SHEDDING LIGHT ON THE BLOCKCHAIN DISINTERMEDIATION MYSTERY: A REVIEW AND FUTURE RESEARCH AGENDA

Research Paper

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Abstract

Blockchain technology has been in the interest of IS researchers and practitioners for several years. One key reason for this curiosity is the possibility to carry out peer-to-peer transactions without a trusted intermediary. Building upon this capability, many researchers posited that blockchain technology would remove traditional intermediaries from their market position. This process has been described in electronic markets literature as Disintermediation. However, other researchers proposed a more distinct perspective by proposing that blockchain technology will not facilitate Disintermediation in all settings. Thus, no unified view on this topic exists yet. Our literature review identifies three dominating concepts in blockchain literature: Extensive Disintermediation, Limited Disintermediation, and Re-Intermediation. We further highlight in our findings that most of the identified literature does not consider all market functions as described in the electronic markets literature. Hence, we provide a structured overview of the field and possibilities for future research.

Keywords: Intermediation, Electronic Markets, Blockchain, Research Agenda; Literature Review.

1 Introduction

Blockchains are at the center of the academic (Chong et al., 2019) and public discourse (Gartner, 2021) regarding the impact of emerging technologies on society, businesses, and individuals. Since the first publication on blockchain in 2008 (Nakamoto, 2008), researchers and practitioners have highlighted the disruptive potential of the technology for business models and industries (Beck et al., 2018). By the decentralized design of blockchain technology, participants facilitate transactions directly without a trusted third party. Thus, many blockchain use cases consider the removal of intermediaries as a key aspect of this technology (Chalmers et al., 2021).

Intermediation is the "[…] bridging of incompatibilities between two (market) sides involved in a transaction" (Wigand, 2020, p. 39). Building on established definitions, we define intermediaries as third parties that provide services for market participants through the administration and execution of transactions (Datta and Chatterjee, 2008; Bhargava et al., 2000; Grover and Teng, 2001). Following the widely adopted transaction-cost-focused view (Coase, 1937), intermediaries fulfill the role of carrying out transactions by reducing the cost of the transaction between two sides, compared to a situation without any intermediary. With the introduction of electronic markets, companies sought the opportunity to further reduce the cost of transactions by removing intermediaries in the value chain. This process is called Disintermediation and directly connects two (market) sides (Wigand, 2015). Subsequently, this process has the potential to disrupt established market structures (Gomber et al., 2018). Even though the widespread assumption in literature posited that through the evolvement of electronic markets, the majority of intermediaries would be removed entirely from the value chain (Malone et al., 1987), many intermediaries found possibilities to reposition themselves in value chains (e.g., through the provision of value-added services) (Giaglis et al., 2002).

Research on the how, what, and why of intermediation concerning blockchain technology is highly fragmented. While many researchers over the years posit that Disintermediation is a key characteristic of blockchain technology (Chalmers et al., 2021; Pereira et al., 2019; Werner et al., 2020), some researchers take a different view by proposing that organizations might adopt the technology to derive novel business models for themselves (Chong et al., 2019). Hence, there is no unified understanding of how intermediaries are affected by blockchain technology and no overview of different research streams in this field. Addressing this research gap helps companies identify the possible effects of blockchain technology on their business models, in particular, as well as the impact on market structures. Rossi et al. (2019) and Lumineau et al. (2021) also highlight the need to further investigate how blockchain technology will impact institutional intermediaries in their traditional responsibilities within markets and possible future business strategies. To answer these calls for future research, we aim to provide a comprehensive overview of how literature conceptualizes intermediation in blockchain systems. We, therefore, state the following research question:

Which concepts and paths for future research for intermediation within blockchain systems exist?

To answer our research question, we carry out a structured literature review. A review of the state of literature is highly recommended when investigating how a research field is structured (Webster and Watson, 2002). By applying a systematic approach that incorporates a defined protocol, we ensure the accuracy and validity of our findings. We, therefore, adopt the methodological guidelines of Webster and Watson (2002).

Our findings provide a structured overview of the research field by identifying different research streams that stem from conceptual as well as real-world studies. We define those research streams into three key concepts. Afterward, we compare those concepts with literature from electronic markets research to provide further insights for academia and practice. Lastly, we derive a framework that serves as guidance for future research by following Alvesson and Sandberg (2011).

The structure of the paper is as follows. First, we provide the theoretical background on blockchain technology and intermediation theory in Section 2. In Section 3, we describe our research method for carrying out our structured literature review. Next, Section 4 presents our identified publications as well as the current state of research. Section 5 discusses our findings from theoretical and managerial perspectives and presents our research agenda. Finally, we present a conclusion to our research in Section 6 and outline the limitations.

