Why Blockchain: A Socio-technical Perspective on the Motives of Business Consortia Members to Engage with Blockchain Technology

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Despite the large number of resources that blockchain has, and continues to mobilize, what makes the technology unique and why people engage with it is not yet fully understood. Hence, "Why blockchain?" is a question that many scientists and managers still ask themselves or must to answer when facing the technology's critics. While the question is undoubtedly justified, it cannot always be answered from a purely technical perspective. Thus, in this study, we apply a socio-technical information systems artifact perspective and analyze the reasons managers involved in the blockchain consortia have for using blockchain technology. Based on a multiple-case study of 19 blockchain consortia, including interviews with 53 stakeholders, we explicate 19 different motives that justify engagement with the technology in practice. Further, we identify the systemic character of *tokenization* and the importance of the socio-technical interplay of aspects like power decentralization that justify the necessity of blockchain.

CCS Concepts: • **Information systems → Enterprise applications**; *Collaborative and social computing systems and tools*; **Data exchange** • **Computer systems organization** → *Distributed architectures* • **Applied computing** → *Electronic data interchange*; Secure online transactions;

Additional Key Words and Phrases: Blockchain, distributed ledger technology, consortia, digital innovation, interorganizational systems, IS artifact, socio-technical view, grounded theory method

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1 INTRODUCTION

Blockchain technology has been impacting our society since the early 2010s. In doing so, blockchain technology has come a remarkable way, from a niche technology with few adoptions to trillion-dollar global information infrastructures in the form of cryptocurrencies [21]. However, the technology is also being tried out in various application domains aside from cryptocurrencies. We have seen businesses forming consortia and applying blockchain technology to use cases, among others, in the energy sector [47], the automotive sector [55], and the health sector [4].

Yet, it is not fully understood what makes blockchain so unique and why people engage with it. This makes it difficult for both practitioners and researchers to judge the necessity and relevance of **blockchain information systems (blockchain ISs)**. As with other "experimentations at the edge" [73], both managers involved in blockchain projects and researchers of blockchain ISs often get held up in their work, having to re-evaluate and legitimize their choice of technology [3]. This situation, from a practical point of view, leads not only to innovation project delays but also sometimes even to project shutdowns, as some managers themselves do not understand the necessity of blockchain or cannot communicate it clearly to their superiors. In addition, from an academic perspective, research that goes beyond a mere technical evaluation of the technology or the technology's applicability to a specific use case often faces the challenges of having to legitimize the necessity of the underlying blockchain for its analyses.

Although the applicability of blockchain technology continues to be debated in research and practice, the hype around blockchain is real insofar as it mobilizes resources in practice [51] and, therefore, constitutes a new phenomenon [24]. Reasons for dealing with this new phenomenon—and, more specifically, choosing blockchain technology—have so far been limited to blockchain's narrative of decentralization and disintermediation that come wrapped in various decision trees [13, 78], for example. Thus, it is now time to revisit blockchain as a socio-technical phenomenon from the perspective of those who engage with it. Studying practitioners' motives for using blockchain and its legitimizations in practice, we aim to shed light on the often-asked question "Why blockchain?" and thereby explicate the particular characteristics of this novel type of **inter-organizational system (IOS)** [68]. Hence, we raise the following research questions:

RQ1: What are the motives of business consortia members for using blockchain technology?
RQ2: What makes blockchain unique to justify engagement with it?

As blockchain advocates claim the ambition of the technology to change the world, a purely technical analysis is not sufficient. Rather, a socio-technical perspective, which lies at the heart of the information systems discipline, is needed [45]. In essence, a socio-technical view regards equal relevance to both the technical and social aspects of a system from which information arises and impacts the socio-technical interaction [14, 67]. Chatterjee et al. [17] provides a conception of an IS artifact that integrates these key elements and their interaction. It allows the opportunity to structure the motives from a socio-technical perspective and, consequentially, to explicate and theorize on the information system's unique properties. Thus, in this study, we apply this reference model to business blockchain consortia, which will be explained in detail later (Section 2.1).

For the empirical basis, we conducted a multiple-case study with business blockchain consortia, which are consortia that focus on business problems (e.g., the cardossier consortium [80]), instead of blockchain technology development consortia, such as Corda or Hyperledger. For this multiple-case study, we conducted 53 interviews with two to four interviewees from 19 different business blockchain consortia from various domains. The results provide rich insights into 19 different motives businesses have for using blockchain technology. Besides that, by contextualizing these motives along with the IS reference framework in Reference [17], and analyzing their development over time, we find that in early exploration phases the motives of businesses for dealing with blockchain technology are comparable to adoption motives for other IOS technologies. However, as soon as the uncertainty about technological innovation decreases, technological-, social-, and information-driven motives emerge that distinguish blockchain from other IOS technologies [45].

This research has various contributions. Applying an empirical analysis that moves beyond a single case study analysis, this research contributes to prior research a deeper socio-technical understanding of blockchain as a phenomenon rather than providing yet another normative description of the technology. This is relevant for both academics and practitioners. Academics can build on the theoretical conceptualization of blockchain as a socio-technical system and move beyond purely technical analyses. Besides that, by explicitly granting the IS artifact a theoretical role, we pave the way for future more substantial research on the effects of blockchain IOSs [64]. Practitioners can benefit from a detailed description of other practitioners' motives and learn about the unique aspects of the technology they should aim to target and leverage. Besides that, they can use the synthesized blockchain IS motives for their following legitimization challenges.

The remainder of this article is structured as follows: First, we introduce the IS artifact reference framework in Reference [17] that guides our study. Next, we introduce blockchain information systems and review prior work on motives to engage with and develop blockchain information systems, as well as motives for IOS adoption. After that, we describe how the data were collected and analyzed. Then, we present the results and subsequently discuss the results in light of prior academic work. Finally, we conclude the article by pointing out limitations and directions for future research.

2 RELATED WORK

2.1 A Sociotechnical IS Artifact Perspective

The socio-technical perspective is often described as the distinctive and coherent foundation of the information system's discipline [67]. It considers both the technical artifact and the tasks and structures of the group of developers and users of the artifact in the social context. Besides that, information is regarded to impact and be impacted by this socio-technical interaction [67], and the outcomes are described as the results of the interaction between these two central systems [14]. To help researchers practically apply a socio-technical perspective and structure their research, the use of an IS/IT artifact is often proposed [2, 11]. However, many IS/IT artifact conceptions today lack the very essence of our discipline, namely information [35, 49]. Yet, especially today, with the growing relevance of information in areas such as artificial intelligence, blockchain, and big data [1], a proper understanding and analysis of the information element is essential. Addressing this research gap and aiming to help researchers practically apply a socio-technical IS perspective, Reference [17] introduced a theoretical conception of an IS artifact, thereby granting information an explicit role (Figure 1). This conception of an IS artifact follows the notion of the socio-technical view and even more concretely integrates and explicates the role of information. While general agreement exists that next to the interaction of the social and technical ends, information represents a central element of the IS field, it has so far mainly been neglected or not addressed adequately given its importance. In line with prior research [56, 57], however, Reference [17] argues that even if technologies might fade or get exchanged, information persists and is gaining increasing relevance that needs to be adequately addressed.

Figure 1 presents the reference model, which serves as a compass for this research. Its elements are explained in more detail below.

The core components of the reference model are the technical subsystem (i.e., the necessary techniques, tools, and systems that enable us to transform inputs to outputs to enhance organizational performance) and the social subsystem (i.e., the individual actors or groups, their knowledge, skills, the structures, and their relationships, etc.), as well as the information that shapes and is shaped by the interaction of the two subsystems. While the social and technical subsystems are in an affording/constraining relationship with each other, information is positioned as "a defining and emergent property of the superordinate system that shapes, and is shaped by, how the social and technical subsystems interact" (Reference [17], p. 7). Thus, information is a fundamental systemic character of the interaction of the social and technical subsystems and can play multiple roles [36]. It can be a medium, a mediator, or an outcome of the interaction of the social and technical subsystems. Regardless of its

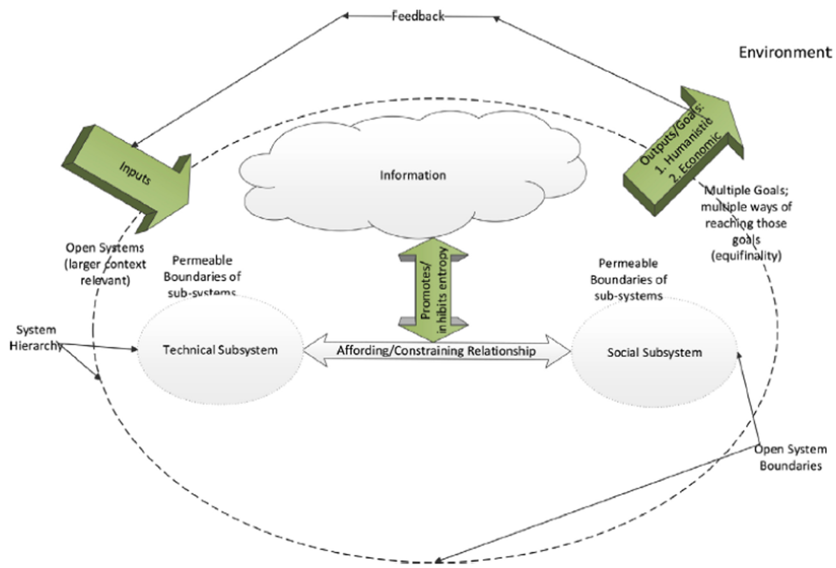

Fig. 1. A reference model for an IS artifact (adopted from Chatterjee et al. [17]).

role, its fundamental salience is to reduce entropy (i.e., the level of uncertainty and disorder in the system) [70]. While both high and low entropy are beneficial, it is important to note that they produce different outcomes. When entropy between the social and the technical subsystem is high, subsystems find innovative ways to reduce entropy and thus create innovations. In contrast, "when entropy is low, subsystems work in tandem and produce outcomes" (Reference [17], p.11).

