

Blockchain technology and its effects on business models of global payment providers.

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ABSTRACT,

Because of its potentially disruptive influence on business models, blockchain technology has sparked interest in the payments industry. This paper aims to explore the effects of blockchain technology on business models of payment providers involved in cross-border payments. The results of the case studies indicate that blockchain technology offers a new model for cross-border payments and can facilitate the more efficient processing of payments, cutting out intermediaries out of the process and in turn lowering the costs of transactions significantly. As a result, blockchain technology allows the offering of new services and causes some of the current practices obsolete. This technological innovation impacts the current infrastructure in the payments industry and generates potential for new business models. Eventually, companies which leverage the potential of blockchain technology to a better extent will prevail. Blockchain technology has the potential to be a force of technological disruption but will require collaboration between innovators, incumbents and regulators, adding complexity and delaying implementation. These factors make the preparation of business model innovation promising but also troublesome. The findings contribute to theory by providing new insights about the impact of innovative technologies on business models and have further practical implications by its contribution to the understanding of the possible applications of blockchain technology for global payment providers, and in particular to its impact on the business models.

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Keywords

Blockchain, cross-border payments, business models, fintech, innovation, payments industry

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1. INTRODUCTION

Technological changes come with new challenges and opportunities for companies. Innovative technologies have the potential to cause disruption in an industry. Companies at the top struggle to maintain their position when technological discontinuities occur. Not identifying the potential impact on the business model may have devastating results (Christensen, 2015). For example, when digital cameras, online streaming, and smartphones were introduced, dominant companies Kodak, Blockbuster and Nokia had to exit the market because they were unable to adapt their business models in a changed technological environment. Thus, assessing the consequences that an introduction of a new technology can have for the business model is of critical importance.

1.1 Payments Industry

The payments industry is one of the major business areas of financial companies. McKinsey estimates that the payments industry makes up 34% of the global banking industry (McKinsey, 2017). Payments are a source of revenues and a critical element in terms of customer data, as it is a source of knowledge about the customer. Thus, losing stakes in payments would have serious consequences for banks. Due to the recent market crisis, the financial services sector has gone through many changes during the last years. According to Chris Mager of BNY Mellon: *"Payment systems collectively are currently under a lot of pressure, as there has been the urgency to modernize payments and to address the questions of safety and security since the 2008 financial crash"* (Fintech Network, 2017). Existing payment systems are old, costly and slow. Cross-border payments can take days to complete and involve fees of up to 10 percent (Credit Suisse, 2016). Transferring money across international borders often involves sending money to people via money transfer operators and banks. Such transactions are known as remittances and are a large and growing business. For instance, expats send home more than \$600 billion during 2016 (World Bank Group, 2015). The global payments industry continues to grow, with transaction volumes and account balances showing healthy developments. This positive scenario lays the groundwork for technological disruption which can change the dynamics between fintechs and financial institutions (McKinsey, 2017). The trend of digitalization of services and processes is pushing financial companies to rethink their business models and strategies.

1.2 Blockchain

A technology named blockchain is attracting attention in the fintech industry because of its potential to revolutionize operations, financials and business models (Deloitte, 2016). In a report, Deloitte states that blockchain *"is a technology that could transform the very infrastructure of financial services. It offers a chance to reimagine the industry, rebuilding financial processes into something simpler, more efficient and often altogether new. Blockchain also challenges many of the assumptions underlying today's business models"* (Deloitte, 2016). In just three years, blockchain has more than 2,500 patent filings and over \$1.4 billion in investments. More than 24 countries are investing in it, 50 corporations have joined consortia around it, and 90 banks are discussing its potential. It is predicted that 80 percent of banks are initiating blockchain projects (Deloitte, 2016b). Blockchain is fundamentally the technology used to support the cryptocurrency Bitcoin, but the underlying technology is now explored for applications that do not involve Bitcoin. Payments with Bitcoin are relatively slow because of the number of transactions taking place while the

block size is limited, and as a result, sees the highest transaction fees in the cryptocurrency space. Bitcoin would not make a suitable candidate to handle a large volume of transactions as needed in the global payments industry. Other blockchain projects have emerged trying to solve this problem and offer a suitable solution to this case. Blockchain technology enables a collective bookkeeping system, called ledger, which, by means of a mathematical function, called hash function, allows participants to reach an agreement on the approval of a transaction. The information about transactions is gathered in blocks. These blocks are reviewed and verified by the network and added on the computers of all participants of the network. A distributed ledger of verified transactions is then provided to the network. The blockchain is a public, trusted and shared ledger (The Economist, 2016b), based on a peer-to-peer network, meaning no one controls it, instead it is maintained by thousands of participants, making it a shared ledger (The Economist, 2015). Since the blockchain is available to all the participants, it is a public ledger (The Economist, 2016b). The information that is recorded on the blockchains cannot be manipulated without going unnoticed, making it a trusted ledger (The Economist, 2015). These elements allow information transfer on the blockchain without any intermediaries. Consequently, the role played by financial institutions as trusted third party mitigating the risk of a transaction is being questioned. Blockchain and its benefits are interesting for the payments industry, as it promises to facilitate fast, secure, low-cost international payment processing services through the use of encrypted distributed ledgers that enable trusted verification of transactions in real time without needing intermediaries (American Express, 2017).