2 Foundations

2.1 Blockchain technology

In 2008, Satoshi Nakamoto introduced the first blockchain to the public with the cryptocurrency Bitcoin (Nakamoto, 2008). In the following years, different organizations developed a subset of technologies

that follow the same or similar principles as the Bitcoin blockchain (so-called distributed ledger technologies). We follow the terminology of blockchain technology which incorporates all technologies that build on the following principles (Chanson et al., 2019): From a technical perspective, blockchain technology is a retroactively tamper-resistant distributed ledger. In contrast to centralized ledgers, the data is stored separately by each participant in the network of connected computers. To ensure the validity of the data, consensus mechanisms are in place. These mechanisms ensure that all participants agree on the rightfulness of new data in the ledger before adding it to the network (Andersen and Bogusz, 2019). Thereby, blockchain technology was originally proposed to remove central intermediaries (Nakamoto, 2008). Building on this idea, various applications that incorporate different technological requirements have since been proposed (Lumineau et al., 2021). Therefore, developers introduced various technologies that enhance the technical design of the original Bitcoin blockchain and now include the support of arbitrary logic (e.g., Ethereum), upgraded privacy features (e.g., Zcash), or address the specific needs of corporations (e.g., Hyperledger) (Guggenberger et al., 2021a). The most common classification for blockchain technology builds upon the right to validate new data on the ledger (permissioned/permissionless) and the possibility to access and write data (public/private) (Beck et al., 2018). As noted by Bakos et al. (2021), this decision fundamentally influences the degree of decentralization and, thus, the possibility to remove institutional intermediaries.

Even though blockchain technology has its origin in the peer-to-peer cryptocurrency network Bitcoin, developers invented applications across industries. The most prominent use cases are supply chain management, decentralized identity management, logistics, energy, and mobility (Chong et al., 2019). Many companies started investing in blockchain technology to gain competitive advantages in the market. Surprisingly, in contrast to the widespread public attention, the number of productive blockchain use cases remains low (Rossi et al., 2019; Guggenberger et al., 2021b), and the impact on businesses is not always as disruptive as originally proposed (Fridgen et al., 2021). Further, blockchain technology is still in an early stage of technological development and maturity. Research and practice still need to address various challenges to bring the technology to its full potential (Rossi et al., 2019). These challenges include the scalability and privacy of DLT. However, more recent achievements in the field of applied cryptography might lower the barriers for productive systems soon (Guggenberger et al., 2021a).

Due to the technological properties, many researchers suggested that blockchains will disrupt business models and industries (Gomber et al., 2018). Since blockchain technology enables peer-to-peer transactions without a central trust-building institution, researchers proposed that blockchain technology allows for Disintermediation (Chalmers et al., 2021; Pereira et al., 2019; Schlecht et al., 2020). This assumption builds on the capability to facilitate transactions between two participants without requiring a central entity that protects all participants against malicious behavior. Even though this perspective became prominent within the information systems (IS) community, some researchers propose a more distinct view on the Disintermediation capabilities of blockchain technology (Chong et al., 2019). One example for the promises of Disintermediation through the distributed facilitation of transactions is Decentralized Finance (DeFi). DeFi promises to establish a new financial system that does not rely on banks or insurances and, thus, aims to remove institutional intermediaries from the financial system (Chen and Bellavitis, 2020).

2.2 Intermediation theory

The first theories on market intermediation date back to the roots of economics research (Coase, 1937). Since then, the introduction of different technologies enabled new possibilities and, thus, led to fundamental changes. With the introduction of electronic commerce to the wider public, electronic markets emerged and received widespread attention from scholars. Academic literature on the – now electronic – interaction between buyers and sellers to facilitate transactions in markets developed in the 1990s (Chircu and Kauffman, 1999). To understand the role of intermediaries in electronic markets, it is crucial to consider the functions of markets. Bakos (1998) summarizes the market mechanisms (whether electronic or not) to the following three primary functions: matching of buyers and sellers,

facilitation of transactions, and institutional infrastructure. Each primary function consists of several subfunctions, which are depicted in Table 1.

Primary market function	Subfunction	Influence of electronic markets
Matching buyers and sellers	Determination of product offerings	• Customization, Aggregation, and Disaggregation
	Searching	• Reduction of search costs
	Price discovery	• Easier access to information
Facilitation of transactions	Logistics	• Cost reduction
	Settlement	• Automation & cost reduction
	Trust	• Increasing importance
Institutional infrastructure	Legal	• Increasing relevance of authentication and guarantees
	Regulatory	

Table 1. Market functions (own depiction, based on Bakos (1998) and Giaglis et al. (2002)).

In the following, we discuss the impact of electronic markets on the function of intermediaries based on the work of Giaglis et al. (2002). This approach allows us to understand how electronic markets work and which impact blockchain technology might have on the respective market functions.

The following aspects affect the market function of matching buyers and sellers. Three major developments influence product offerings in electronic markets: (1) enhanced possibilities regarding customization of particularly digital products and services, (2) the aggregation and disaggregation of products to create new product bundles, and (3) the reduction of costs for demand aggregation which subsequently leads to cheaper products (Giaglis et al., 2002). As electronic markets drastically reduce searching costs, many researchers expected the searching function to become obsolete as buyers and sellers interact directly. However, the vast majority of information within (international) electronic markets cannot be processed by a market participant. This challenge led to the emergence of new roles for intermediaries to aggregate and consolidate market information. Even though price discovery mechanisms profit from easier access to information, price discovery in electronic markets does not substantially differ from analog markets. Still, electronic markets formed new possibilities for intermediaries to provide formerly non-electronic price discoveries in the electronic market (e.g., electronic auctions) (Klein, 1997). Those mechanisms profit from the easier access to information.