Further, as represented through the dashed lines, the subsystems are malleable and interact with the surrounding and changing environment and, potentially, with other subsystems. Finally, represented at the top of the model, the feedback loop emphasizes an IS artifact's dynamic nature and the exchange with the environment through receiving inputs and producing outputs. More precisely put, it allows information to be fed back regarding the system's output as new input, which might lead to changes in the transformation process affecting subsystems and/or information.

Having introduced the reference IS artifact and the particular relevance of information, we now turn our attention to blockchain information systems and business consortia and how the introduced IS conception of an artifact can help us to structure and understand their motives for using blockchain.

2.2 Blockchain Information Systems and Business Blockchain Consortia

While the promises of blockchain for businesses and society have led to innumerable prototypes, the choice of blockchain technology has not always been reasonable [13]. In layman's terms, blockchain technology relies on the principles of decentralization, auditability, persistency, and pseudonymity [71, 81], and blockchain systems are essentially regarded as decentralized record management systems [8]. Blockchain information systems, addressing business problems, are often initiated as collaborative projects in so-called business blockchain consortia [80]. In a blockchain consortium, different organizations join forces to develop, manage, govern, and operate a shared blockchain information system [59]. Such shared systems can be understood as a class of IOS, namely systems facilitating electronic exchanges and interactions between two or more participating organizations [16, 64]. Previous forms of IOS include systems for information integration, using, for example, EDI, or processual integration using, for example, collaborative planning, forecasting, and replenishment (e.g., Reference [65]).

In contrast to prior IOS technologies, blockchain allows the involved parties to decentralize control and management of the IOS [80]. Even though its context is different, the same line of thought has been applied to the fundamental example of Bitcoin, where the choice for the technology—or, better said, the drive for the technology innovation—was very much driven by exactly this economic desire for decentralization of power and control [54] that has so far not been possible. Besides that, blockchain ISs differ from prior inter-organizational exchange systems and standards, like EDI, in that they allow the opportunity to assure the uniqueness of the stored records and, hence, create "ownership of data" [52]. Thus, blockchain information systems provide the opportunity to manage unique digital data in a distributed and decentralized setting.

As the mode of collecting and managing data changes and the role and value of data also changes, the above-introduced conception of an IS artifact (that grants an equal role to technical and social aspects and makes the role information explicit) is uniquely well suited to structure prior work and serve as a theoretical basis for analyzing motives of members of business blockchain consortia to engage with and develop blockchain information systems.

2.3 Motives for Engaging with and Developing Blockchain Information Systems

Reviewing research on blockchain technology, we find that reasons for choosing and dealing with blockchain technology have so far mainly been addressed by drawing on blockchain's technical characteristics mentioned above (i.e., to analyze the technical subsystem). Many researchers draw upon these characteristics and derive questions for decision-makers that help them evaluate the appropriateness of the technology for their businesses [13]. Other works [39], for example, helps to delimit the use of blockchain from related technologies such as shared central databases. Meunier provides an overview of a variety of **decision models (DMs)** (largely from grey literature), again aimed at supporting decision-makers to assess the appropriateness of blockchain mainly from a technical perspective, which is in line with the work of other researchers [10, 19]. Wüst and Gervais [78] provide a tool to assess the technical necessity of blockchain as well as the fit of specific instantiations (i.e., private vs. public, permissioned vs. permissionless). Finally, Betzwieser et al. [13] and Pedersen et al. [62] make the first attempt to integrate parts of the social subsystem (multiple parties with conflicting interests) into blockchain decision models. However, they either position these as prerequisites (e.g., multiple parties that do not trust each need to be involved) rather than granting them an equal role [13], or they do not separate the technical from the social aspects [62]. This makes it hard for decision-makers to understand the interrelationship of the social and technical subsystems and the actual value of the social subsystem. All in all, we find that while these DMs support businesses in their evaluation and decision-making regarding the technology, they largely only focus on the technical subsystem and neglect its interrelation with the social subsystem, and especially with the information element.

Consequently, the variety of blockchain initiatives and systems cannot be fully understood by these decision models that largely focus on technical aspects alone. While Li et al. [44] make a first attempt to adopt a socio-technical perspective studying four dimensions (technical, social, process, and political) in the construction sector, the objective of this study is the development of a framework for implementation. Nevertheless, this study points out the necessity for a socio-technical perspective in studying blockchain. Thus, for the purpose of our work, we also reviewed research that analyzes and reports on the use of blockchain to understand what motivates practitioners to engage with the technology. Focusing on supply chain management, Müller et al. [53], for example, find that blockchain is adopted to foster trust and reduce uncertainties and vulnerabilities in collaborative business processes. The works of Seebacher and Schüritz [68], Dozier and Saunders [23], and Kostic and Sedej [40] highlight blockchain's ability to facilitate decentralized inter-organizational collaboration (i.e., collaboration that does not require a central authority). Consequently, the need for controlling partners, which is inversely related to trust [29], might no longer be necessary. Further, research on blockchains as IOSs in supply chains shows how various tensions among associated parties define the eventual blockchain IS [69]. Eliminating dependencies on a central authority and third parties through blockchain adoption is also considered to be an opportunity to establish "digital trust" between the involved actors [28, 76], for example, in land titling in India [71]. Zavolokina et al. [80] go even further and argue the need for collaboration and sharing of power as the key economic rationale for the consortium's choice of blockchain. Last, the ability to create common goods is another theme that arises [20].

Besides the social subsystem, some researchers also mention the use of blockchain to tokenize assets of high value [5, 55]. These range from medical records [46] and trusted car data to represent a car's lifecycle digitally [7] to crypto art [27]. Essentially, these researchers report on the necessity of blockchain technology as it changes the value of information [58] by making data unique and creating some form of ownership [52]. While this could be positioned as a motive to develop blockchain ISs in the information element, a clear classification and understanding of this motive from a practitioners' view have been missing so far.

Finally, prior research shows that, in fact, many blockchain consortia do not have a final blockchain system in mind when they start. They are rather driven either by the desire to experiment and learn about the technology (e.g., input) [24] or by business goals (i.e., the output) [6]. For example, on the one hand, many aim to move beyond blockchain applications in the financial sector by learning-by-doing and experimenting with it [25]. On the other hand, Reference [6] shows that businesses in the car ecosystem are largely driven by the goal of increasing efficiency, creating product innovations, or customizing products and services. Another example is the case of land registries, where such blockchain systems are driven again by efficiency goals through inter-jurisdictional record integrity and security [43]. However, specific configurations of such systems have not been detailed yet. Rather, multiple possible configurations of such systems are generally possible. Similarly, in the case of inter-organizational collaboration in the container shipping industry [38], blockchain was adopted to improve operational efficiency and reduce costs.

All in all, this review indicates that prior research to specifically address motives to engage with and develop blockchain information systems so far has mainly focused on the technical subsystem. Besides that, reviewing these prior works on decision models that aim to support practitioners, we find that they largely apply a top-down approach. In that, the decision models are developed and described based on general insights about the potential of the technology. Yet, a bottom-up view, from the perspective of practitioners that engage with the technology, is lacking. As presented above, research reporting on the use and development of blockchain information systems in practice indicates that other motives to use blockchain that touch upon the social subsystem, input and output, and information exist. Yet, an in-depth analysis of these motives and their interrelation is missing. Thus, in what follows, we review IOS adoption motives. In this regard, we have to acknowledge that "adoption motives" do not equal "motives for engaging and developing a (blockchain) information system." As such, "adoption" implies that companies decide to use a ready-made system. However, in terms of blockchain information systems, up until now, adoption hardly occurred, since only very few consortia have indeed launched a completed system and started onboarding new companies. Interestingly, with regards to IOSs in general, the literature focuses, with few exceptions [74], on adoption rather than the (collaborative) building of such systems. We reason that most IOS initiatives were mainly driven by a focal firm and then later adopted by others (e.g., suppliers) [41]. In the absence of a dedicated stream of literature on building IOSs, we rely on the literature on IOS adoption motives to see if it can provide further insights and directions for analysis, especially with regard to the so-far-neglected elements of the social subsystem, information, and input/output. As such, we assume that motives of blockchain consortia members to engage with blockchain can still be related to this literature stream (the final goal of such initiatives being adoption), even though IOS adoption motives may reflect a later stage.

