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The Impact of Blockchain Technology on Business Models in the Payments Industry

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Abstract. Because of its potentially disruptive influence on business models (BMs), blockchain technology has sparked a lively debate among researchers. Our Delphi study sets out to explore the impact of blockchain in payments, which represents a major cornerstone of banking and the cradle of this technology. The results, grouped around four areas of thoughts, indicate that blockchain allows the offering of new services and renders some of the current ones obsolete. This consequently impacts the financial structure of firms in the payments industry and further generates great potential for new BMs while making some existing ones obsolete. Eventually, new players, which are better able to leverage the potential of blockchain, will give a strong impulse to this development. Our findings contribute to the literature by providing new insights about the impact of innovative technologies on BMs and have further practical implications by presenting a better understanding of future BMs in payments.

Keywords: *blockchain, business model, Delphi method, innovation, payments industry*

1 Introduction

Technological changes pose new challenges and generate further opportunities for firms. In particular, innovative technologies have the potential to modify the equilibrium among the firms in an industry. Leading firms consistently fail to stay at the top of their industry when technological discontinuities occur [1]. Not promptly identifying their impact on the business model (BM) may even result in a ruinous error [2]. Examples are the introduction of digital cameras, smartphones, and online streaming. Companies such as Eastman Kodak, Nokia, and Blockbuster had to leave the market because of their inability to adapt their BMs to a changed technological environment. Hence, it is extremely important to clearly assess the consequences that the introduction of new technologies for the BMs in the affected industry can have.

During the last years, the financial services sector has gone through far-reaching changes partly due to the recent financial market crisis. Nowadays, the move toward digitalization of processes and products is further pushing banks and other financial institutions to rethink their strategies, BMs, and operations. The advent of new technologies, combined with a decline in margins and the rise of new competitors, are pressuring incumbent companies to find viable solutions that would allow them to cope with

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the new environment. It is under this scenario that especially a technology named blockchain is attracting the attention of the actors in the financial sector for its potentially revolutionary enhancements of operations and financials. Following [3], blockchain technology stands for a radical shift to direct transactions between end parties without current intermediary services building on a consensus mechanism to verify new transactions, and a decentralized record keeping of all transactions.

Although the misuse of bitcoins has aroused some skepticism in the payments industry, the technology behind this early form of new digital currency has gradually imposed its evocative presence. Over recent years, blockchain-based applications have multiplied and use cases that cross over the boundaries of the payments field have been envisioned. Blockchain is thought to have an extraordinary potential [4,5] and its adoption in the payments industry is believed to be groundbreaking [6].

Nevertheless, even if preliminary predictions about the effects of blockchain for specific parts of the financial sector have been made, a clear delineation of the consequences that it might have for the overall payments industry has yet to be identified. To address this point and contribute to the literature related to BMs and technological innovations, this article answers the following research questions: *How does blockchain technology impact current and new business models in the payments industry?*

The results are based on a Delphi study among experts in the payments industry knowledgeable about blockchain technology. The study is composed of three rounds. In total, 45 experts from several European countries have agreed to take part in the study. The results, grouped around four areas of thoughts, indicate that blockchain technology will affect the BMs in the payments industry by (1) allowing new services and making some of the current services obsolete. (2) Through this change in services, a subsequent impact on the financial structure of firms in the payments industry is realized. (3) This generates a great potential for new BMs in the market while some existing ones become obsolete. (4) Eventually, the industry is impacted by new players that are better able to leverage the potential of the technology. Our contribution lies in the analysis of the impact of new technologies on BMs using the example of blockchain technology.

The remaining part of this article is organized as follows. Section 2 outlines the conceptual background of the paper. In particular, it covers cornerstones of BMs as well as blockchain technology and delineates the current situation of the payments industry. Section 3 explains the methodology of our study, whereas section 4 presents the results of the Delphi analysis. Section 5 discusses the implications and limitations of the study. Section 6 concludes the paper.