Further, the facilitation of transactions is affected through the following influences. As with other functions, logistics are driven by a reduction of transaction costs. The direct exchange of orders between buyers and sellers pressures wholesalers but at the same time provides opportunities for specialized intermediaries like logistic companies. The widespread adoption of electronic systems provides numerous possibilities to automate payment transactions and, at the same time, reduce costs drastically. Namely, most previous analog services have been moved by traditional intermediaries to the electronic market, for example, application processes (Kleider et al., 2021). Nonetheless, also new specialized intermediaries emerged that provide a whole range of new services to customers (MacCarthy, 2010).

Finally, electronic markets also affect the institutional infrastructures. The provision of trust in electronic markets, thus, the protection against the leverage of information asymmetries, has attracted various research (Fuller et al., 2007). Giaglis et al. (2002) posit that trust in electronic markets becomes more relevant than in analog markets. Henceforth, intermediaries can adopt new roles in the market by leveraging new technological or institutional safeguards to protect market participants from malicious behavior (Datta and Chatterjee, 2008). Those safeguards include, for example, refund guarantees like

the PayPal buyer and seller protection. Intermediaries, in most cases, have provided legal or regulatory boundaries in markets. This function receives even higher importance in electronic markets, where the relevance of authentication systems and guarantees increases.

Following the assessment of the subfunctions, early research underpinned the hypothesis of a threat of Disintermediation for traditional intermediaries (Chircu and Kauffman, 1999) as electronic markets decrease transactions costs (Malone et al., 1987). Disintermediation describes the removal of established intermediaries from the market process. This scenario can be explained through a decline in transaction costs to a level where a market clears itself (Giaglis et al., 2002) or the extrusion through the technologies (Chircu and Kauffman, 1999). Nonetheless, later research proposes two future scenarios, aside from Disintermediation, on how intermediaries are affected by electronic markets: Re-Intermediation and Cybermediation. (Sarkar et al., 1998; Chircu and Kauffman, 1999; Giaglis et al., 2002).

Re-Intermediation occurs when an institutional intermediary finds a new position or function in the market. Examples of such behavior are further market differentiation (e.g., providing value-added services) or concentrating on a market niche. One example of Re-Intermediation is the e-commerce retailer Amazon. While Amazon initially took over the retail process for many producers, the cost of setting up and running individual e-commerce solutions declined over the last years. Thus, many producers started to set up their own e-commerce while still using Amazon Web Services for their cloud infrastructure. Electronic markets literature further describes the facilitation of market transactions by solely electronic intermediaries. Therefore, scholars proposed the term *Cybermediation* (Giaglis et al., 2002). These intermediaries account for electronic systems that administer the infrastructure and intermediation process in electronic markets (e.g., the provision of trust) (Sarkar et al., 1998, 1995).

Chircu and Kauffman (1999) and Giaglis et al. (2002) highlight that no uniform outcome of electronic market scenarios exists. Instead, each market shows its own consolidation of scenarios between Disintermediation, Re-Intermediation, and Cybermediation. However, through the evolving development in digitalization, the boundaries between traditional and electronic markets vanish (Rahmati et al., 2021). Some scholars even posit that electronic markets create and shape the physical world (Baskerville et al., 2020). With this digital-first paradigm, the distinction between organizations acting as analog or electronic intermediaries and the distinction between *Cybermediation* and other scenarios becomes obsolete. Subsequently, we refer to the organization that fulfills market functions as institutional intermediaries, regardless of whether in the physical world or electronic markets.

3 Method

To carry out our literature review, we followed established guidelines. In our approach, we apply the eight-step procedure as proposed by Okoli (2015). Senior scholars recommend this approach to assess the current body of knowledge of a research field and gain a holistic insight into the existing literature (Webster and Watson, 2002). Hence, a literature review fits our research question. By applying a systematic approach that incorporates a well-defined and structured protocol, we ensure the accuracy and validity of our findings. We display our procedure in Figure 1.

To get an overview of existing literature that incorporates the topic of Disintermediation, as well as possible findings regarding Re-Intermediation and cyber-mediation, we focused on the search term "intermedia* OR disintermedia* OR re-intermedia* OR cyber*media*" as different authors describe different concepts of intermediation in the context of blockchain or use terms synonymously. To systematically extract concepts in the scope of blockchain technology from the literature, we have added the term "DLT OR blockchain OR "distributed ledger*" OR "smart contract*" to the search string. The Boolean operator AND is used for connecting those terms. According to these considerations, the search string aims to ensure an extensive but specific number of results. The search string was applied to the abstract, title, and keywords. Next, we defined the inclusion criterion to English articles. We purposely did not only search for journal articles or a specific field of science since we did not want to limit our sample ex-ante.