2.4 IOS Adoption Motives

IOSs are a class of systems supporting various kinds of inter-organizational processes by allowing members of different organizations to access and exchange information. Examples of technologies representing the technical subsystem of the IS artifact [17] used in IOS implementations include databases, EDI systems, XML, workflow systems, and group decision support systems. As such, motives for adopting and using a particular technology will depend on the purpose of the intended IOS and the processes that it should support. Building on previous work by Kumar and van Dissel [42], Chi and Holsapple [18] differentiate between pooled information resource IOSs, value/supply-chain IOSs, and networked IOSs. Pooled information resource IOSs allow for the exchange of structured information and include common information repositories (e.g., shared databases) and common communication infrastructure (e.g., based on XML or peer-to-peer communication). Value/supply chain IOSs are based on EDI systems allowing joint forecasting and planning or RFID sensors to track shipments, for instance. Networked IOSs can be understood as shared collaborative spaces, such as forumlike applications or video-conferencing. In general, the appropriateness of the technical system will hence be assessed by considering the intended type of IOS and the requirements resulting from a specific use case, for example, in terms of flexibility, scalability, real-time access, available role concepts, configurations for interface design, and access control and security mechanisms.

In terms of the social subsystem [17], previous works provide several reasons for companies or a group of companies to engage in an IOS initiative that is not purely dependent on the characteristics of a certain technology. These can be, for example, contingencies influencing the setup of consortia or their choice of technology [22, 60], project and resource spaces [12], as well as collaborative patterns among companies' [18, 64], e.g., inter-organizational processes along with different steps of a supply-chain. As such, IOS adoption motives [18] include the asymmetry motive (to adopt an IOS to exert power or control other companies) or the reciprocity motive (to adopt an IOS to collaboratively work toward mutually beneficial goals) or may relate to the characteristics of inter-organizational transactions (e.g., in terms of their frequency). In addition, organizational readiness (e.g., in terms of available financial resources and top management support) of individual firms influences IOS adoption [64].

In terms of the information element of the IS artifact [17], sharing information across organizational boundaries (i.e., between organizations) to execute inter-organizational processes is at the core of IOSs. Depending on the type of IOS (see above, Reference [42]), IOSs may be used to exchange structured, semi-structured, or unstructured information. Requirements related to information that may influence companies' decisions to adopt an IOS [18] may relate to information transparency (which information should be shared, and with whom), information quality (which transactions should be allowed/not allowed to ensure validity and utility of the system), information privacy/confidentiality (how to avoid misuse and stealing of information), and information access and symmetry (how to make sure that users of a system have the same level of information and avoid opportunism).

As for input from the environment [17] that motivates companies, or creates pressure on companies to adopt IOSs, prior work by Chi and Holsapple [18] distinguishes between the necessity motive (to adopt an IOS to meet regulatory or legal requirements), the agility motive (to adopt an IOS to become more agile and better able to deal with environmental changes), the stability motive (to adopt an IOS to decrease environmental uncertainty and to achieve more stable relationships with partners), and the legitimacy motive (to adopt an IOS to comply with external norms, expectations, and practices in an industry). Also, culture and institutional forces (e.g., institutional and inter-organizational trust and mimetic pressures) [64] operating within inter-organizational networks have been found to influence adoption. At the level of individual firms, the characteristics of an IOS innovation (e.g., compatibility with existing systems, cost) may influence the intention to be involved in and adopt an IOS [64].

Finally, Reference [18] identifies several motives that relate to the outputs/goals [17] associated with adopting and using an IOS from the perspective of a group of companies. This includes the efficiency motive (to adopt an IOS to increase efficiency within individual companies and the efficiency of inter-organizational collaboration), the innovation motive (to adopt an IOS to innovate and create value), and anticipated (positive) network externalities [64], such as the expected size and coverage of a network of organizations using an IOS.

All in all, the findings of prior work presented above provide an overview of IOS adoption motives in general, which will serve as a frame of reference for discussing the findings of the empirical analysis. They will hence be helpful to compare motives of consortia members to build blockchain ISs, as a class of IOSs, with IOSs in general, as well as to place motives of blockchain consortia members within the context of IOS research.

3 DATA COLLECTION

Mainly postulated by Glaser and Strauss [30], **grounded theory (GT)** is a method applied in qualitative research that aims to develop theory that is grounded in systematically gathered and analyzed data [72]. It is well suited for research that aims to explore and understand information systems phenomena and theorize about them [31]. More specifically, Wiesche et al. differentiate among three valuable outcomes of GT methods, applied in information systems: theory development, model development, and rich descriptions of a new phenomenon. Thus, as the goal of this research is to (1) understand and thoroughly describe blockchain as a new phenomenon, as well as (2) define relevant variables and relationships in a blockchain IS (i.e., model development), GT is a uniquely well-suited method for this study. To support IS researchers in conducting and evaluating grounded theory studies in ISs, Urquhart et al. [72] proposed five guidelines as follows (p. 369): (1) constant comparison (constantly comparing instances of data labeled as a particular category with other instances of data in the same category), (2) iterative conceptualization (i.e., theory building by using iterative theoretical coding), (3) theoretical sampling (deciding, on analytical grounds, where to sample from next), (4) scaling up (grouping higher-level categories into broader themes), and (5) theoretical integration (relating the theory to other theories in the same or similar field). In the following, we explain the grounded data collection and analysis process and show how we followed the proposed guidelines.

3.1 Data Collection

Theoretical sampling started very early in the process. Before the core large-scale multiple-case study, we were engaged in a blockchain business consortium for over 2 years. Thus, through the course of this single-case study, we gathered some general insights about why businesses in the consortium decided to engage with blockchain. However, to extend the scope and gain comprehensive insights into the motives of businesses who are engaged in a consortium for employing blockchain technology, we adopted a multiple-case design and performed a cross-case analysis [15, 79]. Cross-case analysis allows opportunities to gain rich insights and increase the validity and generalizability of exploratory findings [26, 79]. Further, it allows for recognizing cross-case patterns that are domain independent and go beyond single-sided impressions [26]. This is important, as the goal of this research was to explore general rather than domain-specific motives for engaging with and developing blockchain ISs. Initially, we intended to interview 10 business blockchain consortia, including the consortium that motivated this study. However, as the data revealed novel insights, we decided to continue data collection of the same data group (theoretical sampling) and conducted additional interviews until saturation was reached. We hence stopped collecting further data after having interviewed members of nine business blockchain consortia. This led to a total of 53 interviews conducted with 19 consortia and focused on grounded analysis.

The interviews, regardless of the phase in which they were conducted, all followed the same semi-structured approach (e.g., Reference [37], p. 350). The interviews were conducted with individuals that were involved in a blockchain consortium and included questions related to the value creation approach, technical aspects of the blockchain solution, collaboration and governance in the consortium, as well as questions regarding legal and regulatory issues. An excerpt from the interview guide is available in Appendix A.1. To gain complementary insights into each consortium, we conducted at least two interviews per consortium (theoretical sampling). To be eligible, interviewees who were selected needed to belong to different member firms of a consortium and have different competencies in the consortium (e.g., consortium management or blockchain system implementation). Conducting interviews with several persons per consortium also allowed us later, during analysis, to cross-validate and contrast individual statements within a case (constant comparison).

For the recruitment of consortia, we aimed at covering various industries to gain insights independent from specific industries. In addition, we focused on consortia aiming to build a blockchain solution to address a business problem (as opposed to consortia developing technological infrastructure only, e.g., Corda). Table 1 gives an overview of the final sample, including each consortium's industry, source of funding, year of foundation, and the roles of the interviewees' companies in the consortium. The interviews were conducted over 6.5 months, from

Table 1. Sample of Blockchain Consortia

Consortium	Industry	Funding	Founded	Interviewees
C01	Mobility	Public	2017	C01_I01: Academic partner C01_I02: Business partner C01_I03: Public agency C01_I04: Technology partner
C02	Financial services	Public	2016 (-2017)	C02_I01: Technology partner C02_I02: Business partner C02_I03: Technology partner
C03	E-government	Public/ Private	2016	C03_I01: Business partner C03_I02: Legal consultancy C03_I03: Technology partner C03_I04: Legal consultancy
C04	Pharmaceutical	Private	2017	C04_I01: Technology partner C04_I02: Business partner C04_I03: Business partner
C05	E-commerce/ logistics	Private	2018	C05_I01: Business partner C05_I02: Technology partner C05_I03: Business partner
C06	Energy	Public	2018 (-2021)	C06_I01: Academic partner C06_I02: Technology partner C06_I03: Business partner
C07	Logistics	Private	2016	C07_I01: Technology partner C07_I02: Business partner C07_I03: Business partner
C08	Health care	Public	2016 (-2019)	C08_I01: Coordinator C08_I02: Technology partner C08_I03: Legal consultancy C08_I04: Business partner
C09	Trade finance	Private	2017 (-2018)	C09_I01: Business partner C09_I02: Business partner C09_I03: Business partner
C10	Health care	Private	2018	C10_I01: Business partner C10_I02: Business partner C10_I03: Business partner
C11	Pharmaceutical	Private	2016	C11_I01: Technology partner C11_I02: Technology partner
C12	Financial services	Private	2017	C12_I01: Business partner C12_I02: Technology partner
C13	E-government	Private	2016	C13_I01: Technology partner C13_I02: Technology partner
C14	Food supply chain	Private	2018	C14_I01: Technology partner C14_I02: Business partner

(Continued)

Table 1. Continued

Consortium	Industry	Funding	Founded	Interviewees
C15	Financial services	Private	2019	C15_I01: Business partner C15_I02: Technology partner C15_I03: Business partner
C16	Energy	Public	2018	C16_I01: Business partner C16_I02: Academic partner
C17	Trade finance	Private	2018	C17_I01: Blockchain platform C17_I02: Business partner C17_I03: Business partner
C18	Mobility	Public	2017	C18_I01: Business partner C18_I02: Academic partner
C19	Trade finance	Private	2017	C19_I01: Blockchain platform C19_I02: Business partner

February to September 2019, including interviews with the business blockchain consortia that motivated this larger cross-case analysis. Given that the data were collected 2019, these blockchain consortia were all in a relatively early stage. Interviews were held in German or English and either face to face or using video-conferencing software. The length of the interviews ranged between 29 and 100 minutes. The recordings were transcribed verbatim.