2 Background

2.1 Business Models

BMs are a relatively new concept in management studies [7]. The first apparition of the term can be dated back to 1957, but it is not until the end of the twentieth century that it has broadly attracted the attention of researchers [8]. Although a specific definition

has still to be found [9], a BM has been identified as the "story that explains how an enterprise works" [10] or also as the way firms do business. Further definitions of the term have been proposed in the past. Nevertheless, the concept of value represented a central aspect in many of the descriptions given by researchers since the early studies published around the topic [9–13]. Therefore, the definition of BM adopted in this paper follows this approach established around the concept of value by Osterwalder and Pigneur [12], which identifies a BM as "the rationale of how an organization creates, delivers, and captures value".

Next to the concepts of value, strategies, and processes, research on BMs has also delineated a strong link with technology. In particular, the design of IT systems able to support BMs has been one the most cited issues in the early 2000s [14]. BMs represent an intermediate layer – the link between a firm's strategy [8], processes [15], and information technology (IT) [7,16]. This relationship between IT and BMs is fundamental to understand, design and leverage organizations [16]. Technological innovations alone do not assure the success of a firm [17]. A BM is important to secure a competitive advantage [18] and to mediate between the development of technologies and the creation of economic value [13] as well as firm performance [19]. It is essential to capture the value from an innovation and assure its commercial success [11].

The link between BMs and technology further assumes a particular relevance when analyzing the introduction of technological innovations in a specific industry. Inertly maintaining longstanding beliefs and not adapting a company's BM to technological discontinuities has proven to carry fatal consequences [2]. Evidence from the drug industry suggests that in order to have such an effect, new technologies should "create new dependency ties and reshape collaboration patterns" [20]. Therefore, it is imperative to assess opportunities and challenges engendering from technological changes. This article uses the blockchain in payments to evaluate the impact that a new technology has on the BMs of firms in this specific field.

2.2 Blockchain Technology

Blockchain has been initially launched as an approach to payment transactions based on cryptography to provide an alternative mechanism for the trust between two transacting parties [21]. This technology enables a collective bookkeeping system (ledger), which, by means of a mathematical function (hash function), allows participants to reach an agreement on the approval of a transaction. The information concerning single transactions is gathered in 'blocks'. These blocks are reviewed and verified by the network and added in a chronological order on the computers of all participants of the network. A distributed ledger of verified transactions of a particular unit is then provided to the network. As such, the traditional role played by financial institutions as trusted third party, able to mitigate the risk behind a transaction, is under scrutiny.

Bitcoin was the first digital currency and remains the largest until now [22]. Furthermore, it represents one of the most famous applications of blockchain technology. Nowadays, blockchain is being proposed as a solution for a broad spectrum of transactions,

which range from real-time payments between two parties (rapid settlement and without requiring a bank account) to transferring funds across currencies (micro payments, remittances), and digital assets (digitally stored records of ownership).

The impact of blockchain technology might go much further than some modified processes and a few new products and services. A number of authors expect that the consequences might be much further reaching in that entire BMs will be affected [4,5]. In this sense, the impact on BMs through blockchain technology might be a good example for the far-reaching potential of IT [23].

Accordingly, blockchain technology or the more general term of distributed ledger technology (DLT) has raised huge interest in the Information Systems (IS) community, e.g. with regard to trust and cryptographic aspects [24], to the procedure and implications [3], as well as to diverse issues of virtual currencies [25]. Hence, this paper aims to further contribute to this literature by providing an enhanced understanding of the implications that the introduction of this technology might have on BMs.

2.3 Payments Industry

The payments industry represents one of the major business fields of financial institutions. In effect, payments are not only a lucrative source of revenues, but they are the anchor product for various other services and, furthermore, a critical element in terms of customer data. For banks, payment information is a source of knowledge about the customer and, further, is an opportunity to generate points of reference to integrate business processes into the processes of their customers. Thus, losing stakes in payment transactions would cause disastrous consequences for banks.

