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How Can Blockchain Technology Disrupt the Existing Business Models?

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ABSTRACT

Objective: The main purpose of the paper is to show that blockchain technology may disrupt the existing business models and to explore how this may occur.

Research Design & Methods: This is a theory development paper which relies on a literature review and desk re-search. The discussion of the reviewed sources leads to the formulation of three re-search propositions.

Findings: The paper provides a short overview of key literature on business models and business model innovation, indicating, among others, that new technologies may be one of the drivers of business model innovation. This study also provides an overview of blockchain technology and a range of its business applications showing how it can disrupt business models. It is shown that blockchain technology may affect many dimensions of business models. We propose that there are three crucial ways in which blockchain technology can affect and disrupt business models: by authenticating traded goods, via disintermediation and via lowering transaction costs.

Implications & Recommendations: This study shows that blockchain technology may affect diverse dimensions of business models in diverse industries. It is recommended that mangers should follow developments in this field in order to prepare for possible disruptions in their industries.

Contribution & Value Added: This study provides an analysis of the possible impact of blockchain technology on business model innovation. Blockchain technology is gaining momentum with more and more diverse applications, as well as increasing numbers of actors involved in its applications. This paper contributes to our understanding of the possible applications of blockchain technology to businesses, and in particular to its impact on business models.

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INTRODUCTION

Blockchain is a novel technology rooted in cryptography which has been popularised by the seminal work of Nakamoto (2008) who showed how this technology can be applied to develop a cryptocurrency (bitcoin). Generally speaking, blockchain makes up a distributed ledger, the control of which may be dispersed among different computers in the network, thus eliminating the need for trust towards a single administrator of such a ledger. In other words, blockchain is "a distributed database comprising records of transactions that are shared among participating parties" (Zhao, Fan, & Yan, 2016) or "just another type of database for recording transactions – one that is copied to all computers in a participating network" (Deloitte, 2016). One of its possible applications is a cryptocurrency which is "a chain of digital signatures" (Nakamoto, 2008, p. 2). Each transaction conducted with blockchain technology (for example with bitcoin) is registered, time stamped, and consecutively widely published with a unique symbol. Transactions are blocked, and described by a unique hash (alphanumeric string resulting from coding data with a cryptographic, so called hash function), a nonce (a number which is unique to the block) and by a hash from a previous block (see Figure 1 for a simplified scheme of a blockchain transaction). Therefore, an attempt to forge a block involves the need to forge preceding blocks. This makes the mechanism safe from attempts to change a transaction.

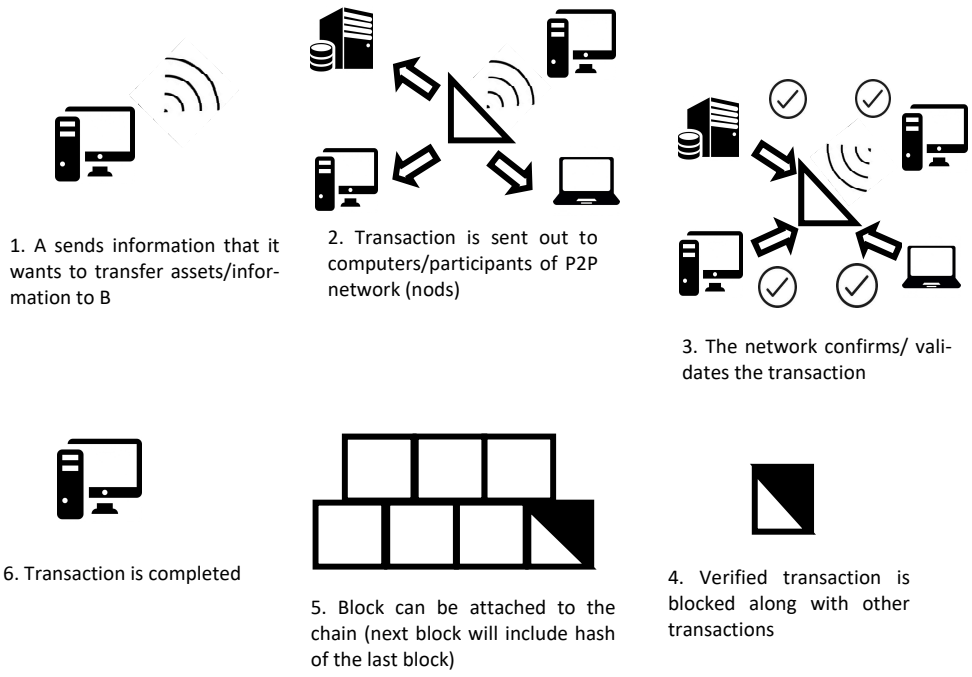

Figure 1. Simplified scheme of a blockchain transaction
Source: adapted model based on PWC (n.d.).