3.2 The Grounded Analysis Consisted of Three Steps, Each of Which Was Developed Iteratively

During the first step, we applied an open coding process [66] and searched bottom-up for the motives of businesses to engage with and develop blockchain information systems. For analyzing the interview material, a qualitative data analysis software (MAXQDA) was used. The resulting code units were mainly phrases and sentences [75]. Two researchers were involved in the coding process, in which we established common grounds on motives to use blockchain technology on the initially collected dataset (C01–C10) by constantly comparing and contrasting the emerging code units of a particular category. Thereafter, one researcher coded the remaining transcripts (C11–C19) to validate and possibly extend the preliminarily identified motives and check whether saturation was reached. Also, during this phase, the researcher again compared and contrasted the labeled text sequences that emerged in a category from the second parts of the transcripts, with prior coded text sequences from the first parts of the transcripts to ensure consistency (constant comparison). Upon completion, the results were discussed and refined iteratively within the research team. To also include external feedback, a workshop with collaborators of the study team was conducted to discuss and review the results.

During the second step, we focused on iterative conceptualization and scaling up. More specifically said, for sensemaking, we applied a top-down approach guided by the IS artifact reference framework of Chatterjee et al. [17]. For this, first, one researcher revisited the codes in the context of the interviews and paid special attention to contextual factors along with their explanation, such as reasoning of the motive (e.g., "to achieve business/strategy goals" or "to achieve external publicity"), that were in line with the definitions of the elements and subsystems of the IS artifact reference framework. This enabled the researcher to map the motives along with the elements and subsystems of the IS artifact reference framework. Besides that, special attention was paid to common themes among the motives mapped to the elements and subsystems of the IS artifact reference framework, which allowed the opportunity to group the motives to higher-level theoretical themes. The results of this mapping and grouping were then discussed and refined within the research team. Thus, we went beyond data labeling and presenting the emerging code units by revisiting codes in context (iterative conceptualization) and mapping and grouping them to higher-level theoretical themes (scaling-up).

Finally, during the third step, we again applied iterative conceptualization and scaling up, however, to move toward theoretical integration in our discipline. Thus, we again revisited our data but now focused on contextual meta-information that provided insights about the development and relevance of the motives. For this, we analyzed the higher-level group of motives in a broader context of the interviews and considered contextual meta-factors such as time (i.e., the project phase that the interviewees described) and the tone that the interviewees used (i.e., strong emphasis of motive or rather supportive arguments). Thus, rather than focusing on the specific instantiation of the motives (e.g., whether experimenting or opportunity-seeking), we analyzed how the groups of motives (e.g., technology innovation) were described in the context of the project development. Finally, as we will present in the discussion section, this middle-abstraction level allowed us to theorize on the characteristics unique to blockchain ISs and discuss and position our resultant theory in the context of blockchain and IOS theories (theoretical integration).

4 RESULTS

In the following subsections, we present the iterative development of our results. First, we show the motives that emerged from the bottom-up open coding process. Second, we present the mapping and grouping of the empirically emerged motives to higher-level theoretical themes along with the IS artifact reference framework of Chatterjee et al. [17]. Third, we show our findings regarding the development and relevance of the group of motives, along with explanatory codes from our contextual meta-analysis that eventually enabled us to develop grounded theory.

4.1 Grounded Motives for Engaging with and Developing a Blockchain IS

Table 2 presents the motives that emerged from the first-step bottom-up coding process. The first column lists the motives (i.e., the codes), the second column provides an explanation of each code, and the third column gives an interview excerpt from our cases for each code.

4.2 Systematization and Contextualization of Blockchain IS Motives

Figure 2 below presents the results from our second grounded analysis step, namely the mapping and grouping of the emerged motives to higher-level theoretical themes. In the paragraphs below, we describe the rationale for the positioning and grouping of the motives to the themes in the IS artifact reference framework along with contextual interview excerpts that showcase our rationale. In Appendix A.2 we further provide an overview of the unique mentions of the motives.

4.2.1 Input: Technology Innovation Motives. *Experimentation, opportunity seeking,* and *domain-specific problems* were positioned to the *Input* arrow and grouped as *Technology Innovation Motives*. The contextual analysis showed that when talking about these motives the interviewees specifically mentioned words like "initial driver" or "starting point" that ignited their engagement with the technology. Besides that, regardless of how general (experimentation) or specific (aim to address long-existing specific business problems) the motives were, the analysis in context showed that the common theme among these motives was to innovate with *"this novel technology."* For example, interviewee C04_I03 mentioned that their motive was rather generally to experiment with blockchain and prove it wrong: "Initially, the driver to use the technology wasn't because we were bought in blockchain, (...) rather we wanted to be on the front lines of the skepticism, and basically prove why it wouldn't work" (C04_I03) *(experimentation)*. Another interviewee mentioned domain-specific contextual challenges, like political instability in the case of C03, that could be addressed by the promises associated with blockchain technology: "(...) the government view was to ensure international-level security, that the data is not stored in one particular place, like in local domestic level servers or even the back-up servers (...)" (C03_I01) (*domain-specific problems)*.

Table 2. Summary of Motives for Engaging with and Developing a Blockchain IS

Motives (Codes)	**Explanation Businesses engage with and develop a blockchain IS to…**	**Code examples from the cases**
Experimentation	experiment at the edge.	“some IT group people have very good knowledge about blockchain, (…) but also, they wanted to experiment; that’s also why we called it pilot project (…).” (C03_I01)
Opportunity Seeking	search for new business opportunities.	“(…) it is really about experimenting with the technology and then seeing an opportunity to (…) turn it into potential business.” (C07_I01)
Domain-specific Problems and Needs	address specific problems and needs of the application domain.	“(…) there was a cyber—it was the war with [Country X] and there once was a cyberattack. All the computers and programs were shut down. That is one of the arguments. Also, that we need very safe data, and very safe data should be stored on the blockchain itself.” (C03_I01)
Decentralization	enable power decentralization.	“So, technically you could do it with another technology, but the idea of this construct of being decentralized provides the attractiveness (…) that every company controls and owns their own data, and they decide who they share it with, and there is no central organization anymore that holds all the data.” (C04_I01)
Uniqueness	create uniqueness and authenticity of entries.	“(…) that extract has its own unique hash code, identical to a hash stored in the Bitcoin Blockchain, so the C03’s website confirms the authenticity of this titles.” (C03_I01)
Control	enable individual control over one’s own resources.	“you can share your data and you have control over your data. So, you know who you share the data with and you still can revoke the access that you have given to somebody.”(C01_I01)
Collaboration	enable cross-organizational collaboration.	“(…) it makes a kind of cooperation between companies possible that was not possible before, because nobody was willing to share data to that extent (…), and we now hope that we will have the opportunity to do so technically.” (C05_I01)
Commons	create something common (e.g., a common vision, system, or resource pool)	“Everyone’s working towards that common good and common purpose (…).” (C04_I02)
Trust	establish trust in a shared system.	“You can do that (with a normal database) if people trust each other and if you trust the operator, you can do that. (…) However, I don’t do that and most people do not have that trust either (…). Contrary, if you share a bigger system, in which you can write in a consensus and in which you can only make changes together in the consensus, then it creates more security about what is written in it.” (C09_I03)
Tokenized Assets	introduce authenticity and uniqueness in digital goods.	“The main idea to introduce the blockchain was that a person can prove that, they are the unique owner of this property with these details.” (C03_I01).
Tokenized Services	create uniqueness and control over the digital expression of will.	“(…) another key aspect are trust services, which are actually the digital expression of will, in other words, everything that is simply said the e-notary.” (C02_I02)
Innovation	create novel innovative products.	“so for sellers, C19 also offers the possibility of invoicing or discounting or financing these BPU-based contracts, which is an important innovation (…).” (C19_I21)

(Continued)