At the moment, banks conduct transactions with each other by creating agreements. This process is slow, takes up to several days to complete and incurs the risk that one party may default. This period is called settlement time and is costing the financial industry around \$65 billion to \$80 billion a year (Wyman, 2015). Blockchain projects have the potential to eliminate settlement periods enabling timely processing of these operations. Other potential benefits for banks include secured global currency exchange rate speeds and increased transaction security, which are accompanied by the replacement of traditional back-office clearinghouses and other outdated mediums that are still in place (Techcrunch, 2018). A number of financial companies have been involved in the development and use of Ripple's blockchain network called Ripple protocol. Ripple offers technology to send money over the world using the power of blockchain. Financial companies can join Ripple's network which allows them to process payments anywhere in the world instantly and cost-effectively. Banks and payment providers can use the technology to reduce costs and access new markets. The use of this technology enables companies to bypass existing banking infrastructure, with the goal of accelerating payment and reducing cost (Fintech Network, 2017). Many other financial companies have started implementing blockchain projects in order to test its potential. Recent research on blockchain in the payments industry has indicated that blockchain allows the offering of new services and renders some of the current ones obsolete. This, as a result, impacts the financial structure of companies in the payments industry and allows new business models while making some existing ones obsolete (Holotiuk, Pisani, Moormann, 2017). The key purpose of this paper is to discuss how blockchain technology may contribute to disruption and innovation in business models of global payment providers. The ability to use new technologies in order to create new innovative business models is an important source of competitive advantage (Baden-Fuller & Haefliger, 2013). Thus, it is important to

understand how new technologies, such as blockchain, can affect business models.

1.3 Relevance

The goal of this paper is to explore the possible implications of blockchain technology utilized for cross-border payments in the global payments industry. The relevance of this paper is in its contribution to the understanding of the possible applications of blockchain technology for global payment providers, and in particular to its impact on the business models. The findings contribute to theory by providing new insights into the effect of innovative technologies on business models. The paper will answer the following research question: How can blockchain technology utilized for global payments improve the business models of global payment providers?

2. THEORETICAL FRAMEWORK

Business models are a relatively new concept in management studies (Al-Debei, 2010). The roots of the term can be dated back to 1957, but only at the end of the twentieth century have business models attracted attention (Osterwalder, Pigneur & Tucci, 2005). A business model has been identified as the story that explains how an enterprise works (Magretta, 2002), or also as the way companies do business. This paper follows the approach established around the concept of value by Osterwalder and Pigneur, which identifies a business model as to how organizations create, deliver and capture value. (Osterwalder and Pigneur, 2010). In particular, it is a conceptualization of an organization which includes the following key aspects: (Chesbrough, 2010; Osterwalder, 2004)

- (1) How key components and functions are integrated to deliver value to the customer.
- (2) How those parts are interconnected within the organization and throughout its supply chain and stakeholder networks.
- (3) How the organization generates value, or creates profit, through those interconnections.

A clearly understood business model can provide insight into strategies and actions of an organization, which in turn supports strategic competitiveness (Casadesus-Masanell and Ricart, 2010). Making the connections between an organization's business model explicit helps discovery of previously unseen opportunities for value creation by transforming existing actions and connections in new ways. This, in turn, supports business model innovation (Johnson et al., 2008). According to Gambardella and MacGahan (2010), business model innovation occurs when a company adopts a new approach to commercializing its underlying assets. Bucherer, Eisert and Gassmann (2012) define business model innovation as “a process that deliberately changes the core elements of a firm and its business logic”. The link between business models and technology is of special relevance when analyzing the introduction of technological innovations in an industry. Maintaining traditional beliefs and subsequently not adapting a company's business model to technological changes has proven to carry fatal consequences (Tripsas, Gavetti, 2000). Therefore, assessing opportunities and challenges coming forth from technological changes is of critical importance.

2.1 Business Model Canvas

The Business Model Canvas is a strategic management template for developing new or documenting existing business models.

This tool depicts a clear picture of a complete business model while describing the various elements of a business model (Osterwalder and Pigneur, 2010). The canvas divides the business model of an organization into nine interconnected components.



Figure 1. Business Model Canvas (Osterwalder, Pigneur, 2010)

- Key partners define the cooperation of a company with other organizations in order to execute the activities related to the value proposition.
- Key activities describe the actions that a company performs in order to deliver the value propositions to its customers.
- Key resources describe the inputs and capabilities that a company utilizes in order to deliver value to its customers.
- Value proposition defines the products and services delivered by a company to fulfill customer needs.
- Customer relationships define the relationship a company builds and maintains with its customers.
- Channels define how a company gets in touch with its customers and delivers the value proposition.
- Customer segment describes the type of customers a company wants to target by offering their value proposition.
- Revenue streams describe the generation of money by offering the value proposition.
- Cost structure describes the costs incurred by a company for delivering the value proposition to its customers and conducting other business activities.

This framework is chosen to study the effects of a potentially disruptive technology on current business practices, and its implications for business model components. Each component of the canvas is inspected in order to assess the effect and potential of the implementation of blockchain technology for cross-border payments by global payment providers. Having a clear overview of the different elements of a business model helps to understand the effects and implications for a business model on a deeper level. This, in turn, helps to see challenges and opportunities more clearly.

3. RESEARCH METHODOLOGY

A multiple-case study is conducted in order to study the implications of disruptive technology on business models by inspecting the qualitative evidence. Additionally, an expert interview is conducted in order to validate the findings from the case study. The theoretical framework, the Business Model Canvas, is applied to the findings and the results are linked to the research.

A case study is one of several ways to conduct research. Since the topic of research is a novel technology, it is interesting to examine current and ongoing implementations in order to explore its potential implications. According to Yin (1994), research questions containing "how" or "why" have a distinct advantage when conducting case study research since these questions are more explanatory and likely to lead to the use of case studies and experiments as the preferred research strategy. A multiple-case study is chosen over single-case study, since the evidence from several cases is often considered more compelling, and as a result, the overall study is regarded as being more robust (Herriott, Firestone, 1983). In order to assess the consistency of the findings, a cross-case analysis is conducted. A common concern about case studies is that