How Do Disruptive Technologies Impact Collaborative Governance? A Blockchain Study

Marcus Vinicius Lindgren Alves[1], Ana Luiza Lara de Araújo Burcharth[1,2], Rosileia das Mercês Milagres[1], Douglas Wegner[1]*

Abstract

Technology such as blockchain and digital platforms add a new dimension to collaboration because they challenge central tenets of Collaborative Governance (CG). This study analyzes how blockchain impacts CG's institutional design in a collaborative initiative sparked by a public agency and pioneered by five financial institutions aimed to develop a low-cost, affordable and inclusive instant payment solution based on blockchain technology. The results show that blockchain introduces novel elements that need to be considered in the institutional design of CG, namely interoperability and attraction of new members. Such elements are crucial for obtaining the network effect for implementing a collective solution. Our results expand CG theory by revealing how blockchain technology demands institutional design to consider the technological requirements of the platform to interact with proprietary codes in order to promote network scalability.

Keywords: Collaborative Governance; Blockchain; Institutional Design; Collaboration; Financial system.

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Introduction

The potential of Collaborative Governance (CG) to solve collective problems has been the focus of many studies in recent years (Sørensen & Torfing, 2021). As it regards collective decision-making (Ansell & Gash, 2008), CG is a type of governance establishing the laws and rules for the collaboration process among external partners, including public and non-state actors. However, the literature also recognizes difficulties for CG initiatives to achieve expected results (Bianchi, Nasi & Rivenbark, 2021). These difficulties may derive from the selection, profile, and the number of actors involved (Ansell et al., 2020), the institutional design of collaboration, the complexity of the problem addressed, or knowledge and power asymmetry among participants (Wegner & Verschoore, 2022). The very dynamics of collaboration, including the role of leadership and the ability of leaders to keep participants motivated and committed (Agbodzakey, 2021), introduces significant hurdles. This reality is illustrated by cases such as Tradelens, a deployment of Enterprise Blockchain in a public supply chain network. Its failure shows that blockchain remains promising but requires commitment to industry-wide collaboration (Cecere, 2022).

Research on CG has recently sought to understand how new technologies can facilitate or hinder achieving collective goals (McCurdy, 2020; Mallinson & Shafi, 2022). Technology such as blockchain and digital platforms add a new dimension to collaboration as they challenge central CG tenets. One of the principles of blockchain is the maximum decentralization of power, distributed among all network members, using consensus algorithms to validate any transaction among participants. In a blockchain network, typical governance structures are replaced by complex digital codes and smart contracts, in which the mechanisms members use to govern relationships are embedded (An & Rau, 2019).

CG theoretical models (e.g., Ansell & Gash, 2008; Emerson et al., 2012) have not incorporated technology as a component that can shape collaborative dynamics. Specifically, in relation to blockchain, a disruptive technology that is spearheading the emergence of the "blockchain economy" (Beck et al., 2018), there are surprisingly few studies considering how it impacts CG. There is limited knowledge about technology's role in the dynamics among actors and how it shapes CG (Douglas et al., 2020a; McCurdy, 2020). The literature does not explain, for example, how new technologies influence the CG institutional design—that is, the coordination and control mechanisms designed to govern the relations among participants (Klein et al., 2012, 2019; Kolbjørnsrud, 2017, 2018; Ostrom, 1990, 2010; Puranam et al., 2014; Puranam & Vanneste, 2009).

Based on the limited number of studies that consider the role of technology in CG (for exceptions, see McCurdy, 2020; Rikken et al., 2019; Torfing et al., 2020), this paper addresses the following research question: *How does blockchain technology affect the institutional design of collaborative governance?* The objective is to analyze how blockchain impacts the institutional design of a CG initiative developed to solve a collective problem by completing a case study of the CG initiative Digital Financial System (henceforth DFS). This was a collaborative initiative conducted by five financial institutions to develop a low-cost, affordable, and inclusive instant payment solution based on blockchain technology. The Central Bank of Brazil (Bacen) supported and accelerated the design stage of this initiative (Rikken et al., 2019).

(1) Fundação Dom Cabral, Nova Lima, Brazil.
(2) Aarhus University, Denmark
*Corresponding author: dwegner@fdc.org.br

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Our results contribute to CG theory by adding two novel dimensions to CG institutional design in the context of blockchain technology use: interoperability and the need to attract new members. The study also offers managerial insights, indicating challenges that network leaders and orchestrators must observe in designing interorganizational collaboration based on disruptive technologies.

Collaborative Governance

CG encompasses a set of processes, procedures, rules and norms agreed to by multiple actors who engage in initiatives to solve a collective problem (Ansell & Gash, 2008; Emerson & Nabatchi, 2015). Collaboration may arise due to contextual incentives or by public agencies which compel actors to act jointly (Ulibarri et al., 2020). Actors will only engage in a collaborative initiative if they perceive alignment of interests, values and principles, but especially if the purpose of collaboration is clear and common to all (Ansell et al., 2020).

General System Context

The general system context is the environment in which the CG is embedded. The general system context influences not only the activation of collaboration, but also shapes its dynamics and performance, since it determines the externalities that drive the process (Emerson et al., 2012). The transition from general system context to CG structure is triggered by a set of drivers involving factors such as uncertainties about the problem, the mutual interdependence of the actors involved, and the presence of facilitating leaders who can bring together the various stakeholders and reconcile their different interests (Emerson & Nabatchi, 2015).

Interdependence favors actors' commitment to collaboration. Nevertheless, like purpose, interdependence is not always clearly understood by stakeholders before the effective beginning of the collaborative process (Ansell & Gash, 2008). Interdependence acts as a facilitator for the alignment of different interests and perspectives. However, when the level of interdependence is low, the role of facilitating leadership can compensate for the lack of it (Ansell et al., 2020).

Starting Conditions

Starting conditions are a set of elements that include (a) power-resource-knowledge asymmetries, (b) pre-history of cooperation or conflict (initial trust level), and (c) incentives for or constraints to participation in the collaboration (Ansell & Gash, 2008). They arise from the context that involves the problem and the collaborative initiative (Douglas et al., 2020a; Ulibarri et al., 2020).

The (a) asymmetry of resources, power and knowledge is determined by the competencies of each actor involved in a collective problem and can be an advantage in the search for a collective solution. However, high power-resource-knowledge asymmetry among potential actors in a collaboration can create conditions for manipulative attitudes by the actors with more resources, driving away the less powerful ones: "if any stakeholder lacks the ability, organization, status, or resources to participate, or to participate on equal terms with other stakeholders, the CG process will be prone to manipulation by the strongest actors" (Ansell & Gash, 2008, p. 551). By resources, we mean not only tangible (financial, for example) or intellectual resources such as expertise, know-how, and knowledge but also time, energy, willingness, and even legitimacy to participate and make decisions within the collaborative process. The lack of balance in power relationships can generate mistrust and a lack of commitment.

