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Exploring the role of blockchain technology in value creation: a multiple case study approach

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Abstract
The value creation potentials of blockchain technology have attracted significant attention from academia and industry. To address how blockchain technology could impact value creation at the business level, this study adopted an inductive multiple case study approach. As part of this focus, fifty-five (55) cases were selected based on maximum-variation and theoretical sampling methods. Selected cases were investigated by conducting with-in case analysis, constant comparative analysis, cross-case analysis, and synthesis and thematic analysis methods. Initially, potential sources of value creation were explored and then the business model innovations were examined to exploit pre-identified value drivers. The findings revealed that blockchain has five potential sources of value creation, including access domain extension, cost reduction, reinforcement and enrichment, new business practices, and social base enrichment. Further, several business model innovations were proposed based on the data-driven exploration to help practitioners exploit identified opportunities or value drivers. This study not only applies the current body of strategic, economics and entrepreneurship knowledge in a new field, but it also adds conceptually and empirically to the current body of blockchain literature. Furthermore, business practitioners could increase their understanding of blockchain's opportunities to address current business challenges, make operations more efficient, foster innovation, and co-create value with stakeholders.

Keywords Blockchain Technology · Value Creation · Digital Transformation · Strategic Entrepreneurship · Multiple case study

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1 Introduction

After the age of the Internet revolution, blockchain technology, which is considered the Internet of value (Tapscott & Tapscott, 2017) represents one of the top technology trends that may influence the way business is conducted (Bajwa, Prewett, & Shavers, 2010; Hawlitschek, Notheisen, & Teubner, 2018). Blockchain technology is the underlying technology and infrastructure for bitcoin and other cryptocurrencies. Despite the hype of cryptocurrencies in the early days, the scope of blockchain applications goes far beyond bitcoin (Biswas & Gupta, 2019; Underwood, 2016). Blockchain, as its name implies, is a chain of blocks. It is like a distributed database in multiple locations between multiple distributed nodes wherein each block contains transactions of any sort of value such as money, identity, and music. Blockchain eliminates the need for centralized control because transactions are stored in multiple locations, thus helping to mitigate a single point of failure and establishing digital trust. The latter is a new form of trust that can be achieved without the need for trusted third parties or central authorities (Casino, Dasaklis, & Patsakis, 2019; White, 2017). The protocol, extension, and application layers are all tiers of blockchain that may be broken down from an architectural viewpoint (Gudgeon et al., 2020; Zhao et al., 2020). The protocol layer has storage and network layers, which allow for distributed algorithms, cryptographic signatures, and data storage. Extension layer is responsible for product creation for the actual use of blockchain technology to generate economic and social progress. Finally, the application layer creates a new financial format or service model to improve the financial system and increase efficiency and quality (Luo & Yan, 2021).

Being among the game-changing technologies of the fourth industrial revolution (i.e., Industry 4.0) (Hawlitschek et al., 2018), blockchain was placed among the top five technology trends (Morkunas, Paschen, & Boon, 2019). Researches show an increasing interest in this subject (Zeadally & Abdo, 2019). Countries and entrepreneurs worldwide started to consider blockchain as their top strategic priority and act accordingly. To be more specific, according to Deloitte (2020), more than 50% of executives in different countries worldwide stated that they placed blockchain as their companies' top five priorities. More than 2300 cryptocurrencies were launched (Ali, Wang, White, & Fatima, 2019), and the overall investments in blockchain technology were US$1 billion in 2016 (Morabito, 2017). According to (Kandaswamy, Furlonger, & Stevens, 2019), investments in blockchain are estimated to reach US$176 billion by 2025 and US$3.1 trillion by 2030. Giant companies like IBM and Linux (Hyperledger project), Facebook (Libra project), Amazon (QLDB), Microsoft, EY, Deloitte, PWC, NASDAQ (stock market), among others, are working on and launching their solutions at different levels of the blockchain ecosystem. Similarly, more than 70 banks across the globe have been reported to start considering and implementing blockchain solutions (Hughes et al., 2019).

All abovementioned projects, plans, and interests convey an important message that a significant socio-technological change is underway. On the one hand, this change may disrupt the current way of doing business and make traditional business models obsolete. On the other hand, visionaries may derive most of the first-mover advantage from adopting blockchain to reduce uncertainties, create value, and achieve sustainable competitive advantage. Of course, first movers and innovators also face innovation failure risks, and they should be informed of these threats and adopt a suitable strategy. The suitable time to entry and the advantages gained differ from industry to industry, and not all firms are required to

perceived risk

consider the adoption of blockchain simultaneously and at the same level (Lieberman & Montgomery, 1988; Porter, 1985b).

There are threats for those who did not foresee change and were unprepared for the upcoming situation. Radical and disruptive changes may make firms' products and services obsolete and out of competition, their resources and capabilities unused, thereby increasing reluctance to enter new markets (Afuah, 2004). Well-established and dominant firms could be challenged by the fatal consequences of neglecting new technologies because their new entrant rivals may adopt new technological innovations and well-defined business models to disrupt the whole value network they perform in (Christensen & Rosenbloom, 1995).

Extant research has separately investigated the blockchain technologies' role in value creation using different theoretical lenses and a limited number of use cases. Moreover, few empirical works have been undertaken to document the potentials of blockchain for value creation. This may result in a shallow understanding of the far-reaching possibilities of blockchain using insights from real-life data. The current research offers a holistic perspective, draws on multiple use cases and combines multiple theoretical lenses with real cases data.

To address how blockchain technology could impact value creation at the business level, we first divided this primary question into two sub-questions based on Amit and Zott (2001) and Zott and Amit (2010): "What are the potential value drivers (sources of value creation)?" and "How could businesses appreciate these potential value drivers? In other words, how could businesses create value?"

This study further draws on digital transformation, strategic management, and entrepreneurship literature by providing evidence from blockchain-based ventures. It also contributes to blockchain literature by applying the knowledge body of these fields to the emerging blockchain domain. Practitioners can also benefit from this research by deepening their knowledge and understanding from a wide range of cases, which illustrate how blockchain technology can contribute to value creation and address different business challenges, such as sustainability, ambidexterity, and resource scarcity.

In the following sections, the theoretical background of current research, including the value creation, the strategic entrepreneurship, and multiple lenses adopted for this research, is presented. Next, in the methodology section, the philosophical assumptions that derive the research process, the research strategy, sampling, and analysis methods are presented. The findings, interpretations, unifying research model, research contributions, limitations, and suggestions for future research will follow.