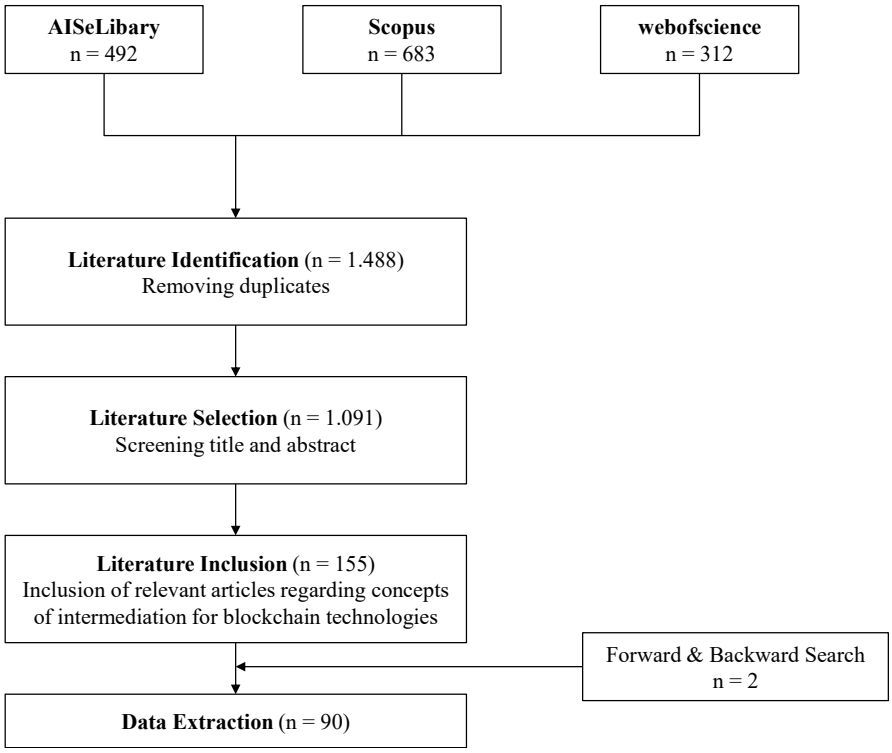

Figure 1. Methodological procedure for the structured literature review.

We followed a twofold approach for the in-depth literature search: First, we used the Web of Science and Scopus search engines as both have a broad and interdisciplinary database. Next, we included data from the IS domain (AISeLibary), since it is predestined as it combines the perspectives of "the natural world, the social world, and the artificial world of human constructions" (Gregor, 2006, p. 613) and takes into account socio-technical change (Rowe, 2018). We identified 492 articles in the Web of Science, 683 articles in Scopus, and 312 articles in AISeL. In the next step, we removed 397 duplicates from our sample based on the title and the digital object identifier. This led us to a sample of 1.091 contributions.

Subsequently, we first screened the titles and the abstracts of the contributions for their relevance (exclusion criterion). To answer our research question, we incorporated articles with a focus on disruption through blockchain technology (e.g., business model perspective), articles with Design Science Research approaches (e.g., application-focused), and articles with (multiple) case studies. Here, we excluded 935 articles from our sample, which resulted in a remaining sample of 155 articles for full-text analysis. In this step, we further refined our sample by excluding 65 articles that did not contribute to the stated research objectives. Finally, we conducted a forward and backward search to identify relevant articles that we missed. Our final sample consists of 90 articles that we consider in our in-depth analysis.

4 Findings

In the following, we present our descriptive and our qualitative analysis of our final article sample.

4.1 Descriptive analysis

While the first identified article was published in 2016, we observe an increase in interest in the topic over the following years until the year 2019. For the year 2020, we identified fewer articles. Figure 2 provides an overview of all articles sorted by their publication year. While 64 articles were published in

scientific journals, 25 articles were presented in conference proceedings. Thereby, two of the leading conferences of the Association of Information Systems (AIS), the *European Conference on Information Systems* (ECIS), and the *Hawaii International Conference on System Sciences* (HICSS) each provide four articles for our review. We also find articles in leading journals like the *IEEE Access* (n=4), *Business & Information Systems Engineering* (n=3), *MIS Quarterly Executive* (n=2), and the *Journal of the AIS* (n=2). Thus, although we did not define an ex-ante focus on the IS and computer science domain, nearly all articles can be classified there.

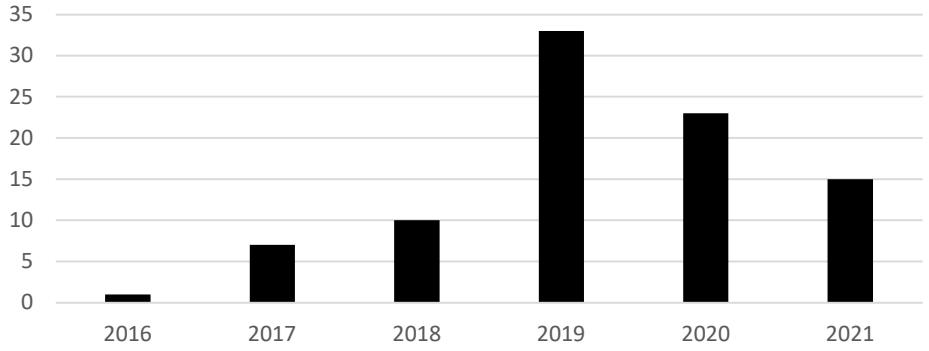

Figure 2. Overview of article publication years.