Table 2. Continued

Motives (Codes)	**Explanation Businesses engage with and develop a blockchain IS to…**	**Code examples from the cases**
Efficiency	increase efficiency in inner- and intra-organizational processes.	“Yes, what really makes our project special is that we ensure that this trade (…) enables us to manage (…) the existing local distribution network efficiently – more efficiently than before.” (C06_I03)
Customization	customize products and services to users’ needs.	“(…) you can create an incredible number of new customized products in trade finance if you use the technologies correctly (…).” (C10_I03)
Domain-Specific Solutions	provide specific solutions to the problems and needs of the application domain.	“(…) a few people in our network sent us articles about blockchain and said, “You should look at blockchain as a potential technology to solve some of the requirements of this regulation.” (C04_I01)
Capability Development	build up technical capabilities and expertise.	“(…) building up (blockchain) technology knowledge. So, essentially, being able to say, “What can you do with it and what can’t you do?” (C05_I01)
Financing	get easy access to financial means.	“(…) you just have a budget for promising projects or promising technologies, (…) and blockchain is one of them.” (C02_I03)
Marketing	market innovativeness of the company.	“(…) we placed it in the press because we found it interesting that the market reacted to it in this way, which brought us a lot of publicity for very little money (…).” (C09_I02)
Partnering	establish new and maintain existing partnerships.	“I think what makes the big difference is that through this blockchain topic we dare to ally with partners who are not from our home turf.” (C05_I01)

4.2.2 Technical and Social Subsystem: Technology Enabling and Governance Necessity Motives. We assigned *decentralization, uniqueness,* and *control* to the *Technical Subsystem.* Each of the three motives described blockchain technology’s features that *enable* businesses to do something. Thus, we also grouped them accordingly as *Technology Enabling Motives*. We assigned *collaboration, commons*, and *trust* to the *Social Subsystem*, since they describe the structures and relationships among the actors in the consortium. As they specifically center around governance-related aspects of the actors involved in such projects that necessitated the use of blockchain technology, we more specifically grouped these as *Governance Necessity Motives*. While we purposefully separated the individual motives during the initial bottom-up coding, from the contextual analysis, the strong affording/constraining relationship of the social and technical subsystems became very much evident. For example, to the question, “how does blockchain technology help you to achieve your goals?,” interviewee C07_I01 answered by explaining first the technical feature of *decentralization* and *control* that allows different businesses to *collaborate* and develop *commons*: “The solution so far (…) is to build a centralized database and bring all the data there. But that is primarily a problem because people want to have autonomy over their own data. (…) what you need is something that can guarantee decentralized data, yet still allows for data exchange between parties. If you put these two together, you (…) end up with the reason why we chose to use blockchain.” Another example is provided by C05_I01, who rather started from the social end and mentioned that blockchain enables (new) long-term collaborative relationships between businesses (even between competitors), which was not possible before. While emphasizing the need for *collaboration* here, C05_I01 went on and elaborated on the opportunity to do so technically, in that blockchain allows the opportunity to *decentralize* the authority and views on the data: “I believe that it makes a kind of cooperation between companies possible that was not possible before, because nobody was willing to share data to the extent, or they were not legally permitted to share data to the extent, and we now hope that we will have the opportunity to do so technically.”

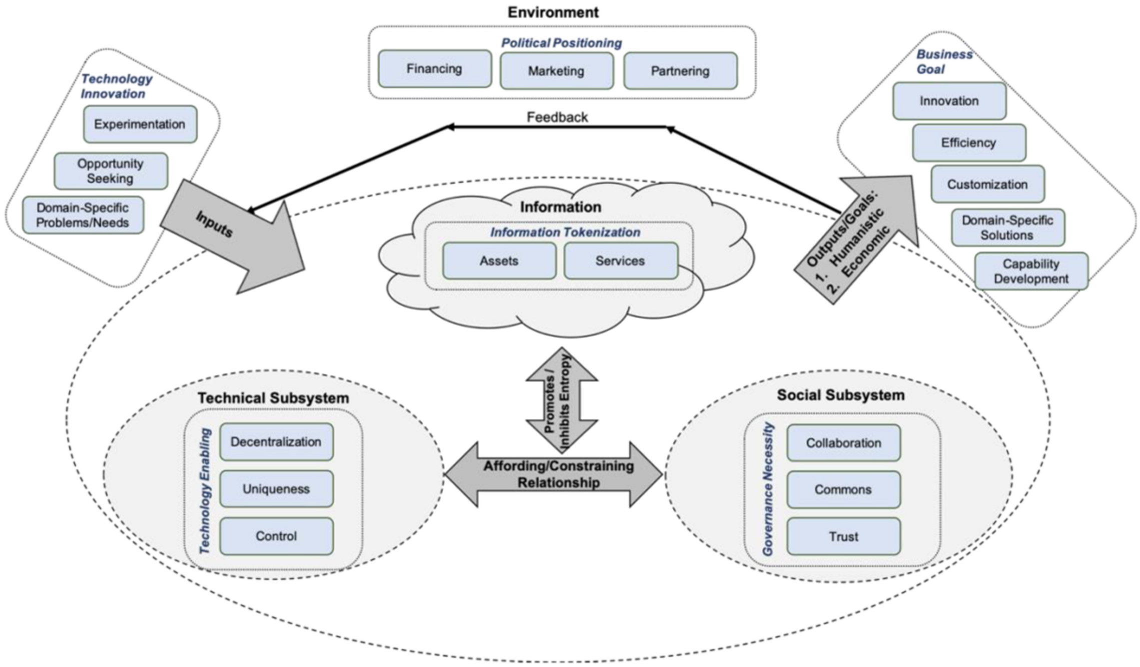

Fig. 2. Motives for engaging with and developing a blockchain IS in practice along with the IS artifact reference framework of Chatterjee et al. [17].

4.2.3 Information: Information Tokenization Motives. The motives of *Information Tokenization (*i.e., *assets* and/or *services)* were positioned in the information element as they centered around the value, role, and use of *information*. While information can take many different forms (e.g., digital asset certificates, digital will representation), abstracting from the specific instantiation, it became evident that the defining novel property of information, that emerged from the interaction of the socio-technical subsystems, was tokenization of information goods. Hence, these motives were grouped as *Information Tokenization Motives*. For example, interviewee C02_I01 purposefully put the specific instantiation of the data good in the background and explained, "So the problem we wanted to solve is to enable us to digitally transfer ownership, whether it's a share or a property, a bond, or a property value of an old car, it doesn't really matter. It's simply a matter of transferring the value right digitally." Besides that, C07_I01 explained why they decided to use blockchain technology rather than another inter-organizational system, such as EDI, along with the emergent tokenization property as follows: "We think that what blockchain offers is more than just data interchange. (...) there's already a solution for simple data interchange that's called EDI and that works fine, at least from a technical perspective. (...) blockchain adds to this in that you can now also capture not only data but also behavior related to assets. An asset can be a bill of lading and we can now also trace and ensure correct transfer behavior." Thus, the interviewee clearly emphasized that blockchain not only allows the opportunity to interchange data simply between businesses but also ensures proof of provenance of the transfer.

4.2.4 Output: Business Goal Motives. Innovation, efficiency, customization, domain-specific solutions, and *capability development* were grouped as *Business Goal Motives* and positioned to the *Output* arrow, as they described the desired outcomes and goals that motivate the interviewees to engage with and develop a blockchain IS. Similarly to the input motives, the desired outcomes varied widely in the level of specificity. Some talked about general possibilities to increase intra- and inter-organizational processes, "(...) so, today (our processes) are mainly paper-driven and not automated. There's lots of inefficiency, lots of delays, and also a bit of a peer-to-peer process in nature with many parties involved, with the retail banks and brokers. (...). It was also a distributed process in nature. Blockchain seems to be a good technology to be applied to these cases" (C02_I03). Others more specifically explained their desire to customize services: "Ultimately, (...) the system is designed in order to make government services more accessible and easier to use and/or trusted and (...) to improve services specifically" (C03_I03). Again, others emphasized their goal to build up technical expertise about the technology, which they will be able to provide as a service to other future customers: "The biggest goal for us was in the first step (...) building up (blockchain) technology knowledge. So, essentially, being able to say, 'What can you do with it and what can't you do?'" (C05_I02). Regardless of the specific instantiation, the common theme among the motives were business goals.

4.2.5 Environment: Political Positioning Motives. Finally, the interviewees occasionally mentioned motives to engage with blockchain to facilitate *access to financial means, market a company's innovativeness or the project itself*, and *establishing new and maintaining existing partnerships*. As they were mentioned as rather supporting motives that addressed the larger environment of the system and were used for political positioning reasons, we positioned them to the *Environment* of the IS reference artifact reference framework and grouped them as *Political Positioning Motives*. For example, in the case of C06_I03, combining the topic of renewable energies with blockchain as an enabler for digitalization facilitated easier access to public funding. Another example was provided by interviewee C09_I03, who stated that blockchain enabled them to initiate new partnerships: "The whole thing was so hung up on the blockchain hype anyway, (...) it is a welcome hook to lift people out of their chairs (...)" (C09_I03).

4.3 A Time and Relevance Perspective on Blockchain IS Motives

The initial bottom-up coding as well as the mapping of the motives to the IS artifact reference framework already indicated that businesses showed multiple motives for engaging with and developing blockchain ISs that evolved over time. To gain a more in-depth understanding of this development of the motives over time and their relevance, we again revisited our data. We analyzed contextually meta-information such as time and commitment.