2 Theoretical Background

2.1 Value and Value Creation

Customers are considered the value determiners in today's world (Chakraborty & Prasad, 2016; Shamma & Hassan, 2013). Customers are not only a trajectory of monetary assets to be exploited, rather they are the main source of data and value creation. In this regard, the current study considers customers as key stakeholders who could increase their value by profit share and decision making authority. This research also adopted Porter (1997) value system as a theoretical underpinning. First, this approach is flexible, and it not only refers to

the traditional manufacturing company value system, but also, to virtual value chain (Rayport & Sviokla, 1995) and value reconfiguration framework (Stabell & Fjeldstad, 1998). Second, this study includes time as an important factor when dealing with long-term and sustainable value creation. Hence, the value is defined as the present value of the sum of all current and future values created by all participants across the value system, where value creation refers to any enhancement of the total value created by all participants.

2.2 Strategic Entrepreneurship

Strategic entrepreneurship integrates strategic management and entrepreneurship fields of studies and simultaneously incorporates opportunity-seeking and advantage-seeking behaviors (Ireland, Hitt, & Sirmon, 2003). On the one hand, strategy is more concerned with the long-term development and growth of the firm. On the other hand, entrepreneurship is more concerned with delivering or creating newness; it involves either creating a new organization or creating a new organizational unit or renewing the existing organization (Ireland et al., 2003; Ireland & Webb, 2007; Thompson, 1999).

Different theories can contribute to the strategic entrepreneurship field of study. The current study adopted value chain, resource-based view, transaction cost economics, strategic networks, Schumpeterian innovation, and institutional entrepreneurship.

2.2.1 Value Chain

Porter (1985a) introduces the value chain framework to analyze value creation at the firm level. Porter uses the term value chain to refer to the set of related activities performed by the firm from the supply side to the demand side to add value to products or services. In its pure form, the value chain disaggregates a firm's technological and economic distinct activities (value activities) into two basic categories, nine generic sub-categories, and linkages. Primary activities encompass activities directly related to physical production, marketing, and delivering the product to the customer; inbound logistics, operations, outbound logistics, marketing and sales, and service are primary activities. Support activities (the second basic category) are those activities that support and provide the infrastructure for primary activities to be conducted; support activities are firm infrastructure, human resource management, technology development, and procurement (Porter & Millar, 1985). Considering system view of the firm, the value chain of the under-investigated firm could be placed in a broader social and environmental context. In this sense, value system refers to the whole value chains of the firm suppliers, the focal firm itself, channels and distributors, and buyers (Amit & Zott, 2001; Porter & Millar, 1985).

2.2.2 Resource-Based View (RBV)

Resource-Based View (RBV) theory looks inside the firm for sources of competitive advantage (Amit & Zott, 2001; Barney, 1991; Wernerfelt, 1984). Instead of trying to outperform competitors with ploys and barriers and gaining monopoly rents, RBV considers the firm as a bundle of resources. These resources consist of assets, capabilities, processes, information, and knowledge controlled by the firm in three categories of physical, human, and organizational resources. RBV also assumes that firms' resources are heterogeneous across firms

(not only across industries or strategic groups like positioning point of view), which may lead to sustainable competitive advantage if these resources are valuable, rare, imperfectly imitable, mobile, and substitutable.

Although the dominant RBV brought tremendous insights into strategic and entrepreneurship fields, it has also been criticized, especially in rapidly changing circumstances. The value creation and competitive advantage(s) of firms in uncertain and technologically turbulent environments could not be explored and exploited through the initial form of RBV.

2.2.3 Transaction Cost Economics

Transaction Cost Economics (TCE) shifts the focus from market, position, resources, or capabilities to transactions. Moving forward from the firm's neo-classical and production function view, TCE considers firms a governance structure (Williamson, 1998). It takes transactions as the unit of analysis. Boundaries of the firm and the governance choice between market, hierarchy, and integration are the main questions that this theory seeks to answer. TCE argues that due to bounded rationality (i.e., no one can access all the necessary information and if he/she can, he/she cannot process all that information) (Simon, 1987); opportunism, asymmetric information, complexity, uncertainty, and transactional inefficiencies may arise. As a result, the best governance model is the one that accomplishes a transaction at a lower cost and more efficiently. Transaction costs involve all the costs of planning, adapting, executing, and monitoring; hence all the searching, traveling, negotiating, consulting, and other time and monetary costs are included. When transaction costs are zero, firms face no strategic problems, yet, in reality, all the circumstances mentioned above usually led to transaction costs, which need strategic efforts toward better establishing governance models that reduce transaction costs (Amit & Zott, 2001; Foss, 2003; Jones & Hill, 1988; Williamson, 1993, 1998).

2.2.4 Strategic Networks

The strategic network perspective differs from the previous theories, which consider external industry sources or internal resources and capabilities as an autonomous entity or atomistic actor. The relational approach of strategic networks deepens the firm's understanding and enables scholars to consider other sources of competitive advantage. Firms could simultaneously seek cooperative and competitive behaviors, in which cooperation is a critical strength. Strategic networks take the form of strategic alliances, joint ventures, long-term buyer-supplier partnerships, outsourcing, and any other important inter-organizational relationships (Gulati, Nohria, & Zaheer, 2000). Furthermore, they are considered a substitute governance mechanism for market or hierarchy modes. In win-win situations (Jarillo, 1988), networks could help firms reduce their uncertainty, information asymmetry, and transaction costs. Through networks, firms could access information, knowledge, markets, and technologies. Alike, firms could attain legitimacy (Borgatti & Foster, 2003). They could also cooperate, achieve economies of scale and scope, learn, share and mitigate risks. Networks facilitate access to expertise and drive innovation in complex industries; therefore, firms could achieve network effects and externalities (i.e., the situation when the utility gained for each user is increased by the number of users), which are an essential source of value

creation and (sustainable) competitive advantage (Amit & Zott, 2001; Gulati et al., 2000; Lorenzoni & Lipparini, 1999).

2.2.5 Schumpeterian Innovation

Joseph Alois Schumpeter, known as one of the most influencing economists, views entrepreneurship coupled with innovation in (usually) technologically changing environments as the driving force which could alter the industries' or economies' routines and conventional ways of doing things. In Schumpeter's view, visionary entrepreneurs could benefit from certain rents (Schumpeterian rents), stemming from generating initiatives along with (radical) innovation and de-institutionalization in complex and uncertain environments (Galunic & Rodan, 1998).

