The Impact of Blockchain on Business Model: A Literature Review

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Abstract: Blockchain is becoming an increasingly relevant topic and companies are beginning to build business solution using this technology. Despite the relevance of the changes that blockchain could bring to business and management, current research is still predominantly focused on technological aspects and practical applications. Knowledge is lacking also both for academics and practitioners who, still struggle to have a clear understanding of the potential impacts of blockchain. Moreover, scientific literature addressing the business adoption of blockchain does not seem to consider the increasing differentiation of blockchain real-world applications This study hence aims to start filling this gap by investigating the existing body of knowledge systematically through a review in which the potential impacts of blockchain are presented and future avenues of research are set out. The review is based on 61 scientific articles published between January 2008 and January 2020. The review has been structured considering two frameworks: the business model elements of value creation, delivery, and capture and the different stages of evolution of blockchain applications. The results provide evidence and future direction for research that are valuable for both academics and managers.

1 INTRODUCTION

Blockchain technology was born in October 2008 when Satoshi Nakamoto published his idea of a peer-to-peer electronic cash system: Bitcoin. With Bitcoin, for the first time, value could be reliably transferred between two distant, untrusting parties without the need of an intermediary (Catalini & Gans, 2016; Zamani & Giaglis, 2018). Nowadays blockchain is not only focused on transactions and cryptocurrencies but it could be also used to create platforms for the development of new applications. Companies and public administrations are starting to increasingly adopt blockchain in their businesses and the number of new firms that use blockchain to create innovative business models continues to grow. Despite the progression in the adoption of the technology, institutions still struggle to have a clear understanding of the benefits of blockchain and how to implement it in their businesses or to create new business models based on it.

Blockchain research is strongly increasing, but still, the main attempts to understand this technology have been mainly restricted to technical aspects of blockchain protocols or the financial aspects of cryptocurrencies (Risius & Spohrer, 2017). Much less progress has been accomplished in recognizing its wider implications from organizational and managerial perspectives, and the extent to which it could disrupt traditional business models remains a subject of intense debate (Chong et al., 2019a; Constantinides et al., 2018).

From a preliminary analysis of literature on this topic emerge that scholarly understanding of business applications of blockchain is still a fragmented and almost unexplored ground, especially for what concerns business models based on blockchain. Contributing to the fragmentation of the literature about the topic, scientific literature addressing the business adoption of blockchain does not seem to consider the increasing differentiation of blockchain real-world applications (Angelis & Ribeiro da Silva, 2019). This complicates the creation of comprehensive theories about the impact of blockchain in business.

Hence, the purpose of this work is to review the literature to analyze and map existing studies that examine the impact of blockchain on business models. This will allow a better understanding of the extant knowledge, highlighting the already existing studies on the theme and opportunities for future research.

These objectives are represented in the following research question:

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RQ: How scientific literature analyzes the impact of blockchain on firms' business models according to the maturity stage of the technology?

2 SETTING THE STAGE FOR THE REVIEW

To answer the research question identified, the review is structured considering two frameworks: the business model elements of value creation, delivery, and capture and the different stages that characterize the evolution of blockchain applications.

2.1 Business Model

"Business model" is a quite vast term that still nowadays does not recall a univocal definition. In fact, over the years researchers have formulated different interpretations and explanations about it, resulting in blurred and non-univocally identified concepts.

In this work, the reference definition for Business Model is the one elaborated by David J. Teece (2010) that identify the business model as a company's architecture of value, it represents the way a firm generates value for its target customers (value creation), delivers value to such target customers (value delivery), and captures a share of such value to make its business sustainable (value capture).

The business model is suitable to be used in the analysis of the applications of blockchain which is characterized by the involvement of different interconnected actors as the point of view of researchers and practitioners in analyzing and using the business model concept has shifted from focusing on a single firm to considering network of firms, not neglecting the growing interconnection between businesses.