We further analyzed the identified articles by their research method (Gregor, 2006) and the industry field (Chiasson and Davidson, 2005). Here, we observe a focus on Design Science Research (n=26) and conceptual papers (n=24). Considering the still rather early stage in the technological development of blockchain technology, it is not surprising that most articles take an explorative approach by designing new applications through these methods. The industry classification shows a focus on established use cases of blockchain technology in finance (n=10), logistics (n=9), and energy (n=9). Nonetheless, the largest group of articles are not classified to a specific industry (n=23) and, thus, consider blockchain technology in general.

4.2 Conceptual analysis

In the following, we analyzed the articles from a conceptual perspective by evaluating which concepts of intermediation were proposed by the authors. Thereby, we found three different concepts: *Extensive Disintermediation*, *Limited Disintermediation*, and *Re-Intermediation* depicted in Table 2.

Concept	#	*Articles*
Extensive Disintermediation	61	Al Barghuthi et al. (2018), Ali et al. (2021), Āriņš (2019), Arndt (2019), Avantaggiato and Gallo (2019), Bailon (2019), Bdiwi et al. (2019), Beverungen et al. (2021), Boreiko and Vidusso (2019), Casado-Vara and Corchado (2019), Chalmers et al. (2021), Chang et al. (2019), Dakhli et al. (2019), de Boissieu et al. (2021), Dilawar et al. (2019), Egelund-Müller et al. (2017), Esmat et al. (2021), Faizan et al. (2019), Fu (2018), Gomber et al. (2018), Gong et al. (2021), Gurtu and Johny (2019), Hasan et al. (2019), Hassija et al. (2019), Heck et al. (2021), Hoess et al. (2021), Hrga et al. (2020), Jabbarpour et al. (2020), Jaiswal et al. (2019), Khosla et al. (2019), Labazova (2019), Larios-Hernández (2017), Lohmer and Lasch (2020), Madhusudan et al. (2019), Magyar (2017), Makridakis and Christodoulou (2019), Mengelkamp et al. (2018), Mika and Goudz (2021), Murray (2019), Nasarre-Aznar (2018), Norta et al. (2018), Notheisen et al. (2017), Nowiński and Kozma (2017), Pereira et al. (2019), Perscheid et al. (2020), Philipp et al. (2019), Queiroz et al. (2019), Rashideh (2020), Rejeb and Rejeb (2020), Saichua et al. (2019), Salah et al. (2019), Saurabh and Dey (2021), Schlecht et al. (2020), Schmidt et al. (2019), Soto et al. (2021), Tian et al. (2020), Wang

		et al. (2019), Werner et al. (2020), Ying et al. (2018), Zhao and O'Mahony (2018), Zielinska et al. (2019)
Limited Disintermediation	20	Al-Shaibani et al. (2020), Beck et al. (2018), Cai (2018), Catalini and Gans (2020), Chong et al. (2019), Frolov (2021), Fridgen et al. (2021), Garcia-Teruel (2020), Guo and Liang (2016), Hawlitschek et al. (2020), Lacity and van Hoek (2021), Mehrwald et al. (2019), Risius and Spohrer (2017), Trabucchi et al. (2020), Wang et al. (2021), Weking et al. (2020), Wilkinson et al. (2020), Yue (2020), Zavolokina et al. (2020), Ziolkowski et al. (2018)
Re-Intermediation	9	Abbatemarco et al. (2020), Chiu and Shang (2019), Collao and Winship (2019), Lindman et al. (2017), O'Dair and Owen (2019), Owen and O'Dair (2020), Tönnissen and Teuteberg (2020), Tseng and Shang (2021), Zamani and Giaglis (2018)

Table 2. Overview of concepts.

Extensive Disintermediation

We find the concept of *Extensive Disintermediation* to be the most prominent in our literature review (n=61). The articles put forward the idea that institutional intermediaries are removed from the markets or processes through blockchain technology. This idea can either apply to a specific use case (Beverungen et al., 2021; Notheisen et al., 2017) or a generic attribute of the technology (Labazova, 2019; Chalmers et al., 2021). Among the most present use cases for this concept is supply chain management, where all authors who focus on this use case (n=9) present the idea that in some way, blockchain will remove institutional intermediaries from the markets by making their function obsolete (de Boissieu et al., 2021; Salah et al., 2019). Some even see *Extensive Disintermediation* as the main reason for blockchain adoption (Chang et al., 2019) or the advent of a new industry system (Egelund-Müller et al., 2017). Within this concept group, most articles either use a design science research approach (n=23) or are purely conceptual (n=15). Qualitative-empirical (n=13) and quantitative-empirical approaches (n=3) are less represented. This stream of literature builds their argument for *Extensive Disintermediation* upon the inherent attributes of blockchain technology: transparency (Heck et al., 2021), immutability (Murray, 2019), decentralization (Nowiński and Kozma, 2017), security (Schmidt et al., 2019), and trust (Dilawar et al., 2019). Thereby, this technical perspective barely takes into account the complex market processes.