Currently, the payments industry in Europe finds itself in a state of great upheaval triggered by regulatory as well as political initiatives. Among them it is worth mentioning the creation of the Single Euro Payments Area (SEPA), the establishment of instant payments, which is already decided and on the way, the revised payment services directive (PSD2), which will become effective in 2017 in all EU member states, and the regulation on interchange fees (EU 2015/751). Most of the current projects serve the goal to harmonize the euro payments market in Europe, as well as to encourage more competition and open the market to new entrants.

Globally, the emergence of smartphones has allowed new players, such as large technology and telecommunication enterprises, entering the market. Furthermore, numerous companies from the fintechs arena (start-up companies in the financial services sector relying heavily on IT) have emerged.

Squeezed in between the need for investments in compliance and IT, the erosion of income from traditional sources, and increased competition, the BM of many financial institutions is already under pressure. Therefore, any further attempt to make the current payment infrastructure obsolete or to pull away payment transactions from banks and other financial institutions strongly contributes to deteriorating their BMs. In this regard, blockchain technology represents a fearful threat, especially since it might switch off the third-party function of financial institutions in payments. At the same time, however, the reduction of costs that could be realized by the use of blockchain in payments induces financial institutions to closely look at its development.

This promising potential of blockchain technology has roused large attention at existing payment infrastructure operators such as SWIFT, providers of international payment transactions as well as regulators. Enterprises from both technology as well as the financial services sector are considering and launching prototypes of blockchain-based solutions. In particular, incumbent companies try to defend their BMs by applying a range of strategies from developing in-house platforms to directly investing in blockchain companies, partnering with them, or offering accelerator services to explore blockchain applications.

Large banks have started to participate in worldwide collaborations (e.g. R3, among them Citibank, Credit Suisse, Deutsche Bank), and almost all major consultancies as well as auditing firms offer their expertise and try to position themselves as the leading knowledge carriers.

3 Research Method

The analysis at the center of this paper is based on a Delphi study conducted among experts from the payments industry knowledgeable of the blockchain technology. Given the lack of existing research and the exploratory nature of our study, open qualitative interviews would have been an option. However, the industry still shows a high degree of uncertainty on the study's topic. Furthermore, based on our industry insight, specific expertise could clearly be located. This advised a multi-stage study in a more formalized and group-oriented approach. Therefore, the Delphi approach was the method of choice [26]. The Delphi method was developed in the 1950s [27] and has become a common tool for measuring and aiding forecasting and decision-making [26]. It is especially appropriate for exploratory theory building on interdisciplinary issues, which often involves new or future trends [28,29]. Hence, the method is highly recognized in research concerning technology forecasting [30,31] and has been used extensively in IS research to identify and rank key issues for management action [32].

The Delphi method allows for the discussion of a complex issue through a structured communication process [33]. Dakey and Helmer [27] define Delphi as a method that attempts to obtain the most reliable consensus of a group of anonymous experts. Four distinct characteristics are presented by von der Gracht [34]: anonymity, iteration, controlled feedback, and statistical group response. With respect to our research aim and as suggested by Murry and Hammons [35] we chose a 3-round procedure. In this regard, we follow Fan and Cheng [36], who suggest three rounds as being sufficient to reach consensus and borne in mind time constraints which might influence the method [34].

Round one (R1) aimed to derive panelists' insights and opinions. In round two (R2) panelists evaluated the results of R1. Round three (R3) asked panelists to reevaluate the results in light of the group feedback. Although we recognize that the Delphi method has been widely reviewed [31,33,37], we briefly outline the identification of experts, data collection as well as analysis, and explain the specifics of our study.