Another important starting condition concerns the (b) pre-history of cooperation or conflict among participants. Even though there are accounts of collaboration that begin with participants from conflicting backgrounds (Gulati, 1995; Macaulay, 1963), the "us versus them" mentality tends to be harmful to CG. This combative climate leads to low levels of trust, which in turn engenders little commitment, leading to manipulative strategies and dishonest communication (Ansell & Gash, 2008). In contrast, past episodes of cooperation tend to create social capital and high levels of trust, leading to a virtuous circle of collaboration (Ansell et al., 2020; Rousseau et al., 1998).

The balance between benefits and costs is generally not evident to participants before effective engagement in collaborative activities (Ansell et al., 2020). Emerson and Nabatchi (2015) argue that the collaboration process that occurs within a CG initiative leads to actions whose impact changes the initiative itself and the general system context in which it is embedded in a cyclical and iterative way. The reason to enact CG relates to the ability to influence the surrounding conditions that create, exacerbate, and sustain the collective problem. In other words, stakeholders collaborate to solve the common problem by changing the general system context in the long term. Participation in collaborative processes is voluntary (Ansell & Gash, 2008). This reinforces the need to understand item (c), the incentives for and factors that influence the decision to participate in a collaborative initiative, regardless of sponsorship from public agencies or imposition by force of mandates, rules, regulations, or public policies.

While strong incentives are a crucial condition for good collaborative performance (Douglas et al., 2020b), the greatest incentive to participate in a blockchain network lies in the fact that gains are collective. That is to say, there is no centralizing actor that captures most of the value created within the network (Beck et al., 2018). However, blockchain is a recent development; thus, it is too early to determine whether this incentive is interesting enough to compel organizations to engage in related collaborative initiatives.

Institutional Design

Institutional design "is the set of basic protocols and ground rules for collaboration, which are critical to the procedural legitimacy of the collaborative process" (Ansell & Gash, 2008, p. 555). Institutional design can be shaped through formalities such as the governance structure itself, contractual specifications, and management agreements (Malhotra & Lumineau, 2011; Provan & Kenis, 2007) or through more informal mechanisms such as trust-based relationships (Das & Teng, 2001). Specifically, for the blockchain context, McCurdy (2020) contends that the institutional design comprises four elements: fo-

rum exclusiveness, participatory inclusiveness, clear ground rules and process transparency.

Forum exclusiveness. Forum exclusiveness determines how unique a solution is to a given collective problem. The greater the exclusivity, the more likely actors will be compelled to collaborate. Stakeholders affected by a particular problem tend to launch a collaborative initiative if there are no alternative pathways to seek or develop the necessary solution to a problem (Ansell & Gash, 2008). An organization will tend to collaborate if it realizes there are no alternatives to developing a solution that addresses the common problem.

When analyzed in the blockchain context, alternative pathways are not just diverse groups of stakeholders available for the co-development of possible solutions. The technological alternatives themselves become extremely relevant in the process of choosing the forum. The concept of distributed ledger technology (DLT)[1] that underlies blockchain differs from conventional competing technologies, whose solutions are centralized in hubs that connect all participants in a network. Use cases in which the solution can be developed in both blockchain, and other technologies will find more alternative forums for collaboration than those in which the problem situation can only be solved with decentralized DLT structures, i.e., blockchain.

Participatory inclusiveness. Who should be included in CG? This is perhaps the most challenging question in collaboration since coordination and control mechanisms work through direct relationships among participants, not depending on hierarchical subordination (Kolbjørnsrud, 2018). Generally speaking, it is accepted that collaboration should be as inclusive and open as possible to provide a holistic view of the problem and stimulate creativity in the development of solutions (Torfing et al., 2020). Yet, the governance of numerous and heterogeneous actors potentially increases transaction costs, reduces the quality of decision-making, and hinders negotiations (Ansell et al., 2020). The decision-making process becomes more time-consuming in the search for consensus, not to mention the risk of divisive subgroups forming that can lead to spin-offs and participants who join the process only to monitor what is happening (Ansell et al., 2020; Ansell & Gash, 2008).

Torfing et al. (2020) place significant weight on institutional design as a mechanism to reduce the tensions and challenges of collaboration in large groups. In a similar vein, Klein et al. (2019) argue that CG should include clear rules on the inclusion and exclusion of members and a clear agreement on how collectively generated outcomes will be distributed. The collective objectives, the major milestones, and the expected results of the initiative must be specified in the instruments that govern the relationships among participants, thereby addressing the decision-making rights of members or groups of members (McCurdy, 2020). Participatory inclusiveness must promote a balance between adding as many actors as possible to the collaboration and simultaneously discouraging free riders.

Ground rules. Clarity about the ground rules of collaboration is an important aspect of institutional design. Actors who engage in a collaborative initiative do so in the belief that their participation will lead to mutual gains for all members. However, actors tend to be skeptical initially (Ansell & Gash, 2008). Thus, clear ground rules are essential to demonstrate that the collaborative process will be fair, equitable and open. Among the topics that should be addressed in collaborative initiatives involving blockchain are the designating the number and characteristics of anchor organizations, what type of blockchain network will be used, regulatory requirements on privacy and compliance, and technological standards (McCurdy, 2020). Rules about infrastructure and application at the organizational and institutional levels are especially important in this context (Rikken et al., 2019). Likewise, some technological issues about CG rules of operation have become more prominent. The decision about the use case for which the application will be developed is critical (McCurdy, 2020; Rikken et al., 2019), as it will determine the interoperability requirements of the technologies used by each member within the blockchain network and possibly among different blockchain networks supporting different value chains transacting with each other. Interoperability is another critical factor because, without it, organizations will not connect to each other and form the network (Vivaldini & de Sousa, 2021).

Process transparency. Best governance practices recommend transparency in relationships among stakeholders. The institutional design must include mechanisms that allow CG to function effectively in the way the members designed and agreed upon. In addition, they should provide conditions for the collaboration results to be communicated transparently to stakeholders, ensuring the feedback of the decision-making and management process (Ansell & Gash, 2008). Collaborative agreements typically contain provisions as to who or which members are responsible for the decisions made by the collective, which mechanisms handle decisions that go beyond the boundaries of each organization, how accountability will be carried out inside and outside the network, principles for dispute resolution, and agreements on data sharing and other rights including intellectual property (McCurdy, 2020).

Methodology

The methodology adopted was a qualitative and descriptive case study approach (Yin, 2018), in line with the purpose of the present study. This choice allows for an in-depth analysis of how the role of blockchain as a contextual factor influences CG institutional design in search of new theoretical insights (Siggelkow, 2007).