By analyzing the motives in a broader context and focusing on contextual meta-information, two phases emerged in which the different groups of motives were expressed to different extents. In *Phase 1*, which we identified as the initial exploration phase, the motives highlighted in light blue in Figure 3 emerged as the key driving motives of businesses to engage with blockchain. In *Phase 2*, which we identified as the prototyping phase, motives highlighted in dark blue in Figure 3 were predominant for businesses to develop blockchain ISs. In the following, we describe these observations in more detail along with examples from our interviews.

In most cases, the interviews proceeded similarly, with the interviewee starting from the beginning of the project and explaining its development. Paying special attention to the time-dimension, *Technology Innovation, Political Positioning*, and *Business Goal* motives have crystallized as the predominant group of motives businesses have for engaging with blockchain during the first phase. This "first phase" represented itself in that the interviewees often used words like "initially" and "at the beginning of the project" or referred to specific starting points. When talking about *Technology Innovation, Political Positioning*, and *Business Goal* motives, such time limitations or throwbacks were often made. For example, interviewee C19_I01 explained their initial *Business Goal* motive as follows: "So the legend goes that, it started off from a conversation between Person X, (...) and a potato farmer down in Country X, and they were really trying to look at ways to improve their trading business" (C19_I01). Besides that, when mentioning these motives, the interviewees' tone emphasized rather loose commitment to blockchain technology itself. This was shown by the fact that the interviewees, when talking about the motives in this early phase, often used words like, "engagement with" or "get to know" rather than referring to investment intense development. For example, interviewee C19_I01 went on to explain their *Technology Innovation* motives along with their *business goal* motives as follows: "We're probably talking about, maybe, beginning of

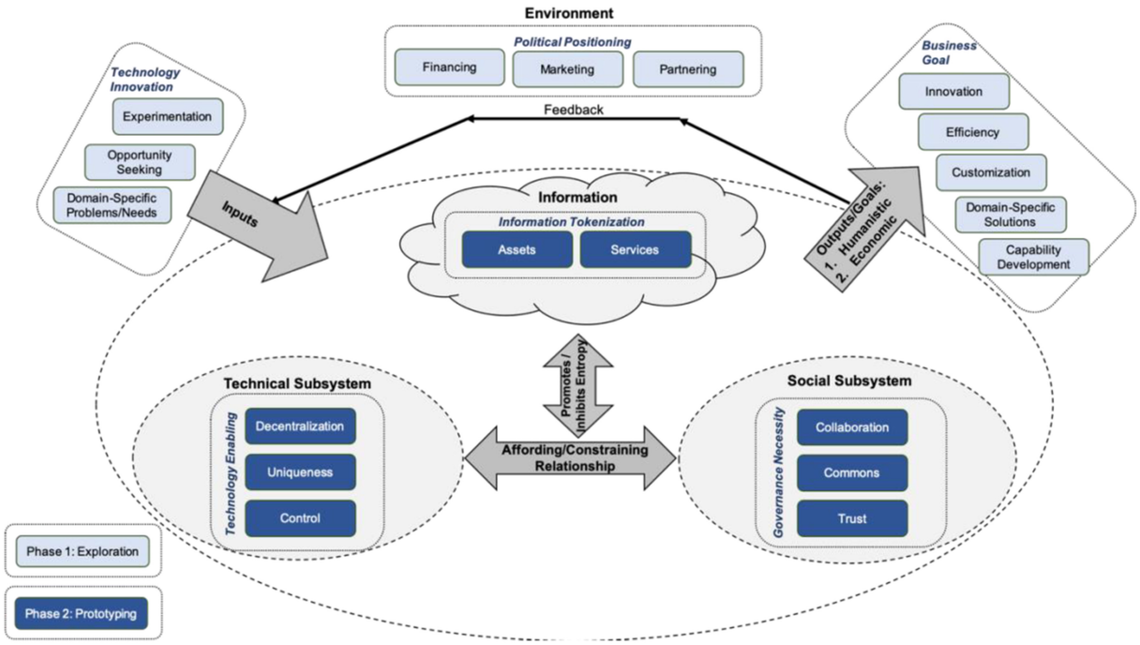

Fig. 3. Development of motives for engaging with and developing a blockchain IS over time.

2016. So Person X gave a mandate to his team to start looking at exploring options from a technology perspective of, 'How can you digitize and simplify the trade finance process?' So obviously, looking at the various options, they identified blockchain and distributed technology as a promising field to do so" (C19_I01).

As the interviews went on and the narratives referred to the current state, the interviewees rather emphasized *Technology Enabling, Governance Necessity*, and *Information Tokenization* motives. While sometimes this change in motive was rather subliminal, meaning that a clear cut between phases was rather difficult to make (in particular also given the fact that the different consortia were in different phases when we interviewed them), other times the change in motive, or, better said, the reevaluation of the technology, was even specifically mentioned. The following interview excerpt from C19_I02 exemplifies this as follows: "With the expansion of the project group to include several banks, we definitely questioned and discussed the necessity of blockchain technology. But we actually agreed that distributed ledger technology (…) actually offers exactly what such a consortia structure needs, namely the possibility of defining rules via the code that ensure that you don't run into the problems that you would with a central database (…)" (C19_I02). C19_I02 emphasized the technology necessity motives of *decentralization* and *control* from a system governance perspective (*collaboration*) as the key motives to use blockchain after they got more involved in the project and even reevaluated the necessity of the technology. Besides that, once projects were initiated, the motives of businesses to develop blockchain ISs became more substantial. This manifested itself in the fact that the interviewees no longer talked only about engagement but much more about Blockchain IS development and the necessity of the technology for their purposes. For example, a colleague of C19_02 from the same consortium went further and emphasized the emergent property of *tokenization* of the interaction of the subsystems as the purpose of blockchain-based development: "(…) the reason why we build on blockchain technology at the moment (2019, when the interview was conducted) is one key point (…) there exists only one copy of that transaction on the blockchain" (C19_I01).

All in all, the contextual meta-analysis revealed that the motives of businesses to engage with and develop blockchain ISs developed over time. Besides that, the tone that the interviewees used indicated that the second-phase motives showcase greater relevance for engaging with and developing blockchain information systems than those from the first phase.

5 DISCUSSION

Interested in blockchain as a new phenomenon that has mobilized and continues to mobilize a substantial amount of resources, we elicited practitioners' motives for engaging with and developing blockchain information systems. The 19 motives presented in Table 2 provide a thorough overview of the motives of members of business consortia for using blockchain technology. Contextualizing the motives and relating them to higher-level theoretical themes, along with the reference framework of Chatterjee et al. [17], allows us in the following to theorize on unique blockchain motives and characteristics. Subsequently, we will differentiate blockchain IOSs from other IOSs and derive recommendations for academics and businesses engaged in blockchain decision-making on how to evaluate and justify blockchain engagement.

5.1 What Is Unique about Blockchain?

Motives for using blockchain are broadly diversified and they develop over time, as our analysis has shown. Looking at this change over time and the relevance of the motives guided by the IS artifact reference framework now allows us to explain which motives apply to technological disruption in general, which motives are actually blockchain specific, and what characterizes blockchain information systems.

Chatterjee et al. [17] describe that an IS artifact consists of mutually adaptable subsystems that manage entropy and strive to balance it. The entropy of a system measures how organized/disorganized it is [70]. In a disorganized system (when entropy is high), the outcomes are random and uncertain. In contrast, when entropy is low (when the subsystems are in harmony), the systemic outcome can be achieved.

Our analysis of the development of the motives clearly shows that at the beginning there was little clarity about the interaction between the subsystems, since the interviewees related their engagement with blockchain primarily to the input and output factors, as well as to the environment. However, the interplay between the social and technical subsystems was rather unclear in most cases. Also, interviewees spoke of *"engagement"* with blockchain rather than the development of blockchain ISs and thus foregrounded the creative process that comes with technological disruption. According to Chatterjee et al. [17], this is common for phases of technological uncertainty. In this phase, companies invest in technology to eliminate uncertainty and to stabilize the system. Therefore, we characterize the motives classified within input, output, and environment as less blockchain-specific but *general engagement motives under high technological uncertainty*.

Over time, however, the motives of businesses for engaging with blockchain have changed, as our analysis showed. Some companies even spoke of a reevaluation of the technology. The motives that the companies mentioned after the reevaluation phase clearly reflect the harmony of the socio-technical subsystem. The examples given in Section 4.2 (Technical and Social Subsystem) illustrate the affording/constraining relationship very well. While some interviewees tended to emphasize the technical motives that, for example, enabled new types of social relationships, other interviewees emphasized the social aspects such as the lack of trust that necessitate such a technical solution. This unification of the motives that describe the social and technical relationship highlights the low level of system entropy and characterizes the *unique blockchain motives*. These motives essentially describe what kind of interaction blockchain technology enables or, the other way around, what kind of social demands necessitate the technology.

As the social and technical subsystems become harmonized, the systemic character of the socio-technical interaction emerges and shapes information [17, 36]. This manifested, in the case of blockchain, in the *tokenization* of information. The interviewees, as shown in Section 4.2 (Information Tokenization) drew on the specific socio-technical interaction and described the unique property that emerges from this interaction, sometimes as their motive to engage with blockchain technology. Thus, *tokenization* can be *characterized as the systemic character* that gives meaning and utility to the socio-technical interaction and hence describes the unique property of blockchain ISs.