3.1 Identifying the Panel of Experts

The most important criterion when selecting panelists is the individual expertise on the issue under study [38]. Therefore, we took the requirements described by Hill and Fowles [39] as well as Adler and Ziglio [31] into account. Accordingly, we selected qualified experts depending on their work experience in payments and/or blockchain technology, their professional position, and the role and background of the company they work with. A key requirement for experts to be selected was a thorough understanding of blockchain technology to assess its implications on payments. In addition, a deep understanding of payments was needed to assess industry-specific consequences for BMs. For the identification and validation of experts, we used web search, talks with practitioners, and databases of professional networks. Hence, the Delphi panel was composed to be a representative mix of experts [3] and included 45 panelists: 16 (35%) from consulting, 11 (24%) from fintechs, 6 (13%) from banks, 4 (9%) from academia, 3 (7%) from public institutions, 3 (7%) from payment service providers, and 2 (4%) technology providers. The high number of consultants is explained by their current leading role in collaborative projects with banks and technology companies with regard to blockchain technology. The panel has not changed throughout the study, but size reduced due to minor dropouts. The stable core enabled us to deduce a broad range of answers from a wide spectrum of organizations while still staying with a clearly focused evaluation and consensus process [40].

3.2 Data Collection and Analysis

Due to the iterative and multi-stage nature of Delphi studies, data collection and analysis are presented jointly. In R1, we sent out 45 emails to the panelists where we asked them to independently provide ideas, thoughts, and opinions on the development of blockchain technology. According to Linstone and Turoff [33], we designed R1 with an open-end format, suggesting starting points around BMs. This was done to elicit individual perspectives, judgments, and opinions from each panelist. In order to develop a general framework in the direction of our research question, the starting points were created by the researchers as suggested by Schmidt [32]. Hence, to stimulate answers in R1, broad questions (e.g. future scenarios, products, and technology) were provided where panelist could deliver their input. All answers were submitted via an online form.

We received 38 responses. For easier reading and analysis the responses were collected in one document resulting in 20,000 words of qualitative data. In order to distil the most relevant statements, the input was coded by three independent researchers with a moderator coordinating the coding activities. First, the researchers went through all answers and developed their own code list. Second, the moderator guided the discussion among the researchers to generate one code list which reflected all relevant input. Finally, the researchers translated all codes into better readable and easily understandable statements. As an example, the code “new business models” was translated to “With the blockchain technology new business models in payments will develop”. All statements relevant to our research are presented in section 4. By means of the coding

in R1, an initial set of 45 statements was produced describing the implications of blockchain technology in payments.

In this paper, we analyze and discuss those statements which are relevant for BM research in relation to blockchain technology. The researchers identified 17 out of the 45 statements as being relevant to the objectives of this research. The statement selection was based on the following criteria: threats and opportunities for existing BMs, need for revising current BMs, implications for designing new BMs, and new service offerings in the industry with substantial potential for new BMs.

For the subsequent evaluation of the statements in R2 and R3, we had to take into account that the expert panel consists of practitioners with limited time as well as relatively low methodical understanding. Hence, to better facilitate the evaluation, the statements were presented through the use of an online tool (Qualtrics) with a strong focus on intuitive readability. In R2, we exclusively considered the 38 panelists who completed R1. These experts were presented with the statements generated in R1 and asked to provide an evaluation of each statement on a six-point Likert scale ranging from "Strongly agree" to "Strongly disagree". Six points were chosen to encourage clear decisions toward agreement or disagreement but at the same time to offer enough options for a differentiated evaluation. At the end of R2, the evaluation of each statement was received from 36 out of the 38 panelists.

This group of 36 experts was further considered in R3, where the identical statements from R2 were presented to the panelists, along with the group's responses from R2 combined with each panelist's own evaluation. Since we required a high degree of clarity to present the responses we adopted intuitively usable measurements. Hence, solely graphical representations of the evaluations were shown. This approach exceeds the standard Delphi method, but assures the correct interpretation, as Argyrous [41] stresses that the mean of ordinal data is misleading and incorrect. In the end, panelists were asked to provide their individual evaluations in light of the group evaluations in R2. In total, 34 responses were collected from R3 (Table 1).