Despite the conventional economists and the classical view of the equilibrium model of supply and demand, Schumpeter addressed disequilibrium resulting from creative destruction and innovation. He also recognized the potential for entrepreneurs (which does not have to be a person; it could be regarded as an organization or even a country) to disrupt the current system of thoughts and routines and shape and influence their environment. Innovation as a key driver of value creation in Schumpeter's view has several forms, namely: introducing or launching new products; application of new production methods; opening new markets; reconfiguring or reorganizing established market or industry; and acquiring new supply sources (Amit & Zott, 2001; Schumpeter, 1934; Śledzik, 2013).

2.2.6 Institutional Entrepreneurship

Institutional entrepreneurship bridges two paradoxical (or complementary) concepts: institutional theory and entrepreneurship or actors' agency.

On the one hand, the institutional theory is more concerned with institutional, structural, and environmental forces that coerce organizations to obey specific rules and adopt certain shapes and behaviors to gain legitimacy (Mazzei, Ketchen, & Shook, 2017). By obeying these requirements and expectations, organizations gain acceptance, appropriateness, and legitimacy in the eye of their stakeholders, which in turn could help them survive and improve their social capital and performance (Mazzei et al., 2017). Legitimate organizations could avoid institutional challenges, benefit from making better relationships with customers, investors, regulators, and suppliers in the light of their legitimacy. Furthermore, legitimacy facilitates their resource acquisition activities. Institutional theory studies how structures are established and become guidelines for social behavior and organizations through institutionalization (Battilana, Leca, & Boxenbaum, 2009; Deephouse, 1999; Johnson & Van de Ven, 2017).

On the other hand, entrepreneurship and actors' agency focused on the actors' will and behavior in their profit-seeking behavior regardless of institutional context. The consequence is the "embedded agency" paradox, which denotes how actors or change agents whose beliefs and behaviors are determined by established institutions could change the same institutions. Therefore, not overemphasizing the structural and institutional role, nor the actors' will, decisions and freedom, the institutional entrepreneurship concept is developed to study how institutions shape actors' behaviors in their legitimacy-seeking journey and how institutional entrepreneurs could change established structure to their favor. That

said, institutional entrepreneurship indicates that firms could maximize their performance by making a balance between differentiation (act differently) and sameness (mimic other actors' behavior) (Battilana et al., 2009; Deephouse, 1999; DiMaggio, 1988).

To summarize, each of the mentioned perspectives alone could not bring a fruitful understanding since each investigates the phenomena from a different viewpoint. Therefore, this paper suggested a multiple perspective method to explore blockchain technology's impact on value creation at the business level. Combining these perspectives enabled the authors to combine the micro and macro views and consider the internal activities, resources, capabilities and competencies; individual efforts of entrepreneurs toward innovation; and economization of a single transaction. Further, our approach aims to place the organization in a broader network, recognize the impacts of institutionalized context on organizational operations, and evaluate the shaping role of embedded entrepreneurs.

3 Related Works and Critical Review of Literature

As illustrated in Table 1, we considered several pertinent studies contributing to blockchain technology's value creation research stream. First, a very brief description of each study is presented, then we categorized these related studies according to theoretical lenses adopted for this research and stated the other areas they did not cover.

Kshetri (2018) explores the blockchain's role in meeting the key objectives of supply chain management. The next study analyzes the role of blockchain technology for operations and supply chain management (Tönnissen & Teuteberg, 2020). Valtanen, Backman, and Yrjölä (2019) investigate the blockchain technology's role in value creation in the 5G and smart grid use cases by applying the resource configuration framework (Adner & Kapoor, 2010) and the 4 C typology (commerce, context, content, and connection) (Wirtz, Schilke, & Ullrich, 2010). Weking et al. (2019), employing design science, investigate 99 blockchain ventures to understand emerging business models. They identify five patterns that cover the emergent business models. The authors characterize them through three business models elements: value proposition, value creation and delivery, and value capture. By investigating five permissioned consortium blockchain case studies, Chong, Lim, Hua, Zheng, and Tan (2019) introduce five blockchain business models based on value configuration and digital business model literature. By inter-relating each of these five business models to value configuration taxonomy (Stabell & Fjeldstad, 1998), the authors explore the value creation logic, value capturing mechanism, and challenges of proposed business models. This study is inspired by the work of (Kazan, Tan, & Lim, 2015) and adds to the literature by investigating the value creation in cryptocurrency networks from the perspective of strategic management and information system. The analysis results in six generic business models based on the resource configuration framework. Spanò, Massaro, and Iacuzzi (2021) examine how blockchain technology may help create value in the healthcare industry. Conducting content analysis, they explore the whitepapers, websites, and weblog conversations of 33 firms formed by professional incubators and accelerators. The study demonstrates four distinct ways to value creation: endogenous hedonistic value, social value, utilitarian/instrumental value, and conflict mitigation between public and private sectors. Morkunas et al. (2019) describe the impact of blockchain technology on different elements of Osterwalder and Pigneur (2010)'s business model framework, including customer segments, value prop-

Table 1 Related Works

Perspective Reference	VC[3]/VS[4]	RBV	TCE				BM[8]	Methodology	Industry/ Sector / Application/ Use-Case
Kshetri (2018)	x							Multiple Case study	Supply-Chain
Tönnissen and Teuteberg (2020)	x						x	Multiple Case study	Supply-Chain
Valtanen et al. (2019)	x	x		x			x	Anticipa-tory Action Learning	5G, Smart Grids
Weking et al. (2019)							x	Multiple Case Study	Holistic (Mostly Technical)
Chong et al. (2019)							x	Multiple Case Study	Permissioned Consortium Blockchains
Kazan et al. (2015)							x	Multiple Case Study	Cryptocurrency Networks
Spanò et al. (2021)								Multiple Case Study	Healthcare
Morkunas et al. (2019)							x	View Point	Multiple Use-Cases
Chen (2018)					x	x		View Point	Entrepreneurship and Innovation
Schmidt & Wagner (2019)			x					View Point	Supply-chain relations
Ahluwalia et al. (2020)			x					View Point	Start-up Financing
Schlecht et al. (2021)	x	x	x	x	x		x	Delphi	Multiple Use-Cases
Our study	x	x	x	x	x	x		Multiple Case Study	Multiple Use-Cases

[3] Value Chain.

[4] Value System.