Empirical Context

We conducted exploratory interviews with four blockchain specialists to identify possible empirical cases. Specifically, we interviewed two IT consultants who are blockchain experts, a serial entrepreneur of startups based on this technology, and a senior executive of a multinational company that provides blockchain platforms. Among the five private

[1] Blockchain can be characterized as a class of technologies (sometimes called DLT—Distributed Ledger Technologies) that give users confidence that archived information (e.g., a certificate) has not been tampered with. In principle, this guarantees a "single truth" across different agents who may or may not trust each other" (Beck et al., 2018).

permissioned networks[2] that showed promise for the present study, we chose the Digital Financial System (DFS) because it is a use case of blockchain technology in which a CG initiative was organized to create a solution to a collective problem. Therefore, it was selected due to its potential to unveil new interaction mechanisms between the use of blockchain technology and CG institutional design.

DFS was a private, permissioned blockchain network aiming to develop an instant payment solution collaboratively. DFS involved a group of five important financial institutions in Brazil, encompassing the two largest national state-owned banks, a large private bank, a credit union, and a regional state-owned bank. The Central Bank of Brazil (Bacen), as a public agency responsible for regulating the financial industry in the country, intervened significantly with DFS, providing guidelines and fostering the initiative. DFS worked on a solution based on a technology that essentially challenges the centralized structures and models of exchange relationships in the industry (Atzori, 2017). Since DFS' operating logic relies on DLT, it would invariably lead to decentralizing the processing and validation of payment transactions, potentially changing the consolidated setup of the banking system centralized in Bacen.

Data Collection

The present study was conducted at the interorganizational level; therefore, the unit of analysis is a CG initiative involving different organizations with specific individual interests. Of the 15 potential informants identified in the data collection phase (exploratory phase), 13 were interviewed between February and April 2021, totaling 711 minutes of recording (Table 1). Of the 2 informants not interviewed, one was unavailable, and the other had retired and could not be reached. The interviewees were divided into 3 different profiles regarding his/her position at the CG: (i) Strategic Decision-Makers (SDM), top managers in their respective organizations responsible for strategic decisions about the CG; (ii) Technical Decision-Makers (TDM), middle managers in their respective organizations, responsible for technical decisions about the CG and actually in charge of execution of DFS initiative; (iii) Non-directly Involved (NDI) in the CG, but related to the DFS project—i.e., member of the Brazilian Federation of Banks' (Febraban) blockchain workgroup (BWG)[3] or Bacen executive. All interviews were recorded and transcribed for analysis.

Table 1: Interviews

Interviewee	Organization Type	Profile	Position in DFS Initiative	Duration (min)
INT 1	Credit Union	TDM	Active Member	58
INT 2	State-owned Bank	TDM	Active Member	63
INT 3	Private Bank	NDI	Febraban BWG	87
INT 4	State-owned Bank	SDM	Active Member	72
INT 5	State-owned Bank	TDM	Active Member	72
INT 6	Non-financial Institution	NDI	Febraban BWG	40
INT 7	Central Bank of Brazil	SDM	Regulatory Board	48
INT 8	Private Bank	TDM	Active Member	50
INT 9	State-owned Bank	SDM	Active Member	46
INT 10	Private Bank	TDM	Active Member	49
INT 11	State-owned Bank	TDM	Active Member	60
INT 12	Private Bank	TDM	Active Member	58
INT 13	Credit Union	SDM	Active Member	56

Source: Authors' elaboration.

We used a semi-structured interview protocol (Yin, 2018), reflecting the CG concepts to provide consistency between informants while allowing novel themes to emerge. The interview protocol included eight thematic sections, available upon request. While the interviews were conducted based on the protocol, we created a sufficiently flexible environment so that the interviewees could freely express their views on (i) the context of the case, (ii) the Starting Conditions that led to the establishment of the collaboration; as well as (iii) the Institutional Design developed by the members for the network.

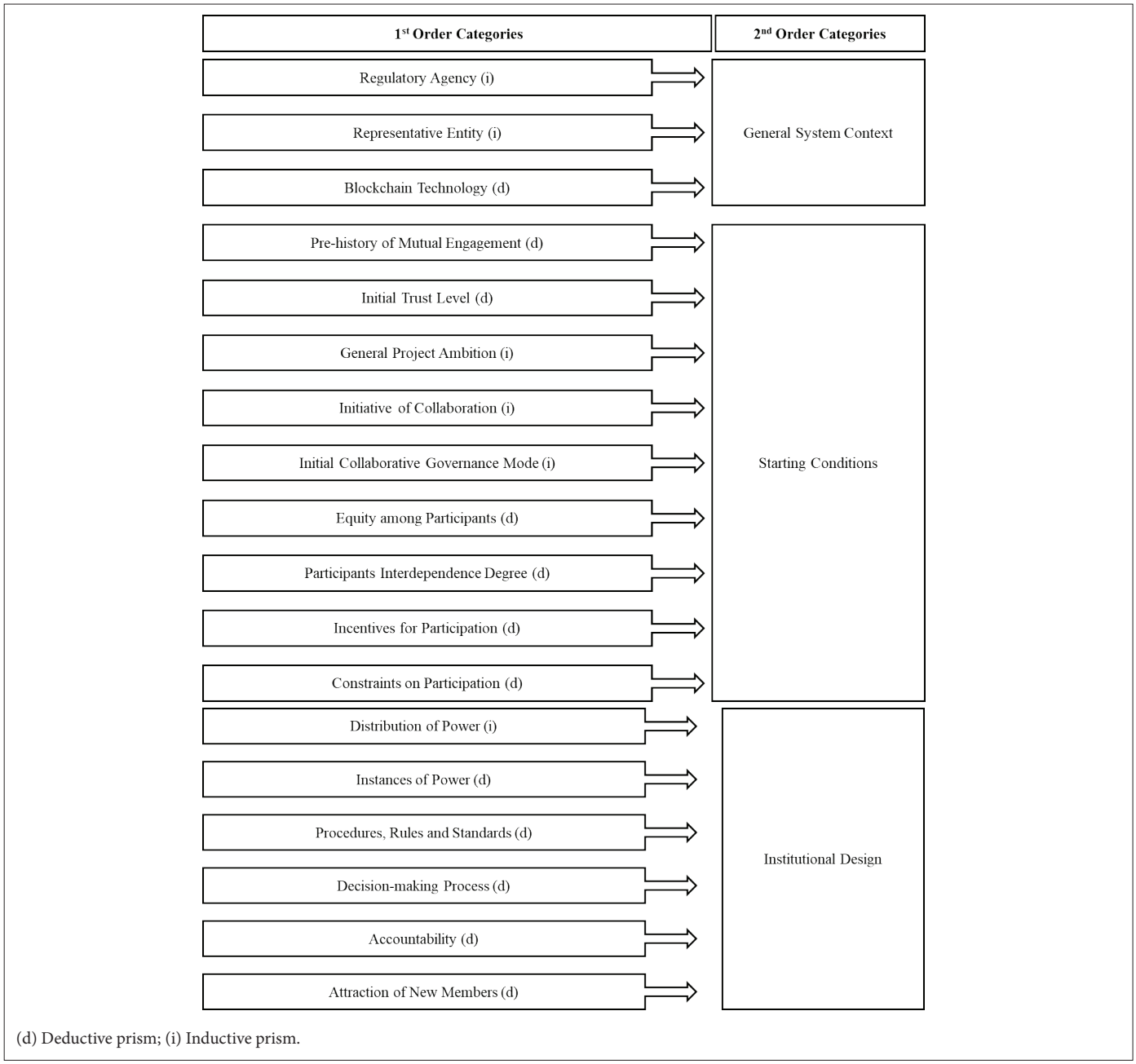
Additionally, data collection included secondary data on the web, media outlets, and social media. A total of 29 files, documents, and web pages were analyzed, some of which were suggested by the interviewees themselves. They were used to validate interpretations of primary data (Yin, 2018).