All in all, blockchain technology provides an alternative mechanism for authenticating assets used in the transaction, and thus can be regarded as an alternative to any centralised exchange system relying on a single institution, such as, for example, a central bank, a stock exchange or a clearing house. Blockchain technology substitutes for the trust which under the central exchange system stems from the role of these institutions. As a database which offers "data security, transparency and integrity, anti-tampering and anti-forgery, high efficiency, low cost" (Zhu & Zhou, 2016), it can be potentially applied in numerous business activities which involve data exchange and require security. Certain prominent authors, like Iansiti and Lakhani (2017) liken blockchain technology to TCP/IP protocol which allowed the development of the Internet as we know it. While this analogy also implies that it may still take many years for the technology to exercise its full impact on business, we can already observe this technology being implemented in diverse industries from finance to supply chains and the music industry.

The key purpose of this paper is to discuss how blockchain technology may contribute to disruption and innovation in business models. The interdisciplinary topic of business models has been taken up by researchers only relatively recently (Teece, 2010), although it has been frequently used by practitioners and consultants (DaSilva & Trkman, 2016) since the Internet Bubble. Googling this phrase yields over 30 million results, while googling "Strategic management" yields just over 15 million. The popularity of the term might stem from the fact that, as Casedusus-Masanell and Ricart (2010) argue, every company has a business model even if not every company has a strategy. Business models are inherently exposed to changes. These may stem partly from factors internal to the company and partly from external ones, such as changes in technology. The ability to use new technologies to create new innovative business models may be an important source of competitive advantage (Chesbrough, 2010; Baden-Fuller & Haefliger, 2013). Thus, it is important to understand how new technologies, such as blockchain, can affect business models.

The paper proceeds in the following way. After presenting our methodological approach, extant research on business models is reviewed with particular attention paid to business model innovation. Applications of blockchain technology are then analysed, mostly by means of reviewing extant professional reports and papers. Next, the impact of blockchain technology is discussed and some initial theoretical propositions are offered. Finally we summarise our findings, indicating their implications for theory and practice, as well as their limitations and avenues for future research.

MATERIAL AND METHODS

This is a conceptual paper which derives research propositions from literature review and desk research of current business press papers, professional reports, company web pages and blog commentaries concerning blockchain technology. We screened these secondary sources using a combination of two screening terms "blockchain" and "business". This resulted in almost 7000 hits in Google Scholar, 348 in EBSCO, of which 19 were research papers, and 7 in Web of Science. As the primary purpose of the paper is to provide some tentative propositions explaining how blockchain technology can affect the existing business models and not to provide a comprehensive review of extant publications on blockchain technology in business, we cite these secondary sources selectively. Overall, we refer in this paper to 8 research papers, 4 industry reports by consulting companies, 2 company web

pages, 12 business press articles and 2 blog posts, although the actual number of sources which we have examined in the desk research was substantially higher than the number of the cited ones. Many of these sources, however, present similar perspectives and for this reason we cite only the most relevant for the case we are making in this paper.

Blockchain technology is quite recent and its business applications, other than bitcoin, even more recent. Therefore, we decided to use not only research papers but also reports prepared by professional consulting companies, blog entries and specialised magazines available online. All these sources were used in order to identify the business applications of blockchain technology and to identify the potential of this technology to disrupt the existing business models. The earliest source to which we refer is Nakamoto's paper from 2008. The sources which concern blockchain applications are from 2016 or 2017 as earlier papers on the topic are quite rare. It is important to keep in mind that as we intended to explore the consequences of blockchain for business models, we did not delve into technical details of blockchain technology as this is a matter of interest for cryptography and computer science, nor did we focus on sector specific details, for example those surrounding the financial and legal aspects of cryptocurrencies. Many of the research papers published so far on blockchain originate from computer science or banking and being highly technical were not regarded as relevant for the analysed relationship between blockchain and business models.