[8] Business Model.

osition, channels, customer relationships, revenue streams, key resources, key activities, key partnerships, and cost structure. In another viewpoint research, Chen (2018) contributes to the literature by examining blockchain technology's potential in entrepreneurship and innovation democratization. The researcher studies the blockchain tokens' role in shaping entrepreneurship and innovation.

Other scholars adopt various methodologies and add to the current body of literature by investigating the role of blockchain technology in value creation using a single case, sector, application, use-case, or theoretical lens (Ahluwalia, Mahto, & Guerrero, 2020; Schmidt & Wagner, 2019; Tönnissen & Teuteberg, 2020). However, as previously mentioned, gaining a holistic and in-depth view needs an integrated multi-case, multi-sector, multi-application, and multi-perspective analysis, which could consider differences and complementarities across cases (or sectors and applications) and different views.

Our research differs from the study of Schlecht, Schneider, & Buchwald (2021), who identified blockchain value creation potentials for businesses by 2030 from different points.

First, their research is not based on real evidence and cases. Second, Schlecht et al. (2021) pre-assumed potential sources of value creation based on Amit & Zott (2001) and did not let the categories emerge and be grounded in data. Finally, the authors did not consider institutional theory, which emerged as a necessary theory in our dataset.

4 Methodology

In order to investigate and explain how blockchain could impact value creation at the business level based on the strategic entrepreneurship perspective, an inductive case study was adopted for this research. To answer the first research question (i.e., What are the sources of value creation?), cases were selected based on maximum variation sampling. This was done to gain as many differing views as possible. Then, single case analysis, constant comparative analysis, and cross-case analysis and synthesis (Glaser Barney & Strauss Anselm, 1967; Miles & Huberman, 1994) were conducted using Braun and Clarke (2006) version of thematic analysis method. First, we developed initial codes and themes; then theoretical sampling method was conducted, and further analysis was done adopting single case analysis, constant comparative analysis, and cross-case analysis and synthesis. In doing so, we aimed to generate new themes and enrich the existing themes, data, and theoretical saturation. To address the second research question (i.e., How businesses could appreciate these potential sources of value?), with-in case analysis and cross-case analysis and synthesis were made during the first and second phases to gain a deep understanding of how entrepreneurs and businesses could innovate their business models to create value.

4.1 Unit of Analysis

The different perspectives adopted for this study are usually accompanied by different units of analysis. For instance, researchers who adopted TCE usually take the single transaction as their unit of analysis, or those who adopt RBV take resources or capabilities. The same happens for a single firm or the entrepreneur for entrepreneurship studies; or firms' activities for value chain studies; or institutions for institutional economic researches. As studied by Zott, Amit, and Massa (2011), the business model concept is being adopted by a growing number of scholars as their unit of analysis. The notion of business model usually refers to how a firm is doing business, a description of different activities of the firm and how they work together, and how it is going to create value and deliver that value to its stakeholders and capture part of that value by its economic mechanism (Bocken, Short, Rana, & Evans, 2014; DaSilva & Trkman, 2014; Demil & Lecocq, 2010; Evans et al., 2017). As per Amit and Zott (2001), the business model construct could align with adopted perspectives for the current study. Therefore, the business model is an appropriate unit of analysis for this study (Table 2). It not only contributes to unifying all the perspectives adopted but also limits and determines the boundaries of data collection and data analysis.

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4.2 Sampling Methods: Maximum-Variation and Theoretical Sampling Methods

4.2.1 Maximum-Variation Sampling Method

The Maximum-variation sampling method is adopted to analyze and demonstrate different and sometimes contradicting research areas. A pre-measure(s) is necessary for this method as cases are selected due to maximum difference based on the measure(s) (Creswell & Poth, 2016). This research adopted three pre-measures, namely: blockchain architecture (Casino et al., 2019), blockchain, generation (Angelis & da Silva, 2019), and blockchain business models (Weking et al., 2019). We purposefully selected cases based on differences in each pre-measure to achieve maximum variation.

The architectural classification includes private, federated (consortium), and public blockchains. The blockchain generational classification includes whether the blockchain project utilizes smart contracts and whether it uses complementary technologies (e.g., the Internet of Things (IoT), Artificial Intelligence (AI), machine learning, big data). The business model classification is based on five archetypal patterns identified by Weking et al. (2019), which include: blockchain for business integration, blockchain as a multi-sided platform, blockchain for security, blockchain technology as an offering, and blockchain for monetary value transfer.

4.2.2 Theoretical Sampling Method

The theoretical sampling method is the joint data gathering, coding, and analysis for generating theory. In this regard, based on an emerging theory, researchers decide which data is needed and where to find it. This process will continue until the emerging themes and categories are saturated. The theory grounded in data would guide the whole research process (Creswell & Poth, 2016; Glaser Barney & Strauss Anselm, 1967).

In this research, each sampling method served the research process well. For instance, the maximum-variation sampling method helped to capture different points of view of value creation in blockchain business across different actors. In addition, the theoretical sampling method provided the researcher with a powerful coherent tool to ensure that the research was based on real data and that the theoretical saturation was well accomplished.

Further cases were also selected after discussions with experts. Fifty-five (55) cases were investigated. Crunchbase[1], Coindesk[2], and other blockchain startups related databases were used to ensure the reliability of selected cases.

[1] www.crunchbase.com.

[2] www.coindesk.com.

Table 2 Research Methodology

Research Paradigm	Interpretive
Research Approach	Qualitative, Inductive
Research Design	
Research Strategy	Case Study
Unit of Analysis	Business Model
Sampling Method	Maximum Variation Sampling Method, Theatrical Sampling Method
Data Source	Secondary and Archival Data
Data Analysis Method	With-in case analysis, Cross-case analysis and synthesis, Thematic Analysis
Validity and Reliability Strategies	Triangulation, Investigator Responsiveness, Peer Review, External Audits or Expert Evaluation, Negative Case Analysis, Reflexivity and Self-disclosing

5 Findings

5.1 Potential Sources of Value Creation

For the first research question "what are the potential sources of value creation?", the data-driven analysis revealed five main themes, eleven sub-themes, and twenty-three initial codes (Table 3).

5.1.1 Extending Access Domain

Blockchain technology could help businesses expand their access domain compared to traditional and non-blockchain based rivals. Entrepreneurs and managers could enjoy accessing new resources and stakeholders.

New Resources Accessing new physical and intellectual resources and continually updating them is of great importance, especially in today's business environments, which are characterized by resource scarcity and constant competition (Teece, Pisano, & Shuen, 1997).