Table 1. Response rates within the Delphi panel

Round 1		*Round 2*		*Round 3*	
Sent out	Complete responses	Sent out	Complete responses	Sent out	Complete responses
45	38 (84.4%)	38	36 (94.7%)	36	34 (94.4%)

After finishing R3 we checked group stability, as defined by Dajani et al. [42] and Linstone and Turoff [33], with the majority of panelists agreeing to the statements. Across all statements, the average for agreement was 87% and only 13% for disagreement.

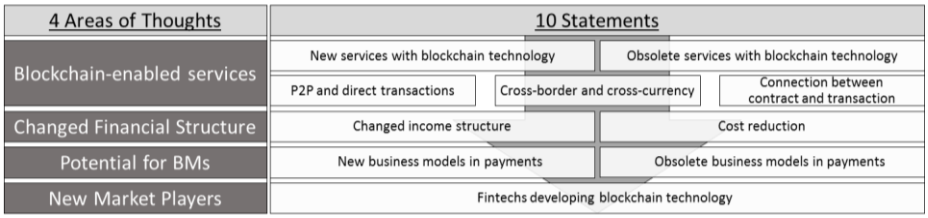
Next, we compared two statistical measures, variance and variation, of R2 and R3 to determine if consensus was achieved. The average variance was reduced from 1.23 in R2 to 0.96 in R3. Furthermore, the average variation decreased from 47% in R2 to 43% in R3. Finally, we selected those statements of the initial 17 with the highest consensus values. First, we used a predefined level of agreement of 75% on our 6-point Likert scale. This seems reasonable as similar research uses percentages between 60% [43] and 80% on a 5-point Likert scale [44]. Second, we required a variation score

below 50% as suggested by English and Keran [45]. Third, statements were excluded when the variance was above 1.0 [34]. As a result, we were able to identify ten statements meeting the before mentioned criteria.

4 Results

The ten statements are the result of the Delphi method and best summarize the implications of blockchain technology on BMs in the payments industry based on the expert panel. Figure 1 illustrates how the ten statements are synthesized into four areas of thoughts: (1) Blockchain-enabled services as a first cluster indicate how new services around peer-to-peer (P2P) and direct transactions, cross-border and cross-currency transactions, as well as the connection between contracts and transactions are being introduced. At the same time some existing services are rendered obsolete. (2) This change in services causes a change in the financial structure of firms in the payments industry. (3) As a consequence, there is a great potential for new BMs in the market while some existing ones become obsolete. (4) A strong impulse to new BMs is given by new players like fintechs, which are better able to leverage the potential of blockchain technology. Details on the opinions of the panelists are provided in the following.

Figure 1. Implications of Blockchain Technology for BMs in the Payments Industry



We see a strong consensus around the impact on payment services due to the introduction of blockchain, and we argue that there are direct implications at the BM level as the design of BMs involves the definition of services a firm delivers [11].

On the one hand, panelists stress that the development of blockchain technology allows new service offerings to be brought to the market. In more detail, experts mention three service areas, which play a major role in the further development. These services are shaping the development of BMs and are forerunners of the change to come in payments: (1) Blockchain technology is expected to make direct transactions possible without any third party acting as "*trust agent"*[1]. Hence, "*transaction can be executed peer-to-peer*" directly between two contractual parties (peers). P2P transactions can occur between identified parties such as firms or customers; but also between unidentified parties like machines (cars etc.) or even unbanked customers. Furthermore, "*transactions without a middle man*" are paving the way for decentralized trading markets. (2) Blockchain technology is thought to improve international transactions in

[1] All direct citations in this section are taken from the answers panelists provided in R1 and are formatted italic.