In the following, we discuss in detail how these findings contribute to the IOS discourse by highlighting differences between *motives to engage with blockchain* and *motives to adopt and use an IOS*.

5.2 Why Engage with Blockchain as an IOS?

Blockchain systems can be regarded as a class of IOS [32, 68] as they facilitate electronic exchanges and interactions between two or more participating organizations [64]. In the following, we discuss how blockchain IOSs differ from IOSs in general in terms of the development process, environmental influences, the nature of innovation, as well as motives attributed to the technical, social, and information subsystem.

First, in line with other research on blockchain IOSs [45, 50], this research observed that the process of designing and building blockchain IOSs seems to be distinct from how previous IOSs were built. Interestingly, while "adoption" is an important theme in the IOS literature (e.g., Reference [64]), we did not find many articles explicitly talking about the process of building IOSs. Rather, the large body of literature on adoption seems to suggest a high relevance of the decision regarding whether a (ready-made) system should be adopted. Moreover, studies on influences, like coercive pressures [34], suggest a key position of certain companies as drivers of such adoption processes. Based on that, we conclude that those focal firms also played a key role in implementing IOSs. In terms of blockchain-based IOSs, however, the idea of decentralization appears to be anchored from the very beginning. While in some of the analyzed cases blockchain-based IOSs were built within the context of existing trading relationships, many initiatives [80] also emerged independently of such preexisting collaborative networks with their inherent power structures [68]. Hence, we observe how blockchain technology opened up opportunities for establishing relationships with new partners.

Second, we recognize that environmental influences triggering engagement with blockchain IOSs differ from motives to adopt and use IOSs. While we have evidence for motives like necessity and stability [18] in our findings, environmental influences like power structures (e.g., business partner power) and culture/institutional forces (e.g., mimetic/coercive/normative pressures, institutional trust) (Robey et al., 2008) are only implicitly expressed in the studied consortia. In this regard, motives associated with political positioning reveal companies' fear of missing out on blockchain as an important technology trend, which in turn also suggests the existence of underlying competitive and mimetic pressures. Hence, the hype around blockchain technology and the general discourse around it was a main trigger for companies to engage with the technology, whereas existing power structures and culture/institutional forces could only be indirectly observed in our dataset.

Third, innovation in the context of blockchain IOSs seems to differ from how IOS literature treats innovation. IOS literature refers to innovation from an outcome perspective, as in organizations adopting IOSs to becoming more innovative because of employing an IOS (Chi and Holsapple, 2005). IOS literature also refers to characteristics of an IOS innovation itself in terms of impacting adoption and diffusion of IOSs in organizations (Robey et al., 2008). In comparison, experimentation, opportunity seeking, and collaborative learning are frequently mentioned motives to engage with blockchain in the studied consortia. In this view, blockchain consortia emerge as a "locus of innovation" [63] to which different companies contribute resources and expertise with the objective to strengthen existing or develop new competencies.

Fourth, focusing on the subsystems, we find unique motives related to blockchain-based IOSs in comparison to IOSs in general. As for the technical subsystem, the identified motives of *uniqueness* and *control* can be associated with the *necessity* and *legitimacy* motives of IOS adoption [18] as legal requirements or external norms may force companies to retain autonomy over their data while collaborating with others, for instance. In blockchain-based IOSs, however, those motives do not seem to primarily relate to external influences. Indeed, companies strive for uniqueness, control, and decentralization of power (over the data) in their own interest and as a necessary precondition to achieve the *Governance Necessity* Motives (*collaboration, commons, trust*) within the social subsystem. IOS literature refers to both the *asymmetry* motive, as in exerting power and control over other organizations, and the *reciprocity* motive (i.e., using an IOS facilitates trust and collaboration) as adoption motives [18]. The emphasis on decentralization and the identified governance necessity motives in the studied cases suggest that companies make a conscious effort to share and distribute power for mutual benefit and try to counteract asymmetry rather than trying to reinforce dominant positions in a collaborative network.

Besides unique blockchain motives related to the *Technical* and *Social* Subsystem, *Information Tokenization* sets blockchain IOSs apart from previous types of IOS. Clearly, the use of blockchain to provide tokenized assets and services specifically relates to the uniqueness of blockchain information systems, which, on the one hand, address weaknesses and gaps of existing forms of IOS, and, on the other hand, facilitate a novel understanding of the value of information [58].

All in all, as already indicated in Section 2.3, the motives of businesses to engage with blockchain are not directly comparable to prior research in IOS adoption motives (as these deal with the adoption of a ready-made system). However, this comparison allows us to reconfirm that the interplay of motives from the social and the technical subsystem (e.g., decentralization of power) are exactly those motives that *motivate members of business consortia to use blockchain technology* as IOSs and not use existing IOSs. Moreover, the above comparison of the identified motives and IOS adoption motive shows that *information tokenization* characterizes the uniqueness of blockchain information systems.

Finally, we discuss what these insights mean for blockchain decision-making concerning the evaluation and justification of blockchain engagement.

5.3 What Can Blockchain Decision-Makers Learn?

Decision trees provided by prior research to support blockchain decision-making have so far largely focused only on the technical aspects of the technology. We add to this stream of literature three aspects that could supplement as well as sharpen blockchain decision-making.

Motives for using blockchain technology are highly diversified and develop over time in practice. This is not surprising given the high technology uncertainty that businesses face with the emergence of novel technological disruption that is claimed to revolutionize businesses or even entire industries [8]. Thus, motives for engaging with blockchain are driven in earlier phases by the desire of organizations to reduce their uncertainty about the technology (*Technology Innovation, Business Goal*, and *Political Positioning* motives). These *early engagement motives* have largely been neglected by prior blockchain research so far. However, they could be valuable additions to existing decision trees [13, 62] to help differentiate the phase in which that blockchain consortia is positioned. Businesses involved in blockchain consortia can benefit from these insights, as doing so would enable them to better understand their situations and manage expectations toward their companies. Further, managers who are not yet part of a consortium but interested in joining blockchain consortia can use these insights to evaluate the motives of businesses involved in blockchain consortia and, consequently, their development state.

Over time, however, understanding of the technological capabilities and the social needs grows, and harmonization of the socio-technical interaction arises. Thus, motives to build an information system that are specific to the chosen technology (blockchain) and the social context (business blockchain consortium) manifest themselves (*Technology Enabling and Governance Necessity* motives). Concerning prior works, on the one hand, the *Technology Enabling* motives (*decentralization, uniqueness*, and *control*) are in line with findings in prior works presented in Section 2.3. Within the decision trees, *decentralization* and *control* were integral parts, as they differentiate between the number of involved parties or the allocation of read/write rights to a ledger [48]. The *uniqueness* motive, on the other hand, relates to questions of the necessity of a single source of truth of data and immutability of data, which was also covered within existing decision trees (e.g., Reference [13]). The *Governance*

Necessity motives of *trust, commons*, and *collaboration* have so far not, or not adequately, been addressed in current decision frameworks. However, they do address important research streams on blockchain governance. For example, the ability to create *Trust* among multiple parties is covered in a variety of cross-organizational documents handling applications [9, 71]. As for the *commons* motive, blockchains, by default create common goods, such as the ledger or necessary resources to develop or maintain the system [20]. Creating commons is not an end in itself, but it may lead to benefits for involved parties aside from the question of whether an actual blockchain system is developed [33, 61]. Last, the motive of *collaboration* is emphasized strongly in blockchain research, as blockchains are said to allow for new modalities of inter-organizational collaboration [23, 40, 68]. Although these socially driven motives have been given little consideration in research on blockchain decision trees to date, they are important motives of practitioners and well debated in current research streams on blockchain governance. Thus, for academics, in accordance with Reference [45], we recommend placing an equal emphasis on these motives stemming from the social subsystem when designing decision trees. For businesses involved in or interested in blockchain consortia, we recommend not only considering technical feasibility but also socially driven aspects in their decision-making about the necessity of blockchain technology.

Finally, once the socio-technical subsystems work in tandem, the systemic character arises and describes the information system's unique property: *tokenization*. While prior research acknowledges the use of blockchain to tokenize high-value assets in a variety of cases [7, 27, 46, 55], too little importance is given to the fact that blockchain is currently the only technology that makes tokenization possible under the above-described social requirements. However, in practice, we observe that businesses engage with blockchain particularly to share and distribute power as well as to allow the opportunity to assign property rights to information goods by introducing digital scarcity [52]. Thus, for academics and practitioners, we recommend carefully considering the importance of tokenization for their application cases but also the changing nature of tokenized information and its impact on businesses when confronted with technology choices.

6 CONCLUSION

In this article, we revisit blockchain as a socio-technical phenomenon and study the motives of members of blockchain consortia for choosing the technology. Studying the motives of those who use the technology, we shed light on the often-asked question "Why blockchain?" and thereby explicate the particular characteristics of this novel type of inter-organizational system. Such a cross-case analysis provides rich insights that are relevant for academics, businesses, and society. First, for academics, this study offers grounded empirical evidence that allows the opportunity to advance and specify motives for using blockchain technology. Besides advancing theories in this domain, the insights can help other researchers to further advance their development work on blockchain applications and platforms. Once there is a clear understanding of why the use of blockchain technology for certain applications and platforms is non-neglectable, blockchain research can focus efforts on the advancement of these instead of having to deal with the recurring question of "Why blockchain?"