- **New Financial Resources**: Blockchain technology empowers startups to issue their own tokens and raise funds independently. With the help of smart contracts, startups could access new investors in regions that were not available before (e.g., the investors who had no access to the global financial system) and micro-investors (who could not participate in the investment process due to their low amount of investments). Digix is an excellent example in which people with a minimum purchase of 0.50$ all around the world could invest, maintain or send their real-backed gold token globally (Andrew, 2018; Digix, 2020). Starbase, as another example, enables other startups to issue their tokens and raise funds (starbase, 2020).
- **New Intellectual Resources**: Decentralized Autonomous Organization (DAO) is a new governance mechanism facilitating firms' inter and intra-connections. DAOs usually give their token holders the authority to take the organization's strategic decisions, viewing their customers as key stakeholders and even shareholders. For example, Status, a decentralized communication platform could more easily align its customer needs

Table 3 Potential Sources of Value Creation

Main Theme	Sub Theme	Initial Code
Extending Access Domain	New Resources	New Financial Resources
		New Intellectual Resources
		Other New Resources and Crowdsourcing
	New Stakeholders	New Customers
		New Strategic Partners
Cost Reduction Potentials	Reducing Value Transfer Costs	Reducing Monetary Costs and Time Costs
		Resource Optimization and Reducing Waste Costs
	Reducing Risk, Verification and Control Costs	Reducing Risk and Costs of Strategic Alliances and Cooperation with Key Stakeholders
		Knowing Your Customer Improvement
		Originality
	Reducing Fixed Costs and Infrastructure Costs	
	Reducing Information Costs	Reducing Search Costs
		Reducing Market Data and Information Costs
Reinforcement and Enrichment	Firm's System of Activities and Processes Reinforcement	Planning Capabilities Improvement
		Data Integration, Preservation, and transparency Improvement
		Virtualization and Automation Improvement
	Networks and Communications Reinforcement	Communication Capabilities Improvement
		Facilitation in Cooperation and Value Co-creation
		Open-Commerce Improvement
	Adaptability Improvement	
New Business Practices	Feasibility	
	Completely New Businesses	
Social-Base Enrichments	Facilitation	
	Data Privacy Improvement	
	Public Welfare, Justice and Democratization	
	Environmental Preservation	
	Other Value Propositions	

with the platform profitability. Furthermore, Status also cuts costs of market research and information gathering and could increase trust in the reliability of collected data (Status, 2017, 2020).

- **Other New Resources and Crowdsourcing**: Blockchain technology facilitates crowdsourcing. Organizations could automate crowdsourcing with the help of smart contracts, thereby reducing costs and increasing transactional efficiency. Startups like Suncontract (Suncontract, 2017), RNDR (Forbes, 2018; RNDR, 2020a, 2020b), and Charg crowdsource their infrastructure (solar panels in the case of Suncontract, GPUs in the case

of RNDR, and electric vehicle chargers in the case of Charg) by the new governance models offered by blockchain technology (Charg, 2020a, 2020b).

New Stakeholders New stakeholders that were not available before could be accessed.

- **New Customers**: Businesses could access new customers not available for their non-blockchain rivals as blockchain technology facilitates value exchanges across borders. Again, Digix is a good example; they could access customers worldwide, especially new customers in third-world countries who have no access to the global financial system. Potential customers can buy and sell DGX tokens 24/7 (Andrew, 2018; Digix, 2020).
- **New Strategic Partners**: Businesses could access whole new strategic partners. They could participate in alliances in an open, transparent network without worrying about copyright issues and lock-in (i.e., market superiority over the organization). Two important points to mention here: first, these partners are not available for traditional businesses due to technological and financial constraints; second, even if they are available, the risks of cooperation and value co-creation are so high. In this sense, the Imusify platform makes it possible for music bands, producers, and other stakeholders to efficiently cooperate and gain their shares automatically with the help of smart contracts (imusify, 2020).

5.1.2 Costs Reduction Potentials

Blockchain technology could help businesses and individuals to reduce their costs. The data analysis and interpretation revealed significant cost reduction potentials in four categories.

Reducing Value Transfer Costs With its great disintermediation potential, blockchain technology could eliminate the need for non-value-adding intermediaries, redistribute their shares among strategic stakeholders and make the value transfer faster. On the other hand, blockchain technology could reduce waste and related costs.

- **Reducing Monetary Costs and Time Costs**: Transaction costs could be decreased, and transactions could be settled faster by disintermediation. For example, Ripple helps individuals, businesses, and financial organizations transfer money on their platform globally with lower costs and faster speed (Qiu, Zhang, & Gao, 2019; Ripple, 2020).
- **Resource Optimization and Reducing Waste Costs**: Blockchain technology could help businesses reduce waste costs. Modum, for example, by integrating blockchain technology, IoT, AI in pharmaceutical and food industries, has been able to tackle several supply chain intricacies and issues. By constantly checking the freight's environmental conditions and available online data, businesses could cut waste costs, especially those stemming from bad transferring conditions (modum, 2017, 2020).

Reducing Risk, Verification, and Control Costs Opportunism and consequent risks accompanied with monitoring and control costs are a significant burden in the way of value co-creation and cooperation. Blockchain technology could help businesses in three areas.

- **Reducing Risks and Costs of Strategic Alliances and Cooperation with Key Stakeholders**: Blockchain technology eliminates the need for trusted third parties in strategic alliances. Instead, businesses could interact, cooperate, and co-create value. Every involved organization does its part and gains its share automatically based on the digital trust that blockchain technology offers. Furthermore, businesses could share their risks with their stakeholders and value co-creators (Rejeb, Keogh, Simske, Stafford, & Treiblmaier, 2021). MyBit, as a good example, facilitates the cooperation between investors, IoT partners, and asset managers, and the profit automatically would be shared between parties (Mybit, 2020).
- **Knowing Your Customer Improvement**: Blockchain technology ensures data integrity and digital identity development. Financial institutions and other organizations could use blockchain technology to improve their knowing Your Customer (KYC) capabilities. For example, Hyperledger projects are initiated to develop a single digital identity and provide KYC improvements for customers (Hyperledger, 2018, 2020).
- **Originality**: Individuals and businesses could reduce the risks of fraud and the costs of monitoring and control of the originality of goods. To illustrate, Everledger is expected to maintain the whole story of a (luxury) product in blockchain history, which is immutable and transparent (Everledger, 2020; Tönnissen & Teuteberg, 2020).