[2]"Permissionless versus permissioned refers to if the protocol is free to anyone to enter as validating or full node, sometimes also referred to as miners. In permissionless networks, everybody can submit transactions and validate them (permissionless), or one needs to be accepted by the standing nodes or organization(s) to become a validating or full node (permissioned). Public versus private refers to the distinction if all information is visible for everybody (public) or not (private)." (Rikken et al., 2019).
[3]Febraban maintains a workgroup to discuss and evaluate possibilities of use cases to adopt blockchain as solution.

Data Analysis

The interview transcriptions were coded using the NVivo software. The interviews were examined using content analysis in two coding rounds. Under the deductive prism (Janiszewski et al., 2016)000 in academic labor costs (Terwiesch and Ulrich 2014, the first coding round identified in the data the theoretical constructs previously selected in relevant literature. Under the inductive prism (Eisenhardt et al., 2016), the second round identified emerging themes in the interviews and not initially contemplated in our theoretical framework. Preparation for content analysis included an initial triangulation with relevant theories to refine categories and codes, enhancing the precision of data interpretation (Skjott Linneberg & Korsgaard, 2019). Given that the interview protocol was largely based on the Ansell and Gash (2008) framework, the coding process was predominantly deductive, heavily influenced by this theoretical structure. This approach led to an initial analytical framework that grouped diverse empirical evidence, necessitating a more detailed coding structure to adequately analyze and discuss the findings. In the second round of inductive coding, several previously unconsidered codes emerged. The two coding rounds resulted in 18 first-order categories, grouped into three second-order analytical categories consonant with the methodology of Gioia et al. (2013).

Figure 1: Category Aggregation Diagram



(d) Deductive prism; (i) Inductive prism.

Source: Authors' elaboration.

Following Yin's (2018) recommendations, a second triangulation was carried out. This triangulation took place between the data collected from the different primary sources, between the primary and secondary sources, and between the empirical evidence and the theoretical background.

Findings

There is no accurate record of the start date of the DFS initiative. Interviewees suggested that the initiative began in 2017 and peaked in 2019. In 2020, the initiative lost momentum due to several episodes that occurred simultaneously, such as the launch by Bacen of an alternative instant payment solution (Pix) and the Covid-19 pandemic. In this section, we describe the general system context in which DFS emerged and the starting conditions that shaped it. Next, we detail the institutional design of CG, the focus of this study.

General System Context in the Financial Industry

Instant payment solutions have been introduced in the first decade of twenty-first century via new entrants in the financial industry. Globally, big tech companies provide solutions for online payments and transfers and launch their own digital currency initiatives, such as the Libra project orchestrated by Facebook. Super apps and platforms like WeChat and Alipay have become private economic ecosystems in China. The proliferation of fintechs has provided different credit solutions, transactions, means of payment and other financial products previously offered only by incumbents.

The Brazilian financial industry is highly regulated by Bacen, which remains attentive to stability to avoid systemic crises. In addition to its role as regulator, Bacen promotes innovation by stimulating better services for users. The industry is robust and formed by actors with great technological capacity (INT 3). It is also highly concentrated among a few large financial institutions. As of December 2020, the five largest financial institutions accounted for 58% of the customer base and carried out 60% of all operations in the National Financial System. As incumbents, the major players have the power to influence the regulatory aspects of the entire financial industry, mainly concerning the business model and the monetization based on tariffs and transaction fees.

For years, Bacen envisioned a system to simplify low-value financial transactions so that low-income citizens belonging to unbanked communities could participate in the financial system. To find a solution to this problem, Bacen stimulated the DFS initiative within Febraban. As the non-profit representative entity of the banking sector in the country, Febraban is the locus of discussions about the interests of the main industry players. Before DFS was launched, some of the largest banks associated with Febraban had started exploratory projects on blockchain, yet such projects were limited to internal technical teams, which composes the blockchain workgroup (BWG). An early conclusion BWG reached was that any blockchain-based initiative would only make sense if it involved other actors, given that this is a network-based technology.

As the initiative evolved, deciding which technology provider would serve as the basis for the proof-of-concept was necessary. The episode of 'clear choice' about the technological platform definition was remarkable at the very beginning of the CG initiative. Among the available alternatives, there were two competing potential suppliers: R3, provider of the Corda technology; and Hyperledger, provider of the Fabric technology. The latter is a consortium originally formed by U.S. financial institutions to develop blockchain solutions for the financial industry, whose business model is anchored on a significant upfront investment to become a consortium member, and the development of proprietary codes. The former is an open-source network, managed by the Linux Foundation, whose business model is based on an open-source collaboration platform.

The result of the 'clear choice' remained inconclusive, which led to the formation of two subgroups: one supporter of Corda technology, led by the two main private banks,[4] and the other, led by the organizations that supported the open-source concept of the Fabric technology. The 'clear choice' episode was decisive in that it created a deep rift among the BWG members, which culminated in the formation of subgroups with antagonistic interests. Even if CG members made explicit the objective of removing non-technical criteria from the decision-making process, the 'clear choice' was unsuccessful in the sense that it reinforced the polarization between the subgroups. From a technological point of view, blockchain seemed an interesting alternative for the development of an instant payment solution. Yet, from a business model point of view, in terms of the way of monetizing transactions and challenging the industry's power structure with a decentralized network, it seemed more like a threat than an opportunity. Because of the fissures opened by the 'clear choice,' only the second subgroup supporting the Fabric technology remained in the DFS initiative, encompassing five financial institutions: the two largest national state-owned banks, a large private bank, a credit union, and a regional state-owned bank. It is estimated that the DFS participants shared 28% of the customer base and 27% of the operations in the industry, as of December 2020.

The potential change in status quo seems to have been the main contextual factor influencing the creation of DFS, in which the starting conditions were based on a centralized industrial structure instead of a decentralized alternative solution based on the DLT concept of blockchain. This case thereby reveals the challenge of implementing a decentralized blockchain-based solution in environments where the current model is highly centralized, as described by Atzori (2017) and Rikken et al. (2019). The power decentralization spurred by DFS' blockchain solution posed a risk to the industry's operating model, which is based on the presence of reliable third parties that centralize operations.