Second, the insights are highly relevant for practitioners who are faced with difficult investment decisions regarding the usage of blockchain technology. By gaining insight into the motivations of other similar projects, decision-makers can make more informed decisions that quite often involve high stakes.

Finally, by enabling opportunities to push blockchain research and its applications further, society may benefit through their advances and use.

This study is not without limitations. However, these limitations open avenues for further research. We acknowledge that the projects under investigation are still at rather an early stage, and a lot of development effort is yet to come. Thus our insights are mainly relevant for early-stage blockchain consortia. While we specifically looked for projects that had moved beyond the mere prototyping phase, in many cases, it will still be some time before their systems will actually be launched. The consortia could encounter many more hurdles that might require them to again rethink the choice of technology, which could thus provide further insights that we have not yet uncovered. At the same time, motives that are particularly expressed in our dataset, such as political position motives and technology innovation motives, are clearly related to blockchain still being a nascent and hyped technology at the time when the consortia were initiated. As such, they may become less relevant over time. In addition, power structures, which have received much attention in IOS literature [34], and imbalances in power may become more relevant as blockchain consortia move beyond the stage of collaboratively building an IOS. Hence, future researchers could reevaluate the identified motives using an updated dataset and datasets that include more mature blockchain projects. Further, subsequent studies could investigate what makes blockchain consortia successful and how specific governance structures or business models support adoption of blockchain technology. In addition, we want to highlight that while the study provides insights into many well-reasoned motives for businesses to apply blockchain technology, it is not the best solution for every case. For many innovative applications, blockchain is certainly not necessary. To identify whether blockchain, from a purely technical perspective, is the right solution in a specific case or not, businesses can use existing DM [13]. Finally, we would like to encourage future research to dig even deeper and study the differences in adoption motives and/or success- / failure factors between blockchain consortia from different industry domains or targeting different application areas. Thus, providing relevant guidelines and insights regarding the suitability of blockchain technology for particular businesses or services.

All in all, with this comprehensive overview of the usage potential of blockchain technologies, we hope to enable more informed decision-making and inspire further investigations in the field.

A APPENDIX

A.1 Excerpt from the Interview Guide

0 SETTING THE SCENE: Let's talk about your consortium [].

0.1 Could you please give me a brief overview of how this/your consortium was formed?
Which other options besides forming a consortium did you consider?
Why did you rule out those other options and decide to cooperate in a consortium?

- Overall goal/Starting point (business idea vs. using blockchain for…)
- Formation process (when, who, how, why, where)
- Funding

0.2 Why would the consortium deploy blockchain? When did you decide to use blockchain?

- Expectation of consortium related to blockchain technology
- What was first: business idea or blockchain
- Previous experiences from consortia/working groups
- Perceived differences of using blockchain technology compared previous experiences
- Blockchain technology as an enabler/constraint in general

0.3 *If interviewee is founding member*: How were the members of the consortium selected? What is each partner's role and which role does your company have/expect to have in this consortium?
***If interviewee joined later*: When and why did you join the consortium? What is each partner's role and which role does your company have/expect to have in this consortium?**

- Selection of partners
- Consortium members' motivations/objectives/expected benefits in consortium
- Leaders of the consortium and their duties

1 HOW DOES THE CONSORTIUM OPERATE?

1.1 BUSINESS MODEL:

I would now like to focus on the consortium's business model.

1.1.1 How would you describe the initial business idea of the consortium? Is this idea still the current focus of the consortium?

➜ If not: How has it changed over time and why has it changed? How did you maintain consensus?

- Business motivations/ideas for being member of the consortium
- Change of business idea over time
- Decision-making concerning business direction

1.1.2 What is the consortium's envisioned business model? Why would the consortium decide for that specific business model?

- Business model
- Revenue streams

1.1.3 Please characterise the customers/business segments targeted by the consortium. Why would specifically those customers/business segments be interested in your solution?

- Potential concerning value creation strategies
  - novel products or services
  - more customized services
  - more efficient or leaner services
- Target group
- What makes system unique/better than existing solutions

1.1.4 Which problem does your system solve in a superior way? How is blockchain technology helping you to create superior value and achieve your business goals? (Why?) However, how does the use of blockchain create challenges in terms of value generation? (Why?)

- Benefits/unique value and costs of using blockchain technology
- Aspects of blockchain technology contributing to business goals

1.1.5 How does the fact that you are organised as a consortium facilitate creating superior value and achieving your business goals? (Why?) However, how does this organisational form create challenges in terms of value generation? (Why?)

- Benefits of being organised as consortium
- Issues due to being organised as consortium

A.2 Number of Unique Mentions

Detailed overview of unique mentions of motives per interviewee.

An ‘x’ indicates that an interviewee in the respective column mentioned at least once the motive in the respective row during the interview. If a cell is empty, then it means that the interviewee did not mention the motives.

High-Level Motives	Motives (Codes)	C01				C02			C03				C04			C05			C06			C07		
		I01	I02	I03	I04	I01	I02	I03	I01	I02	I03	I04	I01	I02	I03	I01	I02	I03	I01	I02	I03	I01	I02	I03
Technology Innovation	Experimentation	x			x	x	x	x	x		x	x	x						x		x			
	Opportunity Seeking		x				x								x		x	x		x		x		x
	Domain-Specific Problems / Needs	x		x	x				x	x	x			x	x								x	
Technology Enabling	Decentralization	x	x	x	x	x	x	x				x	x	x	x	x	x		x	x	x	x	x	x
	Uniqueness	x	x		x	x	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x		x
	Control	x	x	x	x	x				x	x	x	x	x				x		x	x	x	x	x
Governnannce Necessity	Collaboration	x	x	x	x		x	x					x	x	x	x		x	x	x		x	x	
	Commons	x	x			x		x		x		x	x		x	x	x	x	x	x	x	x		x
	Trust	x	x		x	x	x	x	x		x	x			x	x	x	x	x	x	x	x	x	x
Information Tokenization	Assets	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			x	x		
	Services				x	x	x		x	x	x	x	x	x	x			x	x	x	x	x	x	x
Business Goal	Innovation	x	x		x				x		x		x					x	x	x	x			x
	Efficiency	x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				x	x
	Customization	x	x	x	x														x	x				x
	Domain Specific Solutions	x	x	x	x	x				x	x	x	x	x	x								x	
	Capability Development				x			x	x				x	x			x			x				
Political Positioning	Financing	x						x													x			
	Marketing			x	x			x	x		x			x						x				x
	Partnering		x				x			x			x			x		x					x	

High-Level Motives	Motives (Codes)	C08				C09			C10			C11		C12		C13		C14		C15			C16		C17			C18		C19		Summe	
		I01	I02	I03	I04	I01	I02	I03	I01	I02	I03	I01	I02	I01	I02	I01	I02	I01	I02	I01	I02	I03	I01	I02	I01	I02	I03	I01	I02	I01	I02	19 Consortia; 53 Interviewees	
Technology Innovation	Experimentation	x	x	x	x	x			x				x									x	x			x				x	x	23	62
	Opportunity Seeking			x			x	x		x	x	x		x				x		x		x					x	x	x	x		22	
	Domain-Specific Problems / Needs	x				x			x						x	x			x					x	x							17	
Technology Enabling	Decentralization	x	x	x	x	x	x	x	x		x		x	x		x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	46	124
	Uniqueness	x	x		x		x			x		x	x	x			x		x	x			x			x		x	x		x	36	
	Control	x	x	x	x	x		x	x		x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	42	
Governnannce Necessity	Collaboration	x	x	x	x	x	x	x	x	x		x	x	x	x	x		x	x	x	x	x		x	x	x	x	x	x	x	x	42	72
	Commons		x		x		x	x		x		x		x			x		x	x			x			x			x		x	30	
	Trust		x	x	x	x	x	x		x	x	x		x	x	x	x	x		x	x	x			x	x	x		x		x	41	
Information Tokenization	Assets	x	x	x	x	x		x	x		x	x	x		x	x	x		x	x	x	x		x	x	x	x	x	x	x	x	44	79
	Services	x	x			x	x	x					x	x	x	x		x	x	x	x	x	x		x		x				x	35	
Business Goal	Innovation	x	x	x	x		x	x	x		x	x			x			x		x					x				x		x	26	126
	Efficiency	x	x	x		x	x	x		x	x	x	x	x	x		x	x	x	x	x	x		x	x	x	x	x	x	x	x	45	
	Customization	x		x	x	x			x		x		x						x		x					x	x	x		x	x	21	
	Domain Specific Solutions						x							x	x	x								x				x			x	19	
	Capability Development		x						x			x				x	x	x			x				x							15	
Political Positioning	Financing	x			x		x			x			x								x		x						x			11	39
	Marketing		x	x			x					x										x	x							x		15	
	Partnering					x		x						x			x		x	x												13	

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