Reducing Fixed Costs and Infrastructure Costs By facilitating crowdsourcing and public cooperation, blockchain provides businesses with great opportunities for cutting fixed and infrastructure costs. RNDR, for example, instead of investing in infrastructure and building local Graphics processing unit (GPU) farms, crowdsource the infrastructure and achieve impressive cost savings. It is to say that blockchain technology here acts as a facilitator by reducing opportunism and improving cooperation (Forbes, 2018; RNDR, 2020a, 2020b).

Reducing Information Costs The first generation of the Internet (the Internet of information) hugely decreased information costs by its mediating role in redistributing information across different actors and reducing information asymmetry. Blockchain technology further makes that information reliable due to its transparency, traceability, and immutability features. The data-driven analysis revealed two pathways for reducing information costs.

- **Reducing Search Costs**: Individuals and businesses could rely on information available on blockchain as the likelihood of fraud and tampering with data is decreased dramatically. As a case in point, Blocklancer makes the reviews about the freelancers more trustworthy than traditional job markets (Blocklancer, 2018).
- **Reducing Market Data and Information Costs**: The new governance mechanisms brought by blockchain induce customers to act as shareholders or even decision-makers. The adopting organization of the technology could access more reliable data at lower costs of market research. Blockchain enables organizations to be assured of aligning customers' needs and the focal firms' profitability. This point is stressed in the case of Status, which offers a decentralized communication platform to dramatically decrease market data and information costs (Status, 2017, 2020).

5.1.3 Reinforcement and Enrichment

Blockchain technology could enhance the firm's activities system and processes, network and communication, and adaptability.

Firm's System of Activities and Processes Reinforcement The improvements in activities and processes could trigger huge systematic improvements in outcomes. These are three areas to mention.

- **Planning Capabilities Improvement**: Businesses could improve their planning capabilities utilizing blockchain technology. In this context, Ripe.io integrates blockchain technology, IoT, AI, and machine learning to provide supply chain members with customer analytics and valuable insights that could lead to better planning capabilities (Ripe.io, 2020).
- **Data Integration, Preservation, and transparency improvement**: Preserving data is one of the critical business tasks in the organization. Blockchain can be used to secure, integrate, and increase data transparency and traceability. For example, Ripe.io (Ripe.io, 2020) and PeerNova (PeerNova, 2020) integrate data from different parties and make them safe and transparent. The results are increased customer satisfaction, business opportunities. Combining blockchain technology, IoT, AI, and machine learning; and integrating and providing real-time data of all the process of food journey from seed to final consumers in a single dashboard, Ripe.io empowers food chain partners to ensure the quality and originality of foods, gain better insights from consumer analytics, thereby improving agility, planning capabilities, and value co-creation potentials.
- **Virtualization and Automation Improvement**: The borders between real and virtual worlds are increasingly blurring with the help of blockchain technology. By automating organizational tasks, blockchain could empower the firm's activities and processes. This may result in improvements in planning and communication capabilities and better coordination between different tasks and elements of the business. Modum (modum, 2017, 2020) and Ripe.io (Ripe.io, 2020), for example, enable the virtual documentation and online monitoring of a product journey in the supply chain and provide customers with a powerful tool to reinforce their activities and systems.

Networks and Communications Reinforcement:

- **Communication Capabilities Improvement**: Blockchain technology could significantly impact inter-and intra- organizational communications, which could have massive impacts on firms' activities and processes. For example, PeerNova enables organizations to handle data and business flows more efficiently and transparently than their conventional rivals (PeerNova, 2020).
- **Facilitation in Cooperation and Value Co-creation**: Individuals and businesses could cooperate and co-create value more easily than before. RNDR (Forbes, 2018; RNDR, 2020a, 2020b), Suncontract (Suncontract, 2017), Imusify (imusify, 2020), and Charg (Charg, 2020a, 2020b) are all among cooperation and co-creation facilitators. Also, Modum empowers its customers to cooperate with regulators and obtain necessary

licenses more easily thanks to blockchain's transparency and immutability (modum, 2017, 2020).

- **Open-Commerce Improvement**: Blockchain technology acts as a mediation technology and has the potential to improve information technology's role in today's open-commerce practices. Blockchain technology allows unconnected parties to be connected and enables them to build more robust value networks and reach greater network effects. With the help of Imusify, for example, different actors in the music industry, even in third world countries, could cooperate and co-create value and be assured of data safety and copyright preservation (imusify, 2020).

Adaptability Improvement A firm's capability to align its competencies with changes is of vital importance. The new governance mechanisms offered by blockchain technology could empower businesses to gain more reliable insights and collective wisdom faster, which in turn lead to agility improvements. In Status (Status, 2017, 2020) or Digix (Andrew, 2018; Digix, 2020), for example, by enabling the community of token holders to make strategic decisions, organizations could improve their agility and adaptability by aligning the customers' needs and the firm's profitability schemes.

5.1.4 New Business Practices

The literature consistent with the data derived from the cases of current research indicates the value creation role of new technologies in three domains: the current businesses and improvements in efficiencies and processes, the feasibility of doing things that were not available due to technological constraints, and the emergence of completely new businesses related to the new technology.

All these domains somehow were explained in other themes, but here the authors want to emphasize that doing completely new things and the feasibility of doing things are the value creation potential sources per-se. Realizing these new opportunities could bring massive advantages for entrepreneurs, such as the first-mover advantage and the chance to create standards of emerging ecosystems. New markets could be created (e.g., the market for cryptocurrencies' miner devices), and unrealized potentials could be attained. Moreover, previous ecosystems also could be merged and shape new ones (e.g., integration of currently fragmented ecosystems of healthcare, insurance, finance and technology in Pokitdok (Pokitdok, 2020).

Feasibility The established firms and new ventures in the blockchain world could create value for all the supply chain members and society, redefining and reconfiguring their value chains and systems. Blockchain technology supports organizational capabilities, allowing visionary entrepreneurs to discover opportunities and launch innovative solutions. Among those which have been launched till now include tokenization of assets and peer-to-peer value transfers. BitPesa (BitPesa, 2020) and Abra are good examples of peer-to-peer monetary value transfers (Abra, 2020), and Digix is a good example of tokenizing assets (gold) (Andrew, 2018; Digix, 2020).

Completely New Businesses Startups and new ventures could also play an important role in value creation, launching businesses directly related to blockchain technology. 0x empowers its customers to exchange any kind of tokenized assets on the Ethereum blockchain (0x, 2020; Will Warren & Bandeali, 2017). Additionally, Elliptic is a blockchain analytics provider with the main goal of preventing crimes in crypto (Elliptic, 2020). This category involves a wide range of new businesses, including blockchain infrastructure and application providers, as well as new startups being established continuously.