[4] Of the total of Febraban's members, only the two largest private banks had joined the R3 consortium.

Starting Conditions of DFS

The organizations involved in the DFS initiative had previously collaborated in different contexts and through professionals other than those participating in DFS. While there were antecedents of joint initiatives in other contexts at the interorganizational level, there was no record at the individual level. The interviewees did not know each other before the initiative started. This limited history of collaboration is relevant as it shapes the social capital and the level of trust for collaboration (Emerson & Nabatchi, 2015). Still, the high interest in developing the solution was enough to unite members to engage in the collaborative initiative.

Regarding the *power-resource-knowledge asymmetry,* most informants highlighted significant imbalances among financial institutions participating in DFS and the other financial institutions in the country. The highly concentrated industrial structure means that any initiative that aims to succeed within Febraban needs to be sponsored by the five largest financial institutions: "there must be something that brings benefits to the five [largest banks]. For everyone, of course, but mainly for the five. There were some ideas that could benefit some. Then you don't get unanimous support" (INT 6).

The interviewees also reported significant differences in participants' knowledge base. While some aspired to change the industry as to maximize the inclusion of the unbanked communities, others had the pragmatic vision of learning from their peers, signaling limited knowledge about blockchain technology. Apparently, this difference guided the engagement of some of the actors regarding the willingness to invest resources (not only material but mainly intellectual) in bolder collective projects.

Among the representatives of the participants of the DFS initiative, a veiled qualification of the members was noticeable. Within the group of participants there is the subgroup of the so-called "original founders," the three initial financial institutions sponsoring the idea (INT 13). This informal stratification of the two subgroups of members seemed related to the availability of resources for the initiative. It was frequently mentioned that the original founders contributed with more resources than their peers. Resource asymmetry seemed to be a determining factor for this supposed distinction between the initiative's members, which corroborates the predictions of Ansell and Gash (2008).

All DFS participating organizations shared the understanding of mutual interdependence since blockchain "is a network technology that connects with other peers" (INT 13). They continued as part of the CG initiative because they perceived more benefits than risks in collaboration. Moreover, they all understood the inexorable interdependence of the constitution of the blockchain network, allowing the platform access to and integration with their legacy systems.

The main incentive to participate in DFS is not explicit, not least because individual objectives diverged. It can be inferred that the prospect of achieving a future competitive advantage because members would come to master an emerging technology was relevant. The possibility of changing the structure of the payment system to a decentralized model, which could lead to a new power balance in the industry, was another incentive. One way to change the power balance among the current players would be to change the very functioning of the financial and banking industry, transforming it into an ecosystem along the lines of what was done in China with Alipay and WeChat (INT 1). This view was more evident in the group of informants with a technical-managerial profile (TDM). By contrast, the strategic-directive level informants (SDM) demonstrated a more integrated view of the industry, in which the technology bias was not dominant in the analysis of the opportunity: "It's one thing to be there on an initiative from an exploratory point of view, without commitment, saying you're just observing. It's another thing to try to look at it from the point of view of a product actually to be launched by the organization. So, let's say that you can look at everything, but what you're actually going to launch is another matter" (INT 7). Each member organization's cultural and strategic guidelines also created specific lenses that influenced their decisions. Even so, organizations were willing to contribute the necessary resources to the initiative, even if to different extents. All in all, the organizations that followed the initiative identified more incentives than constraints to participate.

Out of the DFS participants, other Febraban members did not have the same favorable perception. They could have weighed more heavily the negative impacts of the blockchain technology and its decentralized model, which could jeopardize the profitable centralized model. These members emphasized the constraints due to the detriment of incentives to participate. In line with Puranam and Vanneste (2009), the element *incentives for and constraints to participation* worked as a system of comparative analysis among the perceptions of organizations about the other elements of CG.

The long-term goals described by the informants differed significantly, suggesting vast divergence among them as well. In addition, the DFS was not the only solution to the existing problem. The lower the forum exclusivity of a given solution alternative to a collective problem, the lower the probability of actors engaging in it (Ansell & Gash, 2008). In fact, the various perceptions of the initiative's overall goal implied distinct engagement levels. One informant declared that the goal of the DFS initiative would be to change society by including low-income citizens in the economy through a technological platform for unbanked communities (INT 4). A more pragmatic informant interpreted the initiative as "merely" a proof-of-concept of the technology (INT 10). According to a document analyzed, "the initiative is an experiment in the areas of information technology of the financial institutions participating in this initiative, with the sole objective of exploring the potential benefits of the blockchain technology. The tests conducted do not reflect the strategies and business models practiced by institutions in their products and services" (Doc 1). Not only were there different objectives in the group, but the participants were not convinced that CG was an exclusive way to solve the problem in question.

Another constraining factor was that the development of the instant payment solution would not necessarily be profitable. According to strategic profile informants (SDM), the solution would cannibalize the status quo of the business model, centralized by Bacen, which charged significant fees for bank transfers and was highly profitable for banks. Put bluntly, the development of an instant payment solution based on a new distributed power configuration among all network members could put the status quo of each individual financial institution at risk.

Institutional Design of DFS

As previously recognized, starting conditions shape the institutional design (Ansell & Gash, 2008). In the case analyzed, the characteristics of the blockchain also had an impact, mainly due to the rationale behind the operation of this kind of network. The choice of technology supplier (layers of infrastructure and application of technical governance) had a lasting influence on the decisions about the structuring of the initiative (organizational and institutional layers of non-technical governance) along the lines advocated by Rikken et al. (2019). The following subsections describe the institutional design elements identified in the DFS initiative. In addition to the four dimensions proposed by McCurdy (2020), two other dimensions directly related to the blockchain context emerged inductively.

Forum exclusivity

The collective problem—the need to develop an instant payment solution—could potentially be solved by blockchain, whose application could disrupt the centralized incumbent model of the industry. However, blockchain was not the only possible forum for addressing this problem. McCurdy (2020) adds the typology of blockchain networks into the Forum Exclusivity dimensions. In situations where the DLT is the most applicable technological solution, it is necessary to consider whether the blockchain network will be public permissionless, public permissioned, private permissioned, or hybrid. In other words, the institutional design of the collaborative initiative should consider not only the technological scope of the forum (DLT versus conventional technology with centralized architecture) but also the typology of the blockchain network itself. Informants stated that this was one of the key points of uncertainty among the members of the DFS initiative. One informant mentioned a certain "schizophrenia" in relation to the CG typology, between being a public, permissionless network and a private, permissioned network.