cross-currency and cross-border context. The huge potential of these improvements become obvious when looking at globalized trade and the high inefficiency of the current global payment infrastructure. Today, cross-border transactions are time-consuming, lengthy, and expensive. Blockchain technology will make these payments "*faster and cheaper*", i.e. faster by providing a solid, common infrastructure across borders for transactions, and cheaper by removing expensive intermediaries, thus overcoming today's "*lack of trust*". If blockchain technology allows easy international transactions based on digital currencies, currency exchange will erode as a service and remove pricey currency exchange offices. Furthermore, due to the inclusive nature of the technology, global and permissionless accessibility, current high charges for remittances by third parties will fade and erode the respective BMs as individuals can participate directly in remittances abroad. These improvements will be some of the "*biggest impacts*" of blockchain technology. (3) A completely new service blockchain technology will allow is the connection between contracts and transactions. Hence, the technology can be used to keep records of "*contracts of purchase and passing of property*" in addition to the actual transaction. Thereby, contracts of purchase can be directly linked to payment transactions, which is referred to as smart contracts. As a result, blockchain technology can be used as a "*proof of ownership*" as well as a proof of payment. The development of smart contracts will allow the "*automated execution of transactions*". Hence, smart contracts prove to be a critical cornerstone in the current advancements around the internet of things. Finally, the connection between contracts and transactions allows 'programmable' money flows and automation of transactions, which leads to decentralized autonomous organizations, where business rules are coded in the organization and executed automatically under certain conditions [46]. Further, extended service offerings mentioned in several answers, touch upon the relevance of "*making money out of data intelligence*" and data in general. The future for market players will be around payment services enhancing the traditional transaction services. Data can be used to offer "*data analytics*" to deliver deeper insights into payments, which contributes to enhanced "*fraud detection and prevention*". Other important services, which will be needed, are the conversion between traditional payments and blockchain payments as well as personal financial management.

On the other hand, blockchain technology is expected to render obsolete current payment services like third-party trust service, clearing and settlement, as well as reconciliation. As a starting point, most panelists mentioned that today's processes are "*inefficient and slow"*. They particularly refer to the current payment infrastructure (SWIFT and SEPA transactions), which require a lot of manual steps and, hence, *"transfers at a relatively high cost"*. Due to the unified record keeping in the blocks, clearing and settlement services will no longer be needed for payments based on blockchain which rather leads to the implementation of "*fully automated reconciliation*". As a result, the omission of entire process steps is expected to eliminate core services of existing BMs, questioning their existence. Ultimately, blockchain technology *"will allow equal access"* for market players, making payments a commodity.

As a consequence of new services, the financial structure of the BMs changes. The implications are twofold: On the one hand, the revenue structure resulting from pay-

ment transactions changes substantially, which means that traditional sources of revenue die out. Yet, at the same time new ones emerge. There is consensus that "*payments will be a commodity*" resulting in very low margins. Furthermore, the currently mainly margin-based revenue structure will erode with transaction fees dropping to "*even less than cents*". Current margins benefit from high complexity and artificially created boundaries between payment networks, which will vanish with blockchain technology. Revenue streams of BMs have to be shifted away from transaction-based margins and have to focus on the provision of "*user-friendly and secure platforms*" or the management of smart contracts. On the other hand, blockchain technology allows cost reductions. For example, the replacement of the currently inefficient payment infrastructure by blockchain technology will free up capital. Also the costs for processing transactions drop, making the transfer of money cheaper. "*The opening of formerly closed systems*" provides great potential to reduce costs. Overall, the increase of efficiency will "*address the rising costs*" of regulation and allow more efficient compliance due to increased transparency. For instance, "*know-your-customer processes will be streamlined*", which results in decreased costs. Furthermore, the faster execution of transactions leads to a reduced risk of default and, hence, to lower costs.