5.1.5 Social Base Enrichment (Legitimacy and Preference)

Blockchain technology enables businesses to offer value propositions that not only can sustain the competitive position of the firm but also can have other important consequences. As such, operating in a blockchain ecosystem, firms can collaborate more efficiently and effectively with their supply chain partners, competitors, regulators, Non-Governmental Organizations (NGOs), social and public members, and other institutions. In such a complex system, long-term success needs sustainable business models that provide value for all the members. Blockchain technology could bring massive opportunities in this legitimacy-seeking journey. The data-driven analysis identified several potential value sources offered by blockchain technology in this domain. These include:

- **Facilitation**: Like other new technologies, blockchain technology could help individuals and businesses by facilitating their intended actions. For example, BitPesa eases transferring money to third-world countries (BitPesa, 2020).
- **Data Privacy Improvement**: Blockchain technology could improve data privacy, one of the most centralized systems' challenging issues. Blockchain could prevent all possibilities to tamper with and misuse data. In this regard, D.tube (D.tube, 2019) and Status (Status, 2017, 2020) platforms launch their decentralized solutions, the former in the video-sharing sector and the latter in the communication sector, are among businesses that provide data privacy based on open architecture and transparency. Wibson, another blockchain platform, enables users to make money from their data while remaining autonomous (Travizano, Sarraute, Dolata, French, & Treiblmaier, 2020; Wibson, 2020).
- **Public Welfare, Justice and Democratization**: Blockchain technology could redistribute wealth and bring justice to the current unfair economy. Businesses could design better win-win games with their stakeholders and the public using blockchain technology. Businesses could also incorporate the public in their core business tasks more easily (e.g., crowdsourcing by RNDR (Forbes, 2018; RNDR, 2020a, 2020b)) and serve more users better than their traditional rivals (e.g., the users who had not had access to the global financial system by BitPesa (BitPesa, 2020)). Furthermore, blockchain enables organizations and their stakeholders to have authority power and gain fairer shares (e.g., DAO's governance mechanism).
- **Environmental Preservation**: Blockchain's traceability and transparency, along with data integration and virtualization, could bring great opportunities for environmental preservation. Blockchain provides an open architecture that prevents firms from acting criminally and harming the environment. For instance, Suncontract leverages

blockchain and public cooperation to reduce energy waste, especially in energy transfer, by decreasing the distance between energy generation and consumption locations.

All these themes and sub-themes have complementarities and interdependencies with each other. Therefore, pursuing and realizing each could contribute to others' realization, which could cause a positive cycle for a great source of value creation.

5.2 Business Model Innovation

To address the second research question "How could businesses appreciate identified potential value creation sources?", the business models of the selected cases were investigated. The analysis revealed that the potentials of business model innovation triggered by blockchain technology could encompass a wide range of incremental to disruptive business model innovations. On the one side, for example, one firm can only add cryptocurrencies like bitcoin to its transaction system while maintaining its current business model. On the other hand, a firm can adopt a business model of a DAO, which crowdsources its infrastructure. Blockchain-induced disruptive business model innovations have considerable differences compared to conventional business models in the related industry. Therefore, there is a need for radical and disruptive changes in certain building blocks of business models like infrastructure, resources, governance, and stakeholders. Consistent with previous debate, on the one hand, some businesses only use blockchain technology as the supportive technology for their business processes. On the other hand, some business models need to incorporate blockchain technology in the heart of the business logic and model.

In this study, some of the innovations revealed through the analysis and discussions with experts were listed. Entrepreneurs and managers, based on their industry and perception of blockchain technology, its impact on their industry, and necessary strategy to unlock the potential of blockchain adoption, could innovate their business models to create value and achieve (sustainable) competitive advantage:

- Stimulate financial system innovation by incorporating cryptocurrencies in business processes (e.g., transaction payments).
- Enter new markets, customer domain, and segment extension and add new customers that were not available due to financial system or other technological constraints.
- Establish new markets for new or previously not feasible products or services.
- Fundraise innovation by innovating the firm's technological infrastructure, stakeholder relationships, etc.
- Facilitate value transfer innovation by including disintermediation and redefining the stakeholders and their relationships.
- Supply chain infrastructures and relations innovation which especially include establishing digital trust in a decentralized setting utilizing smart contracts. Also, the complementarities between blockchain technology and other cutting-edge technologies such as IoT, AI, and big data analytics could provide massive insights. For example, blockchain technology could perfectly suit the decentralized nature of IoT devices and support their functions in terms of sensing, analyzing, and optimizing various tasks of supply chains.
- Facilitation and innovation in crowdsourcing of any valuable resource or infrastructure.

- Innovation in the notion of value, value creation, and value transfer by digitalizing and tokenizing any asset owned and transferred automatically based on digital trust.
- New governance mechanisms and blurring the borders between building blocks of business models and giving the components several roles, for example:
  - Changing the role of strategic partners in participating in important processes of the focal firm, co-creating value, and taking governance-related decisions.
  - Changing the role of customers from regular to cooperative customers. Turning other stakeholders into strategic partners who are a key part of the organization and able to influence the important processes of the focal firm, co-create value and take governance-related decisions.
- Placing the technology at the core of business model components, processes and logic. Transaction facilitation, the development of trust (the digital trust) in fundraising, control, monitoring, governance, stakeholders' relationships and value co-creation, and digitization are indicative of the potential of blockchain and the necessity to place it at the heart of the business logic and model.
- Blockchain business value propositions could increase customer satisfaction through cost reductions, high transactional efficiencies, transparency, traceability, data privacy, and democratization in governance and profit-sharing.

5.3 Conclusions: Towards a Unifying Model

Figure 1 depicts a brief summary of the research findings. First, business practitioners should identify the potential sources of value creation (the opportunity) in their specific context based on their position in the value system or supply chain and according to their perceptions of how and to what degree blockchain technology is going to disrupt their (current or intended) industry. They can utilize or further develop the proposed potential value drivers. This opportunity either could be in the form of addressing and solving a shortcoming or challenge which the manager or entrepreneur identified as necessary (e.g., with considerable cost effects), or it could drive innovation and address customers' needs. For example, business practitioners could benefit from proposed potential value drivers, optimizing operational efficiencies, and being innovative and able to produce new products, services, and solutions. This study posits that these potential value drivers have strong ties with micro and macro environments. Moreover, we also argue that blockchain technology offers enormous potential in value co-creation with supply chain partners and customers. The technology could facilitate the business practitioners' efforts to differentiate themselves and gain legitimacy in relation to institutions.