The most used and complete business model representation tool is the Business Model Canvas designed by Osterwalder in 2004 (Osterwalder, 2004). This framework has been introduced and validated all around the world, and it is currently widely adopted and employed both by practitioners (Osterwalder & Pigneur, 2010) and academics (Chesbrough, 2010).The business model canvas has been chosen as the reference model for analyzing blockchain impact on firms' business logic thanks to its completeness and coherence in considering and illustrating all factors and related connections that contribute in building companies' strategy (Osterwalder & Pigneur, 2010).

The nine building blocks introduced by the business model canvas represent a more detailed level of description of the business model value dimensions (value creation, value delivery and value capture). In particular:

- *Key Partners*, *Key Activities*, *Key Resources* and *Value Proposition* represent *Value Creation* component*;*
- *Customer Relationships*, *Channels* and *Customer Segment* represent *Value Delivery component;*
- *Cost Structure* and *Revenue Streams* represent *Value Capture* component.

2.2 The Evolution of Blockchain Applications

As already highlighted, organizations are adopting blockchain in different ways: from the use of cryptocurrencies to the development of decentralized applications.

Despite the real-world applications of blockchain are increasingly differentiating (Angelis & Ribeiro da Silva, 2019), this differentiation does not seem to be considered in scientific literature. This contributes to the fragmentation of the literature which complicates the comparison of results and the creation of comprehensive theories about the impact of blockchain in business applications.

Different ways of using this technology could influence its impact on firms' business models. Hence, to provide a better representation of the extant body of knowledge and understand the impact of blockchain on firms is essential to first categorize the types of blockchain applications.

One of the most adopted taxonomies about blockchain applications is the one proposed by Swan (2015) that differentiates between blockchain 1.0, 2.0, and 3.0. In the view of Swan, blockchain 1.0 is linked to the deployment of cryptocurrencies in applications related to cash; blockchain 2.0 is used in contracts and financial applications different from simple cash transactions; blockchain 3.0 identifies the applications beyond currency and finance.

This categorization, albeit widely adopted, focuses more on the industry where blockchain is adopted than on how it is applied.

Hence, for the purpose of our research, we adopted the classification offered by Angelis and Ribeiro da Silva (2019) that describes the different stages of maturity of the applications of technology:

- Blockchain 1.0, is focused on transactions, mainly on the deployment of cryptocurrencies in applications related to cash, such as currency

transfer, remittance, and digital payment systems.
- Blockchain 2.0, is an extension of blockchain 1.0 that encompasses privacy, smart contracts, and the emergence of non-native asset tokens.
- Blockchain 3.0, expands the blockchain focus further to incorporate decentralized applications (dApp); a dApp consists of back-end code that runs on a decentralized peer-to-peer network connecting users and providers directly.

The work of Angelis and Ribeiro da Silva also introduces the concept of blockchain 4.0, defined as the applications that involve the inclusion of artificial intelligence (AI) to blockchain technologies. For this research, however, we do not include this category in our analysis as this kind of application is still not widely adopted in business.

3 METHODOLOGY

The review starts by searching the SciVerse Scopus online database for scientific articles on blockchain and business models. Since Scopus is less selective than, for example, the Web of Science, this potentially means that a wider array of international outlets are searched which, in turn, could be more receptive to the emerging topic of blockchain impact on business models. Moreover, because of the recent and fast growth of the literature on blockchain, we decided to review papers published in both academic journals and conference proceedings. This decision came about from the consideration that, in dynamic and growing fields such as blockchain, if the scope of a literature review is broadened by including publications that belong to the 'grey literature' this can lead to the inclusion of novel and relevant findings and avoid the lack of immediacy determined by the lag of academic knowledge (Adams et al., 2017).

Since the literature on blockchain is still fragmented and focused on Computer Science we wanted to include also documents outside the field of "Business, Management, and Accounting" to not exclude any articles with management-type implications. Hence our search was not limited to a specific subject area.