Building on the blockchain-enabled services and the changed financial structure, strong effects on BMs are observable and play a major role when discussing blockchain technology. Nonetheless, the perception is double-edged. On the one hand, we see a strong consensus that new BMs with regard to payments will emerge. For example, panelists stress the importance of data by underlying "*data analytics and further data-related services*". This is in accordance with the trend in our research, that payments-related BMs will only survive if new services are added like "*payments-extending services and products*" and thus BMs are enhanced. Only the creation of "*value-added service*", complementing current BMs, will allow financial institutions to keep their customer base stable. For example, panelists point out that future BMs will no longer build on account service fees but "*hosting and data security fees*" and will be able to "*monetize interfaces*", not just services.

Quite contrary to the great potential of blockchain technology for payments, we see, on the other hand, an equally strong consensus that some BMs in payments will become obsolete. Examples are the traditional margin-based, intermediary or trusted party BMs. The role of a trustworthy broker ("man in the middle*") "will be redundant with blockchains*". Intermediaries face the problem of complete eradication as they are going to be "*extinct because their BM is being replaced with a more efficient mechanism*". Margins cannot provide a source of revenue, as the mere execution of transactions will lose importance in blockchain systems. Blockchain features, like direct transactions, speak against the current structure of the market. This phenomenon is also recently discussed in academic research [3]. Furthermore, it is questionable if financial institutions can maintain their current function as trusted party as advancements with blockchain will enable features like direct transactions and equal access to the market for all participants. It is noteworthy that participants compare the "*future role of payment service providers to the letter mail in the age of the internet*".

Finally, the described changes and implications give rise to new market players. As new players, and particularly fintechs, enter the market, new BMs are expected. Following the panelists, fintechs will play an important role in the context of blockchain technology application in payments. Panelists see fintechs as an "*enabler for market infrastructure*" and as "*specialized providers from outside with a catalytic role*". The increasing number of fintechs like Ethereum and Ripple supports this view. Moreover, there are certain structural and technological boundaries in existing financial institutions that make it hard to change the underlying technology the business is running on (e.g. back office software, inter-organizational payment networks, supra-authority infrastructure). In contrast, fintechs have the advantage of being able to decide for a new technology with fewer dependencies and, hence, adopt blockchain technology considerably quicker. They will play out their advantage to occupy parts of the value chain and offer services industry-wide, which will force existing players to "*acquire white label blockchain solutions*" from fintechs to stay in the market.

5 Discussion

This paper is motivated by the debate on the influence of blockchain technology [24,47] and the growing body of literature on cryptocurrencies [25], combined with the necessity to assess how this would impact BMs in the payments industry.

Our findings indicate that changes due to the introduction of blockchain are reflected in new services as well as new revenue structures and eventually new BMs. Following the definition by Christensen et al. [1], blockchain technology exemplifies disruptive market capabilities, as it currently offers features, which seem uncommon or less convenient, but will change and impact the industry in the long run. The disruptive power of blockchain is further supported by previous literature on the topic [47]. Our findings add a new perspective to the literature on BMs by showing how a new technology could actually impact the BMs of firms in those industries where it is introduced. In this regard, we extend the insights provided by Sabatier et al. [20] and suggest that new technologies have the potential to disrupt the equilibria within an industry especially by undermining the service logic and the revenue structures established within this industry. To better address these situations, banks and other financial institutions in the payments industry have to rethink their current BMs and allow for experimentation. Based on the ongoing development of the technology, these firms have to better assess implications on their current services and products to prepare for the arrival of blockchains. Through cooperation with fintechs, incumbent financial institutions could be better able to benefit from the fintechs' dynamism while limiting the need for large and risky investments until a clear path for the development of the technology has emerged. As first cross-currency transaction conducted by some international banks and the fintech Ripple indicates, a couple of financial institutions have already adopted such an approach.

With the elimination of process steps, the impact of technology will also be reflected in the firms' business processes. Furthermore, we acknowledge the transformative power the technology also poses on society. The inclusive character of blockchain, equal access for all participants and almost zero participants costs, allows addressing

the unbanked customer in the developed as well as developing part of the world and new BMs can offer a wide range of services to those customers [48].