Limited Disintermediation

The second-largest group of articles highlights the idea that blockchain technology might have the possibility to remove institutional intermediaries in certain limited use cases but cannot be attributed to the characteristic of Disintermediation per se (Catalini and Gans, 2020; Cai, 2018; Fridgen et al., 2021; Lacity and van Hoek, 2021; Trabucchi et al., 2020; Mehrwald et al., 2019; Ziolkowski et al., 2018). Mehrwald et al. (2019) posit that blockchain technology can surrogate institutional intermediaries because the technology can replace institutional coordination mechanisms. However, the authors highlight that institutions will not be replaced entirely by blockchain technology since blockchain technology cannot take over functions like matching buyers and sellers. Al-Shaibani et al. (2020) further add the perspective of institutional infrastructures in the case of a decentralized stock exchange. The authors highlight that a fully decentralized exchange would not comply with the regulatory boundaries of the market, and henceforth a blockchain solution cannot disintermediate all functions of an institutional intermediary. Other research finds several possibilities for institutional intermediaries to gain a competitive advantage through blockchain technology (Trabucchi et al., 2020). Due to the inter-organizational character of the technology, institutional intermediaries often collaborate in consortia to implement solutions that improve processes but do not remove their market position (Wang et al., 2021; Zavolokina et al., 2020; Guggenberger et al., 2021b).

Re-Intermediation

Lastly, the concept of *Re-Intermediation* extends the perspective of *Limited Disintermediation* by proposing scenarios of how institutional intermediaries change their role within markets. Drawing on interdisciplinary literature, Zamani and Giaglis (2018) suggest that complete Disintermediation is unlikely to happen in their conceptual paper. The authors propose different scenarios for institutional intermediaries based on Giaglis et al. (2002). While blockchains theoretically could form an Internet of Value that operates without any institutional intermediaries, it is more likely that existing intermediaries find new business models that leverage the advantages of blockchain technology (e.g., banks enhancing processes through blockchain-backed systems). Through the implementation of blockchain networks, also new intermediaries might emerge that provide new services in the market (e.g., wallet providers) that did not exist before. The authors thereby adopt the perspectives of the theory of electronic markets on intermediaries as proposed by Wigand (2015). Chiu and Shang (2019) further develop this perspective, and the preliminary results of their case study approach imply that institutional intermediaries are not removed entirely by blockchain technology but find new roles within the value chain. Tseng and Shang (2021) expand this perspective by proposing a set of five different outcomes for institutional intermediaries when adopting blockchain technology from their multiple case study. Owen and O'Dair (2020) follow the argumentation that blockchain technology is unlikely to completely remove institutional intermediaries in value chains but rather change their role in creating value for customers. Their case study in the music industry finds that blockchain technology enables new possibilities for companies to act as infomediaries in the music industry whereby companies create new services and thus, find new blockchain-enabled business models (O'Dair and Owen, 2019).

Further examples can also be found in the context of blockchain-enabled fundraising. Companies find priorly unknown business models by acting as an auditor to verify new coins in the market (Collao and Winship, 2019). This perspective of evolving business models has also been proposed for law firms (Abbatemarco et al., 2020), finance (Lindman et al., 2017), and supply chain (Tönnissen and Teuteberg, 2020).

4.3 Qualitative synthesis

Next, we decided to gather further insights by exploring the scope of our identified concepts. Therefore, we analyzed each article based on the mentioned functions of an intermediary. To provide a comprehensive overview, we followed the framework of Bakos (1998). While initially proposed as a generic framework, it also applies electronic markets (Giaglis et al., 2002). Henceforth we consider it to analyze our identified blockchain literature. Table 3 presents the identified concepts based on the analysis of the respective articles and their focus on different market functions.[1] The values show the percentual value of articles from a concept incorporating the perspective of a market subfunction. Therefore, one article might incorporate the perspective of multiple market subfunctions.

1 The complete overview of the 90 identified articles can be accessed under the following link: https://doi.org/10.5281/zenodo.5708484

Concept		*Extensive Disintermediation*	*Limited Disintermediation*	*Re-Intermediation*
Primary market function	*Subfunction*	*n = 61*	*n = 20*	*n = 9*
Matching buyers and sellers	Det. of p. offering	1 of 61 (2%)	12 of 20 (60%)	8 of 9 (89%)
	Searching	1 of 61 (2%)	15 of 20 (75%)	7 of 9 (78%)
	Price discovery	2 of 61 (3%)	8 of 20 (40%)	2 of 9 (22%)
Facilitation of transactions	Logistics	48 of 61 (79%)	12 of 20 (60%)	7 of 9 (78%)
	Settlement	55 of 61 (90%)	19 of 20 (95%)	8 of 9 (89%)
	Trust	56 of 61 (92%)	19 of 20 (95%)	8 of 9 (89%)
Institutional infrastructure	Legal	0 of 61 (0%)	0 of 20 (0%)	1 of 9 (11%)
	Regulatory	0 of 61 (0%)	0 of 20 (0%)	1 of 9 (11%)

Table 3. Percentage of articles based on market functions and the proposed concept.