To conclude, the paper should be considered as a conceptual paper where literature review and desk research leads to the development of theoretical propositions.

LITERATURE REVIEW – BUSINESS MODELS

The review of the literature concerned with business model innovation must start with defining the concept of business models. The number of definitions of the term is quite large but so is their diversity (Zott, Amit, & Massa, 2011). One of the early definitions was provided by Osterwalder, Pigneur and Tucci (2005, p. 17) who defined it as:

> "a conceptual tool that contains a set of elements and their relationships and allows expressing business logic of a specified firm... a description of the value company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams".

The efforts to define a business model are progressing, although one could question whether a definite conclusion has been reached. A recent paper from Wirtz, Pistoia, Ullrich and Göttel (2016, p. 41) aimed to define the concept in an integrated manner as "a simplified and aggregated representation of the relevant activities of a company". They distinguish three dimensions: strategic components, customer and market components and value creation components, each of which consists of partial models. The strategic components encompass: a strategic model, a resources model and a network model. Wirtz *et al.* (2016) define customer and market components as comprising three partial models: the customer model (defining target customers and distribution channels), the market offer model encompassing i.a. the value offering and last but not least, the revenue model. Lastly, value creation components involve a manufacturing model, a procurement model and a financial model which describes the approach to financing the venture as well as its cost structures. This is a very broad approach to the

concept of a business model, despite the fact that its authors indicate a tendency towards narrowing of the way in which the concept has been used over time.

While the description of the business model by Wirtz *et al*. (2016) is certainly complete and comprehensive, the inclusion of a strategic model as part of business models is disputable as strategy and business models, according to some scholars (DaSilva & Trkman, 2016), should not be mixed. In fact, DaSilva and Trkman (2016), instead of defining the business model concept, differentiate it from certain other terms, in particular strategy, with which it is at times confused. They indicate that a business model differs in important terms from strategy as, contrary to strategy, it is oriented towards short term consequences, while strategy is oriented towards long-term ones. The business model is therefore not an answer to strategic dilemmas but rather a description of "how the various elements of the business work together at a certain point in time" (DaSilva & Trkman, 2016, p. 386). It is a "reflection of the realized strategy" (Casadesus-Masanell & Ricart, 2010, p. 204), not a strategy itself. However, one cannot effectively use a business model concept for achieving competitive advantage unless a more dynamic approach is being used. For this reason, business practitioners are demanding and business consultants are offering solutions on business model innovation.

According to Gambardella and MacGahan (2010), "business model innovation occurs when a firm adopts a novel approach to commercializing its underlying assets". Thus, business model innovation is linked to the resources, often intangible, which a company controls or at least which are available, whether internally or externally, to the company. Bucherer, Eisert and Gassmann (2012, p. 184) define business model innovation as "a process that deliberately changes the core elements of a firm and its business logic." Analytical applications of the business model innovation concept involve analysis of the extent to which different constituents of business models are affected by the introduction of new technologies. Instances of such analysis involve 3D printing (Rayna & Striukova, 2016), bioscience innovations (Brink & Holmén, 2009) or cloud technologies (DaSilva, Trkman, Desouza, & Lindič, 2013). Overall, the literature indicates endogenous and exogenous sources of business model innovation. As for endogenous sources of business model innovation, they are related to the learning capabilities of the organisation (Sosna, Trevinyo-Rodríguez, & Velamuri, 2010), its strategic agility (Doz & Kosonen, 2010) and its organisational culture (Hock, Clauss, & Schulz, 2015).

Internal Drivers of Business Model Innovation

Sosna *et al*. (2010) describe the case of Naturhouse to argue that business model innovation is an outcome of organisational learning processes, where trial and error are indispensable parts of business model innovation. This case shows that if experimentation may be carried out on a relatively small scale then failures can be used as a source of learning for further changes in the business model, until a consensus on the version of the business model to be scaled up can be reached. It illustrates also the critical role of company leadership which, if committed to business model experimentation, may facilitate innovation processes.