In line with previous reviews (e.g. Ghezzi et al., 2018), we adopted a multi-step process.

In the first step, the following first-level criteria determined whether articles were included: (1) the articles were published between January 2008 and December 2020; and (2) had to contain the term 'blockchain' and 'business model' in their title, keywords or abstract. This search resulted in over 373 articles gathered.

As a second step, we retained the articles that met our more refined second-level criteria: (3) they must be relevant, as inferred from their title or abstract, or by examining the paper; (4) their full text has to be available; and (5) they must be written in English.

This phase allowed us to reduce the number of papers in the sample significantly, resulting in a working database of 61 articles.

These articles collected were then examined through a comprehensive scheme of analysis or third level criteria, where the following were considered: title; year; author/s; publication outlet; article type (for the following labels: empirical; conceptual; literature review); industry type; research findings; and Scopus citations.

In this step, the articles were classified according to the two frameworks of analysis: the business model canvas and the three stages of maturity of blockchain applications.

To analyze the contribution of each article on the impact of blockchain on business models, we highlighted each part of the text that provided relevant information. Hence, the process of text analysis consisted of the complete document screening so to highlight sentences expressing blockchain impact on business models.

Citations reporting the effect of blockchain adoption on business models have been analyzed so to derive which business model canvas components have been affected by the adoption of distributed ledger technology solutions. This activity helps in understanding which value architecture components blockchain technology has the greatest impact on. Each citation can be referred to one of the three different blockchain maturity stages and in the same paper different citations can potentially deal with all three stages.

4 REVIEW OF THE LITERATURE

The literature on blockchain impact on business model is mapped in the section below and discussed through the business model canvas and the three stages of maturity of blockchain applications.

4.1 Blockchain 1.0

The adoption of blockchain 1.0 offers an alternative digital system for cash-related activities and

transactions mainly characterized by not needing any intermediary between parties. The adoption of blockchain 1.0 has the potential to impact all value architecture dimensions, with value creation being the most influenced one since all analyzed papers have reported effects on such dimension.

Table 1: Blockchain 1.0 impact on value architecture and business model canvas

Value architecture dimension	Papers reporting impact (%)	Business model canvas component	Papers reporting impact (%)
Value creation	100%	Key partners	0%
		Key activities	33%
		Key resources	0%
		Value proposition	100%
Value delivery	33%	Customer relationships	0%
		Channels	0%
		Customer segment	33%
Value capture	67%	Cost structure	67%
		Revenue streams	33%

4.1.1 Key Activities

The adoption of blockchain 1.0 can streamline common process operations related to money transfers due to the possibility of accumulating trustable data related to all network transfers. Blockchain 1.0 provides transparency during transfers, allowing an overall simplification of the clearing process by providing secure access, for all involved parties, to the needed information, no longer requiring relying on multiple and repeated data exchange (Chong et al., 2019a).

4.1.2 Value Propositions

Blockchain 1.0 offers a solution for solving traditional payment systems limitations. Distributed payment services enable instant, low cost and borderless payments reducing service prices for both sellers and buyers that traditionally used centralized payment systems such as PayPal. This allows blockchain network users to get access to direct value exchange services characterized by having lower transaction fees thanks to the elimination of previously vital third parties, decreasing the overall cost sustained by customers to access previously centralized services (Chen & Bellavitis, 2020; Weking et al., 2019).

4.1.3 Customer Segment

The reduced involvement of centralized institutions enables cheaper services and can hence attract new customers. Moreover, cryptocurrencies are not tied up to a specific authority or country making them inherently borderless allowing any person with an internet connection to access a decentralized network to manage money transactions (Chen & Bellavitis, 2020). Particularly, cryptocurrencies can have an impact on developing economies where the financial inclusion of companies and individuals can be fostered thanks to blockchain adoption (Holtmeier & Sandner, 2019).