First, we find articles with the concept of *Extensive Disintermediation* to predominantly only cover one primary market function. Thereby, the articles following this concept focus on the facilitation of transactions through logistics, settlement, and trust (Schlecht et al., 2020). This focus can be found across many different blockchain use cases and applications (Perscheid et al., 2020), e.g., in the energy (Faizan et al., 2019) or finance industry (Gomber et al., 2018). Since most articles follow a Design Science Research approach, the focus on these technical attributes is not surprising since they are well documented in the literature (Rossi et al., 2019). Through the decentralized nature of blockchain technology and the retroactive immutability of the ledgers, trust-free transactions are enabled (Chanson et al., 2019). Since the first blockchain application was a peer-to-peer transaction system (Nakamoto, 2008), whereas other market functions are less important, the focus of articles on the facilitation of transactions is reasonable from a technical perspective. However, we observe that this narrow perspective leaves out other functions of an intermediary beyond the facilitation of transactions. Only two articles incorporate mechanisms for price discovery in their research (Jaiswal et al., 2019; Zielinska et al., 2019). We identified no articles that discuss the perspective of institutional infrastructures in this context.

Second, the concepts *Limited Disintermediation* and *Re-Intermediation* have a wider focus by incorporating the functions of matching buyers and sellers and institutional infrastructure. For example, Catalini and Gans (2020) incorporate those functions in their economist perspective to propose a change in the role of institutional intermediaries rather than their removal from the market. Those functions are further displayed in the business model taxonomy of Weking et al. (2020). Tönnissen and Teuteberg (2020) develop this perspective in their multiple case study in the supply chain sector. Thereby, the authors find that institutional intermediaries still administer the matching of buyers and sellers, while blockchains predominantly facilitate transactions between the participants. Following those research streams could lead to a more distinct discussion over the possibilities of Disintermediation through blockchain technology. While it is easy to replace institutional intermediaries for the facilitation of transactions with blockchain technology, it seems more difficult to determine the product offering, search for new products, set prices, and provide legal and regulatory infrastructures.

5 Discussion

5.1 Theoretical contribution

Our article sample demonstrates a strong rise in scholarly interest in the topic of intermediation in the context of blockchain technology over the years. This is not surprising since, with the rising maturity of technologies and the respective literature, more theory-driven questions get into the focus of scholars (Gregor, 2006). Our findings show that most articles dealing with blockchain technology and its impact

on institutional intermediaries focus on *Extensive Disintermediation* as a key characteristic or consequence.

While blockchain applications may render institutional intermediaries obsolete from a technical point of view, this research stream does not incorporate the complex functions of intermediaries in markets (Giaglis et al., 2002). This technical perspective only takes into account the market function of facilitating transactions. The settlement of transactions, the provision of trust, and the facilitation of (digital) transfers and logistics are key functions of markets and have been described as the key attributes of blockchain technology (Lumineau et al., 2021). However, as shown in the literature (Bakos, 1998), intermediaries also fulfill more complex market functions like matching buyers and sellers or providing institutional infrastructures. Further, most articles do not yet consider the required governance to implement decentralized and inter-organizational technologies (Zavolokina et al., 2020; Lumineau et al., 2021). Thus, the implementation and the primary market functions of blockchain technology require some form of institutional intermediary. Our findings show that researchers mainly focused on (dis-)intermediation from a laboratory or theoretical perspective. Even though methods like Design Science Research approaches are highly recommended to investigate the potential of blockchain technology in application domains, they cannot replace empirical work to study complex market mechanisms. Those real-world observations provide valuable and strongly needed insights into how institutional intermediaries behave when blockchain technology is applied.

Literature in the stream of *Limited Disintermediation* considers the more complex market structures and functions of intermediaries. The articles highlight that the *Extensive Disintermediation* of markets through blockchain technology is highly unlikely. All articles highlight that *Extensive Disintermediation* might not be achievable for their application in focus or as a general characteristic. This finding is consistent with research on electronic markets, which posits that Disintermediation is not inevitable (Chircu and Kauffman, 1999; Wigand, 2020). However, this stream of literature largely leaves out the critical question of how institutional intermediaries behave when blockchain technology is implemented. *Limited Disintermediation* focuses on the barriers of Disintermediation.

The stream of *Re-Intermediation* complements this missing perspective. Several researchers proposed different possibilities for institutional intermediaries to react to the threat of Disintermediation. While some articles aim to explore future roles and business models, only a minority consider electronic markets theory to identify perspectives for institutional intermediaries. We posit that incorporating electronic markets theory on Disintermediation serves as a theoretical fundament on which the case of blockchain technology could be discussed. Nonetheless, the vast majority of researchers ignore this literature stream.

Our findings highlight the urgent need for further research on the impact of blockchain technology on institutional intermediaries. Therefore, we propose the following research framework that serves as a guideline for future research avenues.

5.2 Research agenda

Building upon our theoretical contribution, we aim to identify paths for future research (Webster and Watson, 2002). Therefore, we adopt Alvesson and Sandberg (2011) in their approach to problematize existing assumptions in literature to develop our research agenda. This disruptive mode of determining research questions is particular suited to challenge existing assumptions in a research field (Sandberg and Alvesson, 2011). Our findings show that many researchers only consider intermediation functions in a limited scope. Instead of adopting this widespread focus on transaction cost we seek to problematize this stream of research. Therefore, we present a set of actionable paths for other researchers to follow in the future. To provide a structured overview, we follow the conceptualization of our findings section. Table 4 presents our research framework.