Business model innovation was expected to result from certain dynamic capabilities, such as strategic sensitivity, leadership unity and resource fluidity (Doz & Kosonen, 2010). Empirical research has confirmed that two of these, strategic sensitivity and resource fluidity, indeed increase the propensity for business model innovation (Hock *et al.*, 2015).

Strategic sensitivity according to Doz and Kosonen (2010) encompasses the ability to forecast how future products might be used, the ability to experiment with new business models, top management's ability to distance itself from daily operations and use networks to get an outsider perspective on business, the ability to distinguish between generalisable and contextual aspects of their business model, and finally the ability to imagine new business models. In turn, resource fluidity encompasses: flexibility which can be achieved through increased autonomy accompanied by coordination, the modularisation of underlying business processes and IT systems, structural flexibility accomplished by dissociating business processes from business group structures, the simultaneous operation of alternative business models and finally, grafting new ideas from acquired businesses (Doz & Kosonen, 2010).

As mentioned above, according to a recent study by Hock *et al*. (2015) based on a sample of over 300 companies, strategic sensitivity and resource fluidity increase the propensity to innovate business models. The same study indicates that they are positively affected by novelty-oriented cultural values, such as innovativeness and flexibility, openness of internal communication and inter-functional communication but not by efficiency-oriented cultural values such as quality, success and speed.

External Drivers of Business Model Innovation

Teece (2010) explains that technology changes often lead to changes in business model. He provides examples of such changes both in traditional industries, such as 19th century meat packing, and in contemporary times where the introduction of the Internet has led to major changes in how the newspaper and music industries, among many others, operate. Teece (2010) indicates that technology changes affect both the value delivery aspects of business models, with the Internet being here a major driver, and the supply, and consequently the cost aspects of business models, the Cloud being an example of such a technological driver.

Baden-Fuller and Haefliger (2013) explore the link between business model innovation and technical innovation along four dimensions: customer identification, customer engagement, value delivery, and monetisation. They indicate that technological innovations have facilitated the development of two-sided platforms where the user of value can be distinguished from the customer who pays for delivering this value (such as an advertiser). The development of new technologies, such as the Internet, has allowed companies to offer the same product in various ways and also to monetise the delivered value in different ways, either through outright sales, advertising or a freemium model[1]. Online technology may allow companies to apply different levels of customer and business partner engagement which in turn lead to business model choices. Baden-Fuller and Haefliger (2013) mention in this context an example of a t-shirt manufacturer who capitalised on the new stitching technologies and the Internet in order to offer individually designed t-shirts. This manufacturer engaged customers, allowed them to design t-shirts and developed a model under which they would receive royalties from their designs being sold to other customers.

An important conclusion stemming from their analysis is that in the link between new technology development and business success, business models can be regarded as crucial moderators which explain why an innovative technology may lead to either success or failure.

[1] This is a model under which a combination of two products or services is offered, where one is offered for free while the complementary one is sold (Pujol, 2010).

However, innovative technologies may also be the primary driver of changes in business models. As Rayna and Striukova (2016) argue, 3D printing may facilitate downstream and upstream changes in vertical value chains where design companies may move into manufacturing, while typical manufacturing companies may transfer the manufacturing function to customers and focus on design. 3D printing also allows companies to experiment with new business models, something found to be crucial for business model innovation in previous studies (Sosna *et al.,* 2010; Doz & Kosonen, 2010). Rayna and Striukova (2013) provide an example of Hasbro which enabled grown-up fans of the 'My Little Pony' show to design and obtain colour figurines through the Shapeways platform. Their initial model involved customers in designing and even pricing the figurines. It was also highly adaptive as it could be easily closed down in case of failure, but also scaled-up and extended, should Hasbro decide that it wants to extend it to mass production.

Blockchain Technology and its Potential to Change Business Models

While the primary use of this technology has hitherto been in the creation of virtual currencies, such as bitcoin, blockchain technology offers broader opportunities, including any transactions requiring authentication. Such opportunities appear in public administration and supply chains, particularly those involving valuable and forging-sensitive products (pharmaceuticals, luxury products). Zhao *et al.* (2016) speak of three generations of blockchains, where blockchain 1.0 refers to digital currency, Blockchain 2.0 to digital finance, and Blockchain 3.0 to digital society.