4.1.4 Cost Structure

As previously described, the disintermediation process generated by blockchain 1.0 adoption allows for a decrease in transaction costs. This effect can not only be offered to the market as a distinctive characteristic of the provided service but can also be leveraged by firms to reduce money transfer activities costs compared to traditional payment systems (Chen & Bellavitis, 2020; Chong et al., 2019a).

4.1.5 Revenue Streams

Transaction tracking capabilities provided by the available ledger which displays all transactions, allows firms also to enhance their ability to manage cash flows, improving cash balance management and interest earned hence optimizing revenues (Chong et al., 2019b).

Table 2: Blockchain 2.0 impact on value architecture and business model canvas.

Value architecture dimension	Papers reporting impact (%)	Business model canvas component	Papers reporting impact (%)
Value creation	100%	Key partners	41%
		Key activities	86%
		Key resources	36%
		Value proposition	98%
Value delivery	56%	Customer relationships	33%
		Channels	19%
		Customer segment	41%
Value capture	76%	Cost structure	55%
		Revenue streams	47%

4.2 Blockchain 2.0

Blockchain 2.0 application falls outside the conception of purely monetary value but rather considers value in its most generic sense. These applications are characterized by the use of digital assets and smart contracts to allow companies to do business with untrusted parties without the need for a trustworthy intermediary.

4.2.1 Key Partners

The use of smart contracts for managing contractual relationships and the growing availability of trustable data allow new collaborations with previously unreachable partners and collaboration activities based on simultaneous cooperation and competition (coopetition) (Bedin et al., 2021; Schneider et al., 2020).

Blockchain provides increased transparency and security of operations, leading to a modification in business relationships, that shift from the ones based on trust and long-term relationships to new ones characterized by being shorter and more flexible, whereby partners are selected prioritizing the provided competencies rather than the existing trust (Klöckner et al., 2020; Nowiński & Kozma, 2017; Tiscini et al., 2020).

4.2.2 Key Activities

The availability of a reliable database allows firms to streamline entire business processes (Nowiński & Kozma, 2017; Rejeb & Rejeb, 2020) such as verification of compliance to standards (Rijanto, 2020).

The use of smart contracts allows firms to completely automate entire business processes such as the billing and payment in different sectors ranging from insurance, freight transportation to energy (Berntzen & Johannessen, 2019; Tan & Sundarakani, 2020). Hence companies can offer products and services to customers and automatically collect payments once the requested product or services is accessed, increasing the overall process efficiency (Atlam et al., 2018).

4.2.3 Key Resources

The identified potential impacts on key resources are strictly interconnected with the one reported in the key activities segment. Firms can experience an increase in resource fluidity thanks to the establishment of a new ownership paradigm, shifting from the original possession of assets towards flexible access to resources when needed (Morkunas et al., 2019). Moreover, the increased efficiency of operational processes and activities allows to free up both human (Tönnissen & Teuteberg, 2020) and technical resources (Klöckner et al., 2020; Massaro et al., 2020), allowing firms to enjoy greater flexibility in resource management and maximize their usage (Mas et al., 2020).

4.2.4 Value Proposition

Blockchain 2.0 can be applied to create a distributed database where data are securely stored and accessible to all network users that can enjoy trustable, traceable, and immutable information, providing a reliable timeline of network exchanges for all network parties (Tan & Sundarakani, 2020). This particular type of distributed database constitutes a common source of truth for all entities relying on such information, increasing products information accountability, verifiability, and traceability enabling higher safety, detection, and prevention of illicit behaviours (Tönnissen & Teuteberg, 2020), while removing the need of a third party necessary to establish trust between untrusted parties and creating peer-to-peer connections between network actors (Chen & Bellavitis, 2020).

Moreover, thanks to the introduction of non-native tokens, blockchain 2.0 generalized the concept of value beyond monetary terms, including all possible digital assets (Morkunas et al., 2019) building a new protocol for data exchange that offers transparency, immutability, security, and traceability of network shared information that can be used for supporting transactions of value without needing any trusted intermediary (Schneider et al., 2020).