The technology is still developing and a lot of try-outs, prototypes and experiments are needed. Nonetheless, the technology receives a lot of attention and was recently added to Gartner's hype cycle of emerging technologies in 2016. Interestingly, blockchain is placed at the peak of the cycle, which shows the attention it has raised as well as the inflated expectations it faces. Still, moving along the hype cycle does not mean that the technology is a temporary hype as some critics raised in the academic literature might suggest [49]. Instead, the development shows the different stages technologies are going through and our findings do not refer to temporary effects. Nonetheless, the full potential of the technology is still not completely foreseeable and the application of blockchain is still highly context-specific. Not every setting in the payments industry is suitable and a number of questions remain unanswered [3]. Questions raised by our panel of experts such as "*For how long shall systems work in parallel?*" or "*Will the technology prove successful and actually make things better?*" still remain open.

Limitations of our research include the reporting of primarily positive aspects of blockchain technology by the experts in R1. Hence, positive aspects seem to outweigh, which can be explained by the fact that people naturally tend to report aspects they are aware of or agree with. Thus the statements focus less on possible drawbacks. Experts were asked for their opinions and judgments on blockchain technology, which might sometimes be far from real use cases or first prototypes. Not every expert necessarily has gathered personal experience with the technology. Furthermore, the expertise on this new technology is still immature and uncertainty remains.

Blockchain technology is at a young age and research on the matter is still scarce. Future research should deepen the findings of this paper in two directions. First, as described by Al-Debei et al. [15], we see implications from BMs to the underlying business processes. Hence, an analysis of business processes at an intra-firm level is promising and allows studying implementations of blockchain technology within fintechs or first prototypes developed by incumbents. This could also be deepened with a case study analysis and/or interviews with founders of fintechs with the focus on blockchain. Second, there are interactions between the BM and the overlying business strategy [15]. Therefore blockchain technology, as it impacts BMs, also yields strategic implications. Strategy has to include digital technology and to establish a closer link between business and IT [50]. Therefore, studying the impact of blockchain technology on BMs and corporate strategy will provide a better understanding of the fusion of business and IT strategy [50].

Our results led to a research agenda in the field of blockchain technology. First of all, it appears to be decisive to better understand new, customer-centered services enabled by blockchain technology and how these services could be used in existing and new BMs in the field of payments. An analysis of the services will also allow to investigate the interplay between new and existing players. Next, it is fundamental to analyze the changes in the cost structure and, hence, the financial benefits of blockchain as costs represent a major driver for the adoption of new technology and changes to the BM. From the adoption and integration of blockchain technology, researchers can deduce the adaptions needed for existing BMs and the potential for new BMs.

6 Conclusion

Blockchain is a new technology with potentially disruptive power, which yields implications for a number of industries [47]. First applications arose in the financial services sector with bitcoins [21], which puts the payments industry at the center of innovations around blockchain technology. Our study is the first of its kind to gather a high number of experts and gain a better understanding of the implications on BMs in the payments industry. Our paper outlines the changes due to blockchain technology, which are clustered in four areas of thoughts. First, new services are introduced, which foster P2P transactions, cross-border and cross-currency transactions, as well as the connection between contracts and transactions, and, hence, make current services obsolete. As a consequence, financial structures of existing BM will change. Third, these changes will be reflected in the development of new BMs, making some existing BMs obsolete. Finally, these changes create a potential for fintechs to enter the market by leveraging blockchain technology.

Summarized, our research delivers insights into how changes in payments, due to blockchain technology, progress and in what directions firms have to think to overhaul their BMs. Our research contributes to BM literature by analyzing the impact of new technologies. Furthermore, the findings yield new research avenues, which are promising to further explore the topic of blockchain. In the end, the saying "one secret to maintaining a thriving business is recognizing when it needs a fundamental change" [18] might prove right once again with BMs in payments.

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