The original application of blockchain technology is in cryptocurrencies. The best known type, though not the only one, is bitcoin. It was introduced in 2009, trading initially for pennies, to reach 1 USD by early 2011, jumped to 30 USD in mid-2011, going down to around 8 USD in the second half of 2011 and rising sharply to 290 USD in 2015 (Luther, 2016a) and in the range of 800-1070 USD in the first month of 2017 (Coinbase, Inc., 2017). Luther (2016a) argues that the future of blockchain technology in digital payments is bright. On the one hand, we can observe a rise in the share of electronic transactions, and on the other hand, blockchain technology is less costly. However, while he argues that blockchain technology will be used by more and more players from the financial industry, bitcoin and other cryptocurrencies will remain "niche monies". The only possibility to replace the existing currencies exists, according to Luther (2016a), in countries with very weak and poorly managed currencies. In other cases, network effects exist, in the sense that the value of using a particular currency depends on the number of other users who are ready to transact in that currency (Luther, 2016b). Cryptocurrencies may have, however, other uses which do not necessarily require their widespread adoption. A recent trend among companies involved in blockchain development is to use Initial Coin Offerings (Miles, 2017), which serve these companies to acquire capital. On the negative side, one needs to note that virtual currencies might become speculative investments, especially that their value is not supported by any government or central bank (Comment on SR-BatsBZX-2016-30, 2017). In fact cryptocurrencies' price rally throughout the first months of 2017 and their subsequent drop in value confirm earlier warnings in this respect.

Irrespective of the uncertain future of cryptocurrencies, applications of blockchain technology in the developed markets are abundant. Cases of financial institutions working towards the application of blockchain technology in payments include 10 major world stock exchanges, among which are the London Stock Exchange, CME, Deutsche Borse,

NYSE and Nasdaq (Rizzo, 2016). In October 2015, Nasdaq introduced Linq, "a solution enabling private companies to digitally represent share ownership using blockchain-based technology" (Nasdaq, 2016). Linq is just a starting point as Nasdaq already has indicated new applications of distributed ledger technology in improving proxy voting, company registration and public pension registration. Interestingly, Nasdaq wants to apply these technologies in Estonia, where it owns the Tallinn Stock Exchange, because Estonia, due to its small size, is a good location for this type of experiment. This is in line with arguments concerning the experimentation component of business model innovation (Sosna *et al.*, 2010; Doz & Kosonen, 2010). Financial and public services industries make up a specific setting for radical innovations, such as blockchain, due to their vulnerability to possible failures. Therefore the identification of the right setting for experimentation should be quite important for its implementation.

While in the case of cryptocurrencies blockchain's key contribution is in terms of building systemic trust in transaction security, trust might not be an issue when the technology is used by large players, such as leading exchange markets which have developed their own instruments for ensuring trust, e.g. clearing houses. It remains an issue, however, in other types of transactions. Zhu and Zhou (2016) indicate that crowd-funded companies are such an example. They lack the support of a centralised, trustworthy clearing and settling house. For this reason, on the one hand, they could benefit from mechanisms that would increase trust in the crowd-funding transactions, and on the other hand from mechanisms that would increase their efficiency. The issue of trust is related to the registration of shares, the management of funds collected by crowd-sourcing, and facilitating a mechanism of corporate governance that would enable small, distributed shareholders to exercise control over a funded company (Zhu & Zhou, 2016).

Blockchain technologies in most of these areas could additionally improve the efficiency of operations and facilitate compliance with regulations. One of the areas where blockchain is already offering benefits are cross-border payments. Recently, Ripple developed an application to provide interbank payments using blockchain technology, involving several important banks, such as Santander, UBS, UniCredit, ReiseBank, CIBC, National Bank of Abu Dhabi (NBAD), and ATB Financial, and working with some 90 more banks to introduce this solution. The technology will basically replace the current system of SWIFT and correspondent banking by real time payments between the involved parties (Holotiuk, Pisani, & Moorman, 2017). In October 2016, the first trial involved Ripple and R3, a financial innovation consortium backed by some leading banks, when a cross-border payment using Ripple's XRP digital currency was carried out (Roberts, 2016). The progress is fast, as reflected by recent news on making cross-border payments using blockchain technology operational by National Bank of Abu Dhabi on 1st February 2017 (Reuters, 2017). Trials have also been underway using blockchain technology in international securities clearance (Fujitsu, 2016).