The process of tokenization whereby assets, whether physical or digital (Lohmer & Lasch, 2020), are represented as tokens in a blockchain-based environment, supports and reinforces the broaden Internet of value potential of blockchain 2.0 by offering users new sources of value not only monetary.

4.2.5 Customer Relationship

The use of tokens and smart contracts to build new offerings contributes to the automation of relationships with customers that can enjoy the requested value proposition by autonomously access the dedicated smart contract (Massaro et al., 2020). An example of this relationship is represented by the issuing of tokens through ICOs for involving people in future launches of products and services while raising funds to develop the project (Chen &

Bellavitis, 2020; Morkunas et al., 2019). This issuing doesn't require any customer dedicated resource but is carried out automatically by smart contracts. Tokens can be used by companies also to create token-based communities and rewarding systems to interact and relate with their customers, stimulating customer engagement and lock-in effects (Mas et al., 2020; Rijanto, 2020; Schneider et al., 2020).

4.2.6 Channels

The analyzed papers didn't highlight a particular impact on the channel dimension apart from underlining the increasing trend of relying on digital devices such as phone applications, websites, and more general digital databases (Tiscini et al., 2020).

4.2.7 Customer Segment

The increasing product safety and compliance to standards provided by the use of blockchain applications, allows firms to generate trust in customers, increasing positive brand perception and customer loyalty, ultimately favoring an increase in company customer base enabling final consumers who don't usually trust displayed information accountability and safety, to participate in the business model (Palas & Bunduchi, 2020; Tiscini et al., 2020).

4.2.8 Cost Structure

The impact on the costs structure component is strictly related to key activities. A direct consequence of simplification of business operations thanks to increased automation, higher availability of information, and reduced coordination activities effort, is a reduction in operating costs related to business activities and processes (Chen & Bellavitis, 2020; Mas et al., 2020; Tönnissen & Teuteberg, 2020).

4.2.9 Revenue Streams

Blockchain 2.0 gives firms improved access to capital thanks to innovative fund-raising alternatives such as ICOs, a blockchain-related crowdfunding solution that allows companies to collect capital from different investors without the need of any financial intermediary (Chen & Bellavitis, 2020; Morkunas et al., 2019; Nowiński & Kozma, 2017). Moreover, blockchain 2.0 allows for the creation of new sources of monetization for customers that can enjoy additional profits from previously unavailable value sources.

4.3 Blockchain 3.0

Blockchain 3.0 introduces the concept of Decentralized Applications (DApps) which are constituted by computer codes running on decentralized systems instead of centralized ones as for commonly known apps.

Blockchain 3.0, as the two previous maturity stages, has highlighted the potential impact on all three value architecture components and value creation is still the most impacted one with all analyzed documents reporting effect on such dimension.

Table 3: Blockchain 3.0 impact on value architecture and business model canvas.

Value architecture dimension	Papers reporting impact (%)	Business model canvas component	Papers reporting impact (%)
Value creation	100%	Key partners	0%
		Key activities	0%
		Key resources	100%
		Value proposition	100%
Value delivery	33%	Customer relationships	0%
		Channels	0%
		Customer segment	33%
Value capture	67%	Cost structure	0%
		Revenue streams	67%

4.3.1 Key Partners and Key Resources

In blockchain 3.0 the role of the network provider is separated from the one who develops the business solution. By decoupling the blockchain platform provider role in two different actors, new links and relationships are established. Blockchain network provider represents a key partner for a service provider who relies on its technical knowledge and supplied blockchain network (key resource) for designing value propositions to be offered to the final customers (Chong et al., 2019b; Trabucchi et al., 2020; Weking et al., 2019).