Once the founders of the DFS began their collaboration, based on the precepts of a public network, it was expected that such precepts would be implemented in the governance, too. The participants in the initiative did not arrive at the definitive format of how the power distribution among them would be and between them and future members. The interviewees indicated that they guided their behavior consonant with the logic of power decentralization in search of isonomy and equity among them. Formally, it is specified that all members would have the same power regardless of when they joined the network. This would apply both to the members who effectively participated in the DFS initiative in the design stage and to any other organization that would participate in the latter operation stage. However, there was a veiled distinction between the three founders and the other two members who effectively came later to the initiative. Though not explicit, there are indications that the positions supported by the three so-called "original founders" had greater weight in the decision-making process. These findings demonstrate that a close link was created among the three founding organizations, which formed a "decision-making hardcore" within the initiative: "We gave approval for everyone to enter the DFS, but one detail would be that we kept the 'hardcore,' let's put it like this. The three institutions. It was yet to be decided how it would be, but it would be like the core decision-maker" (INT 13).

Since the solution proposed by the CG initiative was not the only viable solution for solving the collective problem, the perception of incentives to engage was diminished. Bacen ended up implementing an alternative instant payment solution called Pix, in November 2020. The architecture of Pix follows the traditional, centralized model and keeps Bacen in the position of the trusted third party to legitimate all the transactions. The CG initiative had important support from Bacen in its early stages, but it was not enough to garner fundamental institutional support from Febraban.

Clear ground rules

The creation of clear ground rules is considered an essential factor for the success of any CG initiative. Decisions within the DFS initiative were made by consensus, following the recommendations of the blockchain (An & Rau, 2019; Arruñada & Garicano, 2018; Atzori, 2017; Cennamo et al., 2020; Rikken et al., 2019; Yu et al., 2018)we assess how recent technology advances have changed the way we coordinate. After a brief discussion of the common challenges to effective coordination, we highlight some important implications of technology on addressing informational and behavioral frictions. We focus on discussing the effects of three specific technology developments including artificial intelligence (AI and the CG literature (Ansell & Gash, 2008; Douglas et al., 2020a; Emerson et al., 2012; Emerson & Nabatchi, 2015; Ulibarri et al., 2020). Consensual decision-making was a recurrent practice, and there is no description of situations in which another means of decision-making was triggered.

Moreover, we identified two kinds of rules within the DFS initiative: (i) structuring rules on decision-making levels and (ii) rules on procedures and standards. Participants established different (i) decision-making levels. Documents suggest that there were two levels: at the lowest level were the "permanent members"; at the highest, the "sponsors" (Doc 2). At both levels, representatives of the five financial institutions participating in the DFS initiative were listed. The operational performance group (called the Tactical Committee) was formed by the "permanent members," who were middle managers with a highly specialized technical profile (TDM) and who were intensively dedicated to the development of the solution. The second group (called the Executive Committee) was formed by the "sponsors" or executive officers at the directive level in their home organizations (SDM) and had a decision-making role on strategic issues in addition to being the sponsors of the DFS in their respective organizations. The governance

structure of the DFS initiative intuitively followed the layers proposed by Rikken et al. (2019): a level of technical governance—the Tactical Committee, responsible for the layers of infrastructure and application; and another, non-technical level—the Executive Committee, responsible for dealing with the organizational and institutional layer.

As for (ii) rules on procedures and standards, each committee had a specific set of procedures, rules and standards of collaboration. Once the Tactical Committee was the group made responsible for the effective development of the technological solution, meetings became more frequent, with routine interactions between the professionals involved and informal relationships established. In the Executive Committee, the rules were more formal, documented, and bureaucratic. The procedures of the Executive Committee followed the best practices of corporate governance, mimicking those from each financial institution represented. The meetings were held monthly, using structured and well-defined guidelines, focusing on negotiating more complex topics (INT 12; INT 13). The agreements orchestrated by the members of the Executive Committee were formalized in minutes, contracts, and terms of cooperation.

A finding not supported by the previous literature emerged in the empirical research: the relationship between the governance of the DFS initiative and the corporate governance of each individual organization. Through its committees, DFS reconciled the interests of the initiative with those of the organizations, respecting the rules of their respective corporate governance. The original proponents of the initiative had a highly specialized, technical profile. However, none of them had a board position within their respective organizations and, therefore, did not have the power to decide on the collaboration initiative. Thus, for the CG initiative to be constituted, proponents had to "evangelize" (in the words of INT 2) their peers and leaders within their respective organizations.

Participatory Inclusiveness

The CG's objective to promote collaboration between interdependent actors to achieve common goals and contribute to solving collective problems implies a high level of inclusion and participation in decisions. In line with McCurdy (2020) and Rikken et al. (2019), the institutional design of DFS was influenced, at the beginning, by the fact that it was conceived as a private permissioned network. By definition, private permissioned networks have some level of power centralization in the hands of the organizations that create them and, therefore, have differentiated rights over the modeling of network governance. Whoever can conceive or change the governance rules has the power to govern the network (Klein et al., 2019). Hence, the founding organizations concentrated the CG initiative's power.Regarding the decision-making process in CG, it would be natural, due to the history of the DFS initiative, for the decision-making process to be guided by consensus, thereby maintaining coherence with the logic of blockchain technology. The interviewees reinforced this finding by describing episodes where members had to decide on impactful issues when solutions were recurrently built upon consensus. As the setting for the development of the technological solution, the Tactical Committee resolved deadlocks after heated debates among participants in the search for alignment of the understanding of the possible alternatives until a solution approved by all emerged. The Executive Committee articulated the decisions related to the DFS initiative with the corporate governance of their respective organizations. Whereas consensus was the rule agreed to among the members of the Executive Committee, it was mentioned that, in a non-consensus situation, the decision would be democratic (INT 4).

Nevertheless, the accounts of interviewees indicated stark differences between the two committees. A perception of unequal power distribution was related to the unequal contribution of resources to the DFS initiative. The three original founders contributed heavily to personnel, physical space and infrastructure, and other resources. The other two members appeared as marginal contributors—a situation not interpreted as a demerit but used to justify the unequal power distribution. This removes the DFS initiative from the equity precepts typical of permissionless networks and brings it closer to what it effectively is: a private, permissioned network with heightened power for its founders.

Process transparency

The fourth element of the institutional design refers to process transparency, which is considered fundamental in fostering trust among partners to develop CG. In the case studied, accountability was central to process transparency.

Accountability is analyzed at two levels: accountability under the CG initiative—that is, within the interorganizational arrangement; and accountability of the initiative with the participating organizations, individually, between the interorganizational arrangement and the participant organizations. In general, all informants indicated that the control mechanisms were efficient and that the commitment to the initiative was so high that it was unnecessary to use pressure or coercion to achieve goals (INT 12). The "intra-initiative" flow took place from the Tactical Committee to the Executive Committee and dealt with the evolution of the initiative and effective implementation. In the activation and collectivity stage (Ulibarri et al., 2020) of a collaborative initiative, intense interaction among the members to set the constitution of their operating agreements is expected.