Managers and business practitioners should reconfigure their current business logic and business models. They can utilize or further develop proposed business model innovations. However, they should be aware of the inter-relationships between potential sources of value creation and business model innovations. For example, if they can only take advantage of blockchain in financial transactions and money transfers, they do not need to design and repurpose their current business models radically. Instead, incremental changes in credit and payment systems would be enough. On the other hand, if managers perceive value co-

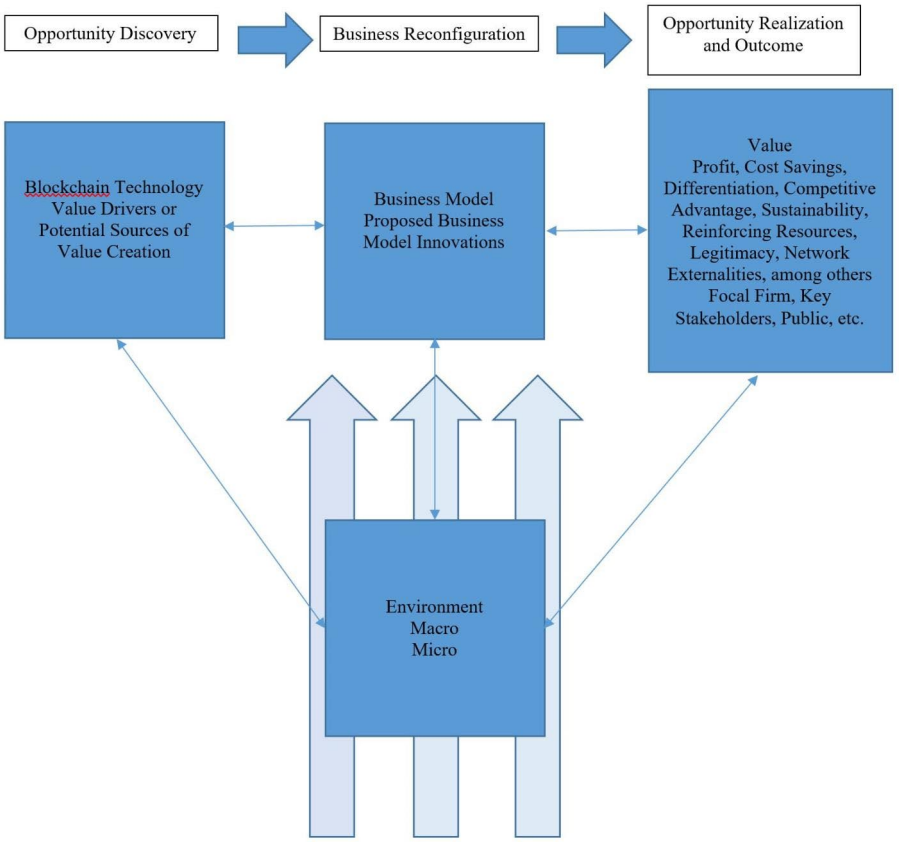

Fig. 1 The Proposed Research Graph

creation potentials with key stakeholders as a critical advantage of blockchain, they may need to change their current routines and governance system significantly.

Furthermore, organizations should be aware of inter-relationships between micro and macro environment and business model innovations. The new governance mechanisms, the changing role of stakeholders and institutions, and the new market and hierarchy interrelations should all be under consideration when transitioning to a blockchain-enabled business model. This changing role was indicated by arrows, as shown in Fig. 1, which demonstrates the active role of the environment in potential value drivers as well as in business model innovations and value co-creation.

When business practitioners have opportunities to optimize their operations or innovate their products, services, or processes, they must reconfigure or renovate their business models considering the identified opportunities and environmental impacts of blockchain. In this way, they can achieve more value in terms of profitability, cost savings, competitive advantage, network effects, legitimacy, and co-creation.

6 Research Contributions

This study offers significant theoretical, practical, and social contributions. From the theoretical perspective, this study applied the current body of strategic, economics, and entrepreneurship knowledge in the blockchain technology field; hence, it spurs further development in strategic entrepreneurship, value creation, innovation and blockchain literature. Furthermore, this research adds conceptually and empirically to the current body of blockchain technology and innovation, strategic economics, and entrepreneurship literature by analyzing evidence from multiple cases worldwide. Practically, this research can deepen business practitioners' insights into the potential sources of value creation and opportunities that blockchain technology offers in their specific context. Also, this research can facilitate business practitioners' endeavors to create value by providing a wide range of potential value drivers and proposed business model innovations. Furthermore, the findings of the current study are expected to address some of the significant business challenges, including: sustainability, ambidexterity, and scarce resources.

Regarding sustainability, in today's world of powerful social entities and regulators, the narrow view of some issues including, economic profitability and satisfaction of customers' demands and requirements, may not be appropriate. As a promising pathway toward sustainable business ecosystems, blockchain technology has major economic, social and environmental impacts and can contribute to triple-bottom-line sustainability realization. Considering ambidexterity, being efficient and innovative at the same time is a challenging task. However, blockchain technology can contribute to risks and cost reductions and increase the firm innovativeness. Addressing scarce resources, as a vital part of business structure, blockchain technology can facilitate businesses' access to new resources, which is illustrated as one of the main potential value drivers in the current research. Finally, blockchain technology can be a hope in today's world of the unfair win-lose economy and arms-length relationships. In this study, we identify social welfare, the democratization of share distribution and authority, data privacy, and environmental preservation as the significant social contributions of blockchain technology.

7 Research Limitations and Future Research

As the research proceeds, some areas were beyond the scope of this study. Some shortcomings in research methodology and findings have been identified and deserve further research. For instance, the research sample used in the paper may not capture all potential value drivers and business model innovations. As a result, investigating additional cases at different times can further help to support or contradict current research findings. Moreover, more in-depth studies and action research are needed to bring significant (context-specific) insights. In the current research, only the value-creating potentials were investigated, thus future researchers should address this limitation by investigating the downsides of incorporating blockchain technology in the organization.

Declarations

Conflict of interest The authors have no conflict of interest to declare. All co-authors have seen and agree with the contents of the manuscript and there is no financial interest to report. We certify that the submission is original work and is not under review at any other publication.

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