4.3.2 Value Proposition

In blockchain 3.0 the value proposition is split between two distinctive roles: blockchain provider, offering platform as a service, and service provider that is responsible for designing the final application on top of the existing blockchain network. Taking the perspective of blockchain providers, they offer a complete distributed ledger-based network on top of

which customized business solutions can be designed, providing indeed great application design flexibility. On the other hand, service providers purchase access to such blockchain network that enables them to offer highly flexible applications to their customers to solve a vast set of customers' business needs (Trabucchi et al., 2020). In blockchain 3.0 the technology is offered as an open-source platform to developers that can leverage existing blockchain networks thanks to dedicated APIs that are proposed to developers without any specification of asset or channel for distribution (Weking et al., 2019) that can foster cooperative innovation aimed at developing customized business applications independently from the application field (Chen & Bellavitis, 2020).

4.3.3 Customer Segment

The presence of multiple service providers and the multiple roles played by users in a blockchain environment allows increasing direct network externalities in two-sided blockchain-based platforms, increasing the attractiveness of such solutions and addressing the chicken and egg paradox (Trabucchi et al., 2020).

4.3.4 Revenue Streams

In blockchain 3.0 the platform provides access to new sources of revenues thanks to the innovative value proposition offered to service providers. In particular transaction fee still constitutes a major source of revenues for distributed ledger providers that also profit from technology rental fees, obtained by charging third parties for the use of the network, and token reselling whereby blockchain providers profit from the reselling of their network-related tokens (Trabucchi et al., 2020; Weking et al., 2019).

5 AVENUES FOR FUTURE RESEARCH

The review has highlighted how the literature about blockchain impact on firms' business model is still in its early stages.

Available documents refer mostly to blockchain 2.0, neglecting the other two maturity stages. The low number of studies on blockchain 1.0 could be related to the fact that research on this type of application is focused more on a technical perspective rather than a business one. There has not been a mass adoption by general firms of blockchain 1.0 instruments, such as cryptocurrencies, leading to a lack of practical cases to analyze. Recently though, important actors of the financial sector such as banks, fintech companies, and regulators have started to approach this kind of blockchain application.

Similarly, also blockchain 3.0 has shown a low number of studies. This phenomenon might be justified by the fact that blockchain 3.0 has been only recently introduced as a way of applying blockchain technology. Hence, related research is still scarce so little information has been found. At the same time, it could represent one of the most promising and innovative interpretations of blockchain. The increasing number of released DApps on blockchain platforms like Ethereum and the related user's number testifies the high potential of blockchain 3.0.

Looking at the impact on business model canvas components, literature doesn't analyze multiple dimensions: blockchain 1.0 available documents have not provided significant impacts for key resources, key partners, and customer relationships components; blockchain 2.0 lacks analysis on channels; blockchain 3.0 related studies have neglected the impact on key activities, channels, customer segment, customer relationships. Hence, future research should focus on filling the current literature gaps about the missing consideration on business model canvas dimension of each blockchain maturity stage. Future research can additionally investigate the magnitude of the impact of each highlighted effect so to provide a quantitative scale of impact and an additional categorization variable to discriminate the most relevant effects from the least relevant ones.

6 CONCLUSIONS

Blockchain technology adoption is evolving through diverse applications and new instruments. This paper contributes to the understanding of the impact on business models of the different types of blockchain applications.

This study can benefit academics by contributing to the growing stream of literature that addresses the impact of blockchain on organizations from a strategic perspective, especially by providing contributions to the impact of blockchain on business models.

This research can also benefit practitioners that are still struggling in the adoption of blockchain technology and with the understanding of how they can create value, by providing tools to understand how blockchain can modify their business models.

Important implications for practitioners have also been derived suggesting that each maturity stage of the application of blockchain provides a precise set of characteristics that can be leveraged by firms to solve defined business needs.

This study has been developed minding limitations that mainly consists in the lack of documents analyzing the research topic thus bringing to a restricted pool of information to which elaborating considerations on, and the intrinsic delay of academic literature that generates a gap between released practical cases and theoretical considerations elaborated on such evidence.

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