Within the scope of the accountability of the initiative to the participating organizations individually, there was the challenge of intraorganizational negotiations between the technology and business areas (INT 12). These internal negotiations created the consequent need for articulation with the corporate governance of each organization. The misalignment of strategic interests between intraorganizational areas emerged when the initial stages of network design were overcome successfully and in a relatively short period. At a time when the initiative presented a technological solution mature enough to scale and be brought to market, the intraorganizational conflict of interest affected the development of the initiative to the operational stage.

Even if no previous theoretical support could be found, this finding seems to have had relevant weight in the case. Initiative-organization accountability resulted in an unusual situation: as the DFS matured

and advanced from design to operation, the business boards of the participating financial institutions began to hinder its progress. Apparently, it was at this point that the misalignment of interests became more evident. This ended up becoming one of the main obstacles to the expansion of the solution to other Febraban members, as not even the five organizations participating in the DFS initiative were unanimous about its continuity.

Interoperability

The interoperability demanded in blockchain networks requires each organization to connect its infrastructure and proprietary applications to develop the solution. Blockchain-based solutions do not exist if they cannot interact with the specific technological environments of each network node (Vivaldini & de Sousa, 2021). For a blockchain network to interact confidently with all organizations, it is mandatory that the specificities of each organization are known for the proper integration of the collective platform. As a result, details of business rules can become public, jeopardizing the competitive advantage of that specific company.

The requirement to open individual, proprietary technology for participation in the network can become an embarrassment for participation. In line with previous research (Vivaldini & de Sousa, 2021), interoperability was an important challenge to be overcome when setting up the DFS initiative. While the initiative was in the design stage, with a small number of participants, this challenge was overcome with relative ease. However, with the possible expansion and advancement to the operation stage, the inclusion of new members was postponed. This decision was triggered by the fear of impacting the network's development due to the need to adjust it to the technological standards of the new participants and vice versa.

Attraction of new members

The DFS case highlights an important insight that goes beyond the theoretical mechanisms found in prior work, as the attraction of new members was an element inductively identified during the research. Ansell and Gash (2008) and Emerson and Nabatchi (2015) mention the need for collaborative initiatives to attract relevant actors for collaboration but do not make this element explicit in their frameworks. Surprisingly, this element had the greatest impact on DFS's failure. While all informants knew that the solution would only be adopted effectively if as many financial institutions joined the network, the barriers mentioned previously deterred some from fully participating and blocked others from joining, leading to the project losing momentum. As blockchain-based CG initiatives need to make use of the network effect to achieve scalability and maturity (Beck et al., 2018; Katz & Shapiro, 1994; Rikken et al., 2019), the ability to attract new members becomes vital to advance a given network from the design to the operation stage, according to the criteria of Rikken et al. (2019). Specifically, at DFS, the scalability of the initiative would only be achieved if most members adopted the solution (especially the five largest banks members of Febraban) to compel the entire industry to adopt it, something that never happened. By contrast, individual initiatives, or those sponsored by small groups, would hardly go beyond the initial stages of proofs-of-concept, minimum viable product, or prototype.

In the case of a blockchain-based network, it would be natural to expect that egalitarian powers would be offered to organizations that would join the network at any time. However, the "hardcore" group of the three original founders expected to maintain some kind of control over the network. This would naturally become an inhibitor of attractiveness for potential supporters. The scalability of the initiative depended on the participation of the largest possible number of players in the industry but, vitally, it could not do so without the participation of the two largest private banks, which had declined to participate in the DFS initiative due to the result of the 'clear choice' episode, in favor of an open-source platform (Hyperledger), instead of the Corda technology. This aligns with the impression of one interviewee: "When we declare the participation of the largest banks, in terms of assets, a share of credit in the market, this was discussed a few times...'gee, it will be interesting and important for the initiative to have the recognition of great players.' This was discussed" (INT 12). The DFS case thus reveals the need for the institutional design to create governance mechanisms that are beneficial for new entrants. The CG initiative seems to have been unsuccessful in this realm. Although it managed to complete the design stage of the blockchain-based instant payment solution (i.e., development of the technological solution), it could not attract other players in the financial industry to join the initiative and put it into operation.

Discussion and Conclusion

The present study aims to analyze how blockchain technology impacts the institutional design of a CG initiative developed to solve a collective problem. The CG initiative investigated is unusual in the literature as it is based on a private permissioned blockchain-based network.

The general findings confirm the proposal of McCurdy (2020) regarding the influence of technology on CG institutional design. The impact of blockchain on the characteristics of the four elements of institutional design—forum exclusiveness, clear ground rules, participatory inclusiveness, and process transparency—was identified in the DFS case study. Specifically, network configuration impacts *forum exclusiveness*, mainly concerning the choice of technology supplier. The decision for the infrastructure and application layer (Rikken et al., 2019) and its respective level of centralization influences the institutional design of the initial CG model (McCurdy, 2020). Network typology (Rikken et al., 2019) also impacts the CG. The DFS case shows the relevance of a clear definition of what type of network it is: permissionless versus permissioned and private versus public. Although McCurdy (2020) analyzes this characteristic as part of the *forum exclusiveness* element, in this case study, it seems to be more significant for the element *participatory inclusiveness*. Regardless of the element, network typology must be carefully considered in blockchain contexts.

