**

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. **https://doi.org/10.1002/smj.4250060206**

Huber, T. L., Kude, T., & Dibbern, J. (2017). Governance practices in platform ecosystems: Navigating tensions between cocreated value and governance costs. *Information Systems Research*, *28*(3), 563–584. **https://doi.org/10.1287/isre.2017.0701**

Jacobides, M. G., Cennamo, C., & Gawer, A. (2018). Towards a theory of ecosystems. *Strategic Management Journal*, *39*(8), 2255–2276. **https://doi.org/10.1002/smj.2904**

Kahai, P. S., Carr, H. H., & Snyder, C. A. (2003). Technology and the decentralization of information systems. *Information Systems Management*, *20*(3), 51–60. **https://doi.org/10.1201/1078/43205.20.3.20030601/43073.6**

King, J. L. (1983). Centralized versus decentralized computing: Organizational considerations and management options. *ACM Computing Surveys (CSUR)*, *15*(4), 319–349. **https://doi.org/10.1145/289.290**

Lacity, M. C. (2018). Addressing key challenges to making enterprise blockchain applications a reality. *MIS Quarterly Executive*, *17*(3), 201–222. **https://aisel.aisnet.org/misqe/vol17/iss3/3**

Lumineau, F., Wang, W., & Schilke, O. (2021). Blockchain Governance—A New Way of Organizing Collaborations? *Organization Science*, *32*(2), 500–521. **https://doi.org/10.1287/orsc.2020.1379**

Lyytinen, K., & Newman, M. (2008). Explaining information systems change: A punctuated socio-technical change model. *European Journal of Information Systems*, *17*, 589–613. **https://doi.org/10.1057/ejis.2008.50**

Mikalef, P., Pateli, A., & van de Wetering, R. (2021). IT architecture flexibility and IT governance decentralisation as drivers of IT-enabled dynamic capabilities and competitive performance: The moderating effect of the external environment. *European Journal of Information Systems*, *30*(5), 512–540. **https://doi.org/10.1080/0960085X.2020.1808541**

Mintzberg, H. (1984). Who should control the corporation? *California Management Review*, *27*(1), 90–115. **https://doi.org/10.2307/41165115**

Mintzberg, H. (1989). *The structuring of organizations*. Springer. **https://doi.org/10.1007/978-1-349-20317-8_23**

Moldoveanu, M., & Martin, R. (2001). Agency theory and the design of efficient governance mechanisms (Joint Committee on Corporate Governance). *Toronto: Rotman School of Management, University of Toronto.*, *3*(5), 430.

Nakamoto, S. (2008). *Bitcoin: A Peer-to-Peer Electronic Cash System*. Decentralized Business Review.

Peppard, J. (2018). Rethinking the concept of the IS organization. *Information Systems Journal*, *28*(1), 76–103. **https://doi.org/10.1111/isj.12122**

Rediker, K. J., & Seth, A. (1995). Boards of directors and substitution effects of alternative governance mechanisms. *Strategic Management Journal*, *16*(2), 85–99. **https://doi.org/10.1002/smj.4250160202**

Romanelli, E., & Tushman, M. L. (1994). Organizational transformation as punctuated equilibrium: An empirical test. *Academy of Management Journal*, *37*(5), 1141–1166. **https://doi.org/10.5465/256669**

Sambamurthy, V., & Zmud, R. W. (1999). Arrangements for information technology governance: A theory of multiple contingencies. *MIS Quarterly*, *23*(2), 261–290. **https://doi.org/10.2307/249754**

Siggelkow, N., & Levinthal, D. A. (2003). Temporarily divide to conquer: Centralized, decentralized, and reintegrated organizational approaches to exploration and adaptation. *Organization Science*, *14*(6), 650–669. **https://doi.org/10.1287/orsc.14.6.650.24840**

Smith, W. K., & Lewis, M. W. (2011). Toward a theory of paradox: A dynamic equilibrium model of organizing. *Academy of Management Review*, *36*(2), 381–403. **https://doi.org/10.5465/amr.2009.0223**

Smith, W. K., & Tushman, M. L. (2005). Managing strategic contradictions: A top management model for managing innovation streams. *Organization Science*, *16*(5), 522–536. **https://doi.org/10.1287/orsc.1050.0134**

Srikanth, K., & Puranam, P. (2014). The firm as a coordination system: Evidence from software services offshoring. *Organization Science*, *25*(4), 1253–1271. **https://doi.org/10.1287/orsc.2013.0886**

Tushman, M. L., & Romanelli, E. (1985). Organizational evolution: A metamorphosis model of convergence and reorientation. *Research in Organizational Behavior*, *7*, 171–222.

Uhl-Bien, M., & Arena, M. (2018). Leadership for organizational adaptability: A theoretical synthesis and integrative framework. *The Leadership Quarterly*, *29*(1), 89–104. **https://doi.org/10.1016/j.leaqua.2017.12.009**

Weick, K. E. (1987). Organizational culture as a source of high reliability. *California Management Review*, *29*(2), 112–127. **https://doi.org/10.2307/41165243**

Weill, P. (2004). Don't just lead, govern: How top-performing firms govern IT. *MIS Quarterly Executive*, *3*(1), 1–17. **https://aisel.aisnet.org/misqe/vol3/iss1/3**

Wiseman, R. M., Cuevas-Rodríguez, G., & Gomez-Mejia, L. R. (2012). Towards a social theory of agency. *Journal of Management Studies*, *49*(1), 202–222. **https://doi.org/10.1111/j.1467-6486.2011.01016.x**

Yin, R. K. (2011). *Applications of case study research* (3rd ed). Sage Publications.

Yin, R. K. (2017). *Case Study Research and Applications* (6th Edition). Sage Publications.

Zhao, Y., von Delft, S., Morgan-Thomas, A., & Buck, T. (2020). The evolution of platform business models: Exploring competitive battles in the world of platforms. *Long Range Planning*, *53*(4), 101892. **https://doi.org/10.1016/j.lrp.2019.101892**