Another important way in which blockchain can affect business is via the implementation of so called smart contracts, which are programmable contracts that could enforce themselves upon the occurrence of predefined conditions (Capgemini Consulting, 2016). According to Capgemini's report (2016) the potential of these contracts can be particularly high in those fields of financial activity that lag behind in terms of processes, speed of settlement, risk of fraud, back-office costs or operational risks. Therefore, their benefits

could be the highest for syndicated loans (where processes are not automated and settlement is very slow), insurance, which is often subject to fraud, or the aforementioned equity markets and payment systems. Unquestionably, smart contracts also face challenges, particularly in legal area, such as the issue of contract immutability, secrecy and enforceability by the judicial system (Capgemini Consulting, 2016).

Applications of blockchain technology extend far beyond financial services. Blockchain technology can be used in sharing services such as computing, offered for example by MIT's Enigma, or the direct renting of apartments, office space or wi-fi routers, as declared by the German startup Slock.it (Sun *et al.*, 2016). Other sharing economy applications include carpooling, where platforms such as Lazooz and Arcade City are operating, decentralised trading platforms, exemplified by OpenBazaar or distributed social networks like Akasha (De Filippi, 2017). Blockchain thus eliminates the need for intermediaries providing tools for a secure contact between the provider and the user of services. The range of industries and activities where this solution could be operational is huge, including the music industry (Tapscott & Kirkland, 2016). Another opportunity related to the cost efficiency effects of blockchain involves decreasing the scale of transactions in which large retailers are involved. As Gupta (2017) suggests, large retailers might be inclined to increase their supplier networks and source from much smaller ones, if the costs of carrying additional products go down.

Blockchain technology is not a stand-alone technology, but rather works alongside other modern technologies, such as smart contracts or encrypted chips through which smart tagging can be used to authenticate luxury products (Vermes, 2017), including arts (Lopez, 2016), as well as food and medicine. The reasons for this authentication may vary from safety concerns in the case of pharmaceuticals or food to social responsibility in the case of sourcing diamonds (Rogers, 2017). While in some cases authentication may seem redundant, when goods are purchased from trusted parties, for example high-street boutiques, in other cases, such as making purchases from less trusted parties, this technology could make a huge difference. Authentication may also facilitate the trade in these products, even if in some cases for the sake of tradition or the social factor customers will continue to purchase from trusted parties.

While authentication offers huge benefits, it also has certain limitations. As Kaminska (2016) explains, using a tuna supply chain as an example, the key challenge may lie in developing means and rules for authentication so that certain products fulfil predefined conditions, and blockchain technology is not going to substitute these authentication processes. What it can do, however, is to decrease the probability that frauds occur between the production point, where authentication occurs, and the final consumer.

Interestingly, blockchain technology may not only provide disruption in well-established business models, but it can offer solutions to industries with structural problems. One example of this is real estate where illiquidity proves a structural bottleneck in the smooth operation of the market. Illiquidity is one of the consequences of two major factors: lack of trust and long closing time[2]. The current business model of real estate broker firms involves a number of players with different roles in the deal process: lawyers, banks, insurers, regulators, tax agencies, inspectors etc. Each of these has their own records and verification systems to ensure the validity of transactions from all aspects. Due to the large number of players involved, the transparency of the process is compromised, discouraging

[2] Closing time: the time needed to execute a real estate transaction once the offer is formally accepted.

casual buyers or sellers who are not fully familiar with what they can expect. All the more, in time sensitive cases, the high number of players along with the substantial administrative burden involved slow down the process to an extent that raises viability issues. The decentralised ledger at the heart of the blockchain system cuts the costs of record keeping and verification, hence the increased transparency and shorter closing time of the deal process. Protagonists of blockchain also add another element to their argumentation: through tokenisation[3], the ownership of properties can be more accessible and liquid to a wide range of potential customers (King, 2017).