Theoretical Contributions

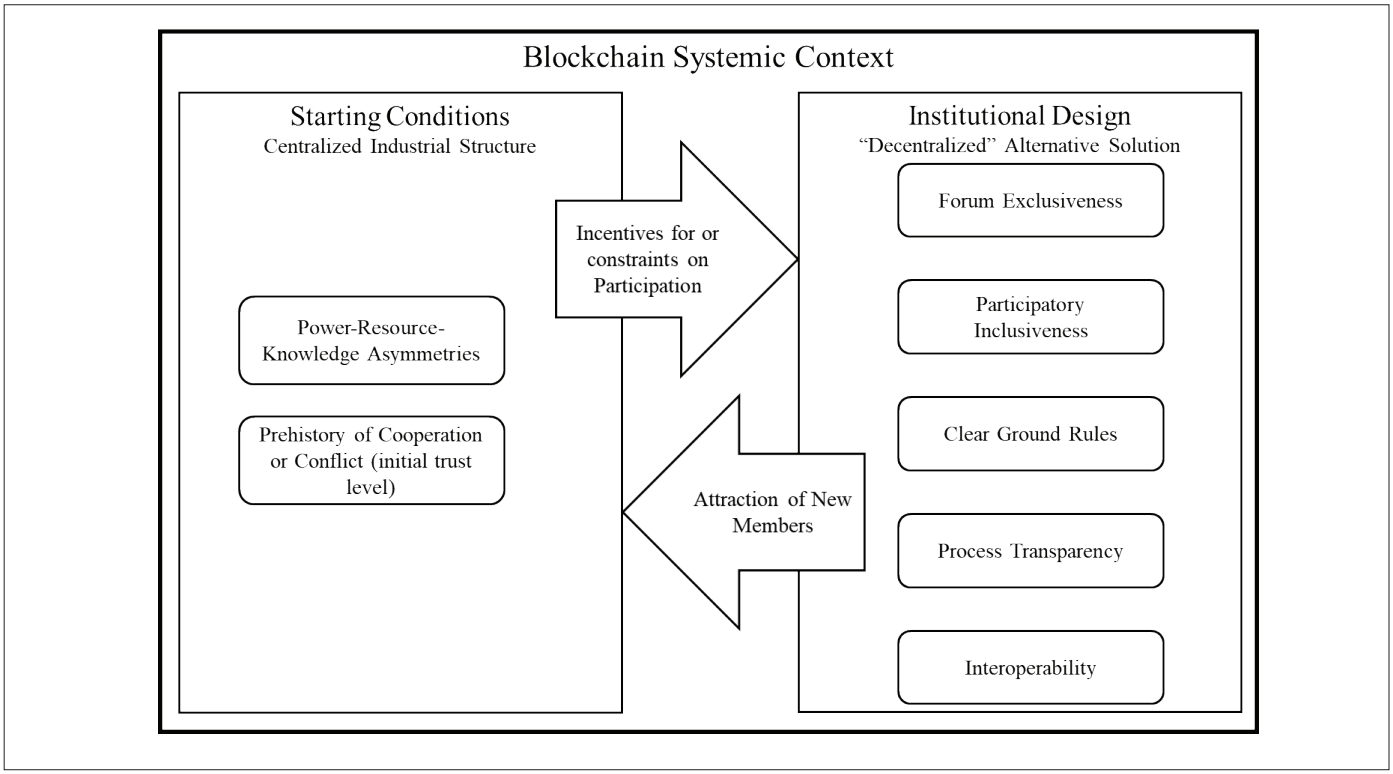
The present study emphasizes technology as a protagonist aspect of CG, specifying new governance mechanisms driven by blockchain. It brings light to the implications of the network effect, making the ability to attract new members to the interorganizational initiative

mandatory. In addition, CG is impacted by the need to ensure technological interoperability. In this sense, the study includes the process of scaling as a key mechanism for CG. Thus, our main theoretical contribution is the addition of two novel elements to the institutional design: attraction of new members and interoperability. The present study expands the previous CG theory by including the need for the institutional design to establish mechanisms to attract new members to the interorganizational initiative and ensure interoperability whenever the context in which it is embedded demands the network effect for its expansion.

Starting conditions influence institutional design, which in turn should feature sufficient benefits to attract new members. Gradually, this changes the understanding of the status quo of starting conditions and the general system context itself by putting it in an iterative cyclical loop, in which starting conditions influence the institutional design and vice versa. This iterative loop is not something new and is supported by previous literature (Emerson & Nabatchi, 2015). However, the attraction of new members to this loop has not previously been explicitly examined. Another contribution of the present study is to emphasize the notion of interactivity between the starting conditions and CG institutional design to provide the scale demanded in collaborative initiatives dependent on network effects.

We developed a conceptual framework to illustrate the iterative, cyclical loop and how the two novel elements—interoperability and the attraction of new members—affect the original components posited by Ansell and Gash (2008)—starting conditions and institutional design.

Figure 2: Conceptual Framework



Source: Authors' elaboration.

Practical Contributions

The present study offers several practical contributions. First, it sheds light on the initiative itself that it analyzed since it deals with an important change in the financial industry, namely the development of an instant payment solution. This case study presents behind-the-scenes insights into CG initiative solution development, showing its interaction with Bacen and navigation of industry intricacies. This can help entrepreneurs in the development of fintechs or guide incumbent companies that intend to launch new solutions for the financial market via CG initiatives.

Regarding CG, the present study reveals the need to align the interests and practices of the participants with those of the internal corporate governance of the participating organizations. CG initiatives involving organizations with well-established governance rules and a high degree of maturity need to consider efforts to achieve alignment of governance interests and practices at both levels, inter- and intra-organizational. In this sense, CG can benefit from learning the corporate governance practices adopted by the individual actors on a path to becoming an intelligent compilation of best practices. This point is especially relevant for permissioned blockchain networks for which large organizations with robust corporate governance are both actual and potential members.

Another important contribution of the present study refers to the applicability of blockchain as a technological basis for developing solutions to complex problems. The case analyzed suggests that the robustness promised by technology was not the most important factor in deciding how to structure solutions for use cases involving a large number of actors and transactions. More than the technological requirements, the structural model of the industry in which the use case is found is the deciding factor for effective impact. The dichotomy between the current centralized structure and a decentralized alternative solution is something managers should consider broadly when deciding on the use of blockchain.

The need to pursue the network effect in CG initiatives involving blockchain also indicates that participants in the initiative must devote efforts to attracting new members. This means that, from the beginning, there should be a focus on creating mechanisms that allow communicating the initiative to potential participants and attract them to the collaboration. Collaboration may only achieve limited results without this action, and the solution to the complex problem may not be fully realized.

Limitations and Future Research

Some limitations must be acknowledged in this research. The first is the fact that it is a descriptive case study, which allowed for examination into the minute details of a failure case but limits generalizations. A multiple case study, for example, would be explanatory rather than descriptive. In such research, in addition to describing the influence of one component on another, the cause-and-effect relationships between elements could be identified.

Our findings exposed some further gaps that deserve future study. It would be interesting to repeat the present study with other similar cases in the future, when more blockchain networks are available, to identify patterns in the relationships between CG components. Cases not necessarily anchored to the blockchain context could also be investigated, provided that these situations invoke a similar dichotomy between the current centralized structure and the decentralized alternative solution. The interaction between CG and corporate governance is another stimulating opportunity for future research that can assess how the corporate governance practices of participants in interorganizational collaboration influence the set of procedures, norms, and rules of collaboration in the institutional design. The existing literature does not support the interpretation of this situation, which suggests that there is room for further research. Analyzing the accountability process of a collaborative arrangement that has reached the operation stage for transparency could also unearth new insights.

In conclusion, technology such as blockchain can greatly expand the scope of collective action in addressing society's urgent challenges. By promoting inclusiveness, ensuring transparency, and enabling the decentralization of power, blockchain-supported networks can facilitate more effective CG in technology-driven contexts with a large and diverse array of stakeholders. Interestingly, the purely technological aspects of blockchain do not seem to be the most relevant in shaping the institutional design. Instead, it is the inherent characteristics of network formation, especially the decentralization of power and the removal of a trusted third party, that truly impact these components. As one interviewee aptly put it during the exploratory interviews: "The challenge is not the technology; it's the network!" This research suggests that the interviewee was indeed correct. The findings highlight the necessity of addressing key underestimated factors, such as interoperability and the attraction of new members to achieve scalability and ensure the success of blockchain-based CG initiatives. By incorporating these elements into the institutional design, organizations can better navigate the complexities of collaboration in technology-driven environments, ultimately enhancing their ability to solve collective problems effectively.

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