First, we follow the *Extensive Disintermediation* concept. Building on electronic markets literature, researchers should investigate if Disintermediation removes the functions of (institutional) intermediaries or transfers them to the technology. This could shed further light on whether the concept

of *Extensive Disintermediation* is appropriate in the context of blockchain technology, as it takes over certain functions rather than removing them. Thus, blockchain technology itself might serve as an algorithmic intermediary. Researchers should also address the question of how companies find new functions within markets. This question is strongly related to the following area of research.

Second, we encourage future projects to address the antecedents and barriers for Disintermediation through blockchain technology in contingency models. Such models for Disintermediation in electronic markets might serve as a starting point for researchers (Giaglis et al., 2002). Future research should also investigate why blockchain use cases rarely reach a productive state, even though many researchers underpin the disruptive potential of the technology. Our results serve as a starting point by highlighting that many researchers focus on blockchain technology as a transaction system, thus, disregarding other market functions. We further urge researchers to think of blockchain technology beyond the facilitation of transactions. Future technological developments might include other markets functions and thus, fuel the dissemination of decentralized marketplaces.

Third, future research projects should investigate how institutional intermediaries use blockchain technology strategically to reposition themselves within the market. Also, researchers could investigate other patterns in business models stemming from Disintermediation. Observations from blockchain-based markets, e.g., cryptocurrencies, show that institutional intermediaries aim to gain market functions that can be classified as value-added services, e.g., the provision of digital wallets. This research should apply either qualitative- or quantitative-empirical methods to address the drawbacks of the yet mainly conceptual work in the field. Further research could also investigate which technological properties of blockchains promote which archetypes of businesses.

Concept	*Possible further research avenues for the identified concepts*
Extensive Disintermediation	• Does Disintermediation of institutional intermediaries remove the functions of intermediaries or shift them towards the technology? • How can institutional intermediaries find new functions once they are disintermediated?
Limited Disintermediation	• What are the drivers and barriers for Disintermediation? • Do inflated expectations regarding the disruptive potential of the technology limit the implementation of blockchain projects? • Can blockchain technology replace institutional intermediaries' functions beyond the facilitation of transactions?
Re-Intermediation	• How can institutional intermediaries facilitate a strategic repositioning in the value chain by using blockchain technology? • Which technological properties of blockchains facilitate which archetypical business models? • Which archetypes of Re-Intermediation from electronic markets literature can be transferred to the case of blockchain technology?

Table 4. Research framework.

5.3 Managerial implications

Our findings further provide important practical implications. First, our literature review provides valuable insights for corporations when dealing with blockchain technology. The results show that even though many studies in an experimental setting suggest the threat of Disintermediation, most studies with real-world observations posit that this is a very unlikely outcome for institutional intermediaries. Henceforth, companies that might fear adopting disruptive technologies should engage more openly with blockchain technology.

Second, we find several possibilities for institutional intermediaries to leverage blockchain technology to develop their business models. Thereby, companies could use the capabilities of blockchain technology to automate processes, in particular, the facilitation of transactions. Thus, practitioners should not just consider the threat of Disintermediation but also the possibilities of blockchain technology. Here, we propose a more specific perspective not only for incumbents but also for established corporations. Other authors also support this perspective (Lacity and van Hoek, 2021; Fridgen et al., 2021; Mattke et al., 2019).

6 Conclusion

Blockchain technology is still at the center of interest in academia and practice. Much of the expectations regarding the disruptive potential of the technology build upon the capability to facilitate peer-to-peer transactions without a trust-providing central entity. While many researchers build upon this capability to foresee the removal of institutional intermediaries in different use cases, our research identifies three different concepts in the literature. Thereby, we find *Extensive Disintermediation* to be the most prominent concept, followed by *Limited Disintermediation* and *Re-Intermediation*. Comparing our identified set of articles with literature about the functions of intermediaries in electronic markets shows that the concept of *Extensive Disintermediation* largely focuses on the facilitation of transactions. Therefore, the key functions of intermediaries are only partly considered. Building upon these findings, we propose several avenues for future research. While our research provides substantial benefit to research and practice, we acknowledge several limitations to our results, which we elaborate on in the following.

First, our findings are limited to our applied search string and the selected databases. We followed a highly structured approach in our methodology by applying established best practices for literature reviews (Webster and Watson, 2002). Nonetheless, we might miss studies that provide further insights. Second, due to the ongoing technological development, our paper only assesses the current body of knowledge. Future generations of blockchain technology might enable other functions of intermediaries, thus facilitating the removal of additional intermediaries. Third, the selection of the articles was only conducted by one author. Even though the selection criteria had been discussed iteratively with all authors to achieve a high degree of objectivity, the selection process itself is limited to some subjectivity of the responsible researcher. Finally, selecting the framework to assess the market functions of each identified concept (Giaglis et al., 2002) limits the breadth of our insights. Other theoretical lenses might yield further insightful results.

Our overview and assessment of existing intermediation scenarios serves as an important building block for a more theoretically founded discussion about the impact of blockchain technology on institutional intermediaries. Thereby, we provide a starting point for researchers to assess the impact of blockchain technology on real-world applications and continue to develop the research field onward.

Acknowledgment

We gratefully acknowledge the Bavarian Ministry of Economic Affairs, Regional Development and Energy for their support of the project “Fraunhofer Blockchain Center (20-3066-2-6-14)” that made this paper possible.

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