Another industry where blockchain may bring a long-awaited solution to pressing structural problems is the music and media industry. Forgery and the spread of fake news hurt the industry and limit its growth potential while the rights holders of content are poised to find a sustainable business model for monetising their creative talent. Blockchain offers the prospect of bypassing content aggregators and platform providers, hence resulting in direct and efficient delivery of products (Deloitte, 2017). Not only will the new process validate the originality of the content, but a new business model of commercialisation will emerge as an opportunity. Confirmed subscribers of the envisioned blockchain community would be more willing to pay for content with the pleasing knowledge of their fees being channelled to the rightful owners. All the more, fee payment may be more customised and economical as micro-transactions will be the basis of the new business model: each consumer will pay content owners directly for individual product items (e.g. songs or news articles) and they will no longer be forced to purchase bundles including content they do not need. As for the supply side of the industry, marketers will also achieve greater efficiency through more concentrated access to the subscriber community (Parker, 2017).

THEORY DEVELOPMENT AND DISCUSSION

We will now conclude on how different elements of a business model, such as: value proposition, value creation, value delivery, value capture, and value communication can be affected by blockchain technology.

Referring to the integrated business model by Wirtz *et al.* (2016), blockchain seems to affect several of its constituent elements. For one, this is a network model, where blockchain eliminates certain partners or changes their roles. While correspondent banking, for example, may see its end due to blockchain, the cooperation between banks at technology level can be expected to rise in importance. A number of interbank consortia, also involving technology and consulting companies, are already working on projects related to blockchain. Additionally, we could expect blockchain to affect certain key resources, such as reputation. However, we are unlikely to see reputation to disappear generally, but rather to be eliminated as a guarantee for certain transactions. As a result, the range of partners with which companies could be involved should increase and become more fluid. This is also the case for customer relationships, at least in certain products or services. As discussed previously, blockchain can affect the revenue model of certain companies, for example auditing firms. While the demand for classic documentary audit should decrease, this could be com-

[3] Tokenisation: the process of replacing sensitive data with unique identification symbols that retain all the essential information about the data without compromising its security.

pensated by audits in the field of software and by regular software testing. Further, blockchain is likely to affect value creation and will affect manufacturing processes by shortening them and eliminating parts of the processes. It will also have a decisive influence on the procurement model by providing additional reliable information that can decrease the risks of falsifying the product. Last but not least, it is going to change the financing model by facilitating access to small shareholders for whom crowd-funding will become safer and thus a more attractive way of financing new ventures.

Our findings concerning the implications of blockchain technology for business models are summarised in Figure 2.

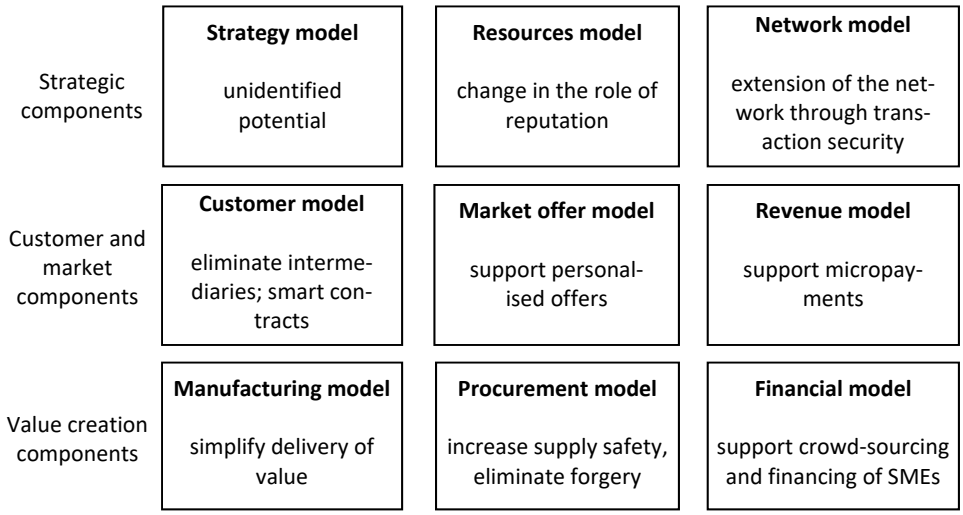

Figure 2. Potential impact of blockchain on business models
Source: adapted model based on the Wirtz *et al.* (2016) model of integrated business model.

While these are not the only ways in which blockchain technology can contribute to changes in business models, they show that the technology has a high potential. Simultaneously, there is much uncertainty as to how it can evolve. We hope that by providing this overview on the business models, blockchain and the linkages between the two, we can contribute to a discussion on how the technology will affect the way in which business will be done in the 21st century.

To conclude, while blockchain has the potential to disrupt numerous industries, CBI Insights mentions 27 of them (CB Insights Blog 2017), an important question is not only how often but also in what ways it can disrupt businesses. On the basis of the preceding review, we propose three ways in which business models can be affected by blockchain technology.

Proposition 1: Blockchain technology affects business models by authenticating traded goods.

In our understanding, traded goods can be interpreted in a wider sense, including any tangible or intangible goods or services that are subject to a business transaction. If these goods are complex or their authenticity cannot be immediately validated, if consumption involves profound perceptual elements, or related brand values are

high, the need for authentication is strong, hence there is a business case for disruptive business models using blockchain technology.

Proposition 2: Blockchain technology affects business models by facilitating disintermediation.

The presence of intermediaries introduces inefficiencies when industries are complex, customer needs diverse and suppliers numerous. In such instances, especially when the transaction size is relatively small, blockchain technology can generate business which would be unfeasible in the presence of intermediaries and the costs which they generate. Through the democratic nature of the blockchain technology, providing wide and direct access to service providers to a large number of potential users, the business case for disruptive blockchain applications is strong. Our earlier examples concerning new businesses in the sharing economy (Slock.it, Lazooz, Akasha) illustrate our point.

Proposition 3: Blockchain technology affects business models by improving operational efficiency.

As argued in the preceding section blockchain solutions increase operational efficiency in various ways and in various industries. One of the outcomes is shortening time for transaction execution as exemplified by cases from financial and real estate industries. Another outcome is the decline in operational costs which facilitates small size transactions.

CONCLUSIONS

Blockchain technology is gaining momentum with more and more diverse applications, as well as increasing numbers of actors involved in its applications. This paper contributes to our understanding of the possible applications of blockchain technology to businesses, and in particular to its impact on business models.

It also has theoretical implications. The analysis of extant research and professional papers indicates that value creation through blockchain technology occurs in several ways. First, it is via building transaction-related trust through authenticating assets which are subjects of the transaction. Secondly, by means of decreasing costs via eliminating previously necessary intermediaries and operations. Thirdly, via improving operational efficiency, for example by means of shortening settlement times, which can boost the demand for products, decrease processing costs and generate savings which can be shared with customers (Capgemini Consulting, 2016).

Our findings also have management implications. Blockchain technology may be most beneficial when the trust in the authenticity of products is an important element of value for customers. Furthermore, benefits accruing from its application will be comparably greater if transaction costs are relatively large as compared to transaction margins. It is important to note that blockchain is going to affect not only the companies which apply this technology but also those companies which have to restructure their business as blockchain undermines their offering. The latter case is exemplified by auditing companies for which the market may actually diminish or at least significantly change once the documentation of the processes alters or virtually becomes redundant (MacIver, 2016).

This paper explores a very recent phenomenon and for this reason it relies on desk research of mostly professional sources. This methodological approach constitutes a limitation of the paper. As research on the topic expands, alternative methods, such as literature review, qualitative study based on direct feedback from companies using and developing blockchain technology or possibly also quantitative research verifying the propositions offered by this study may become more appropriate. Future research could also explore the extent, nature and depth of the impact of blockchain applications across a number of industries. The theoretical propositions developed in this paper can be regarded as starting points for future studies on the implications of blockchain technology for business. This is not, however the only research direction that can be pursued as the consequences of blockchain technology are numerous. Blockchain technology, according to the Vice President of Blockchain Innovation at Nasdaq, Fredrik Voss "...only works at its full potential in a network. You need to have a complete ecosystem on the blockchain for it to offer maximum value to all its participants." (Nasdaq, 2016). This suggests that further understanding of possible blockchain applications and how they can be implemented would benefit from applying findings on entrepreneurial ecosystems and open innovation. This we consider an interesting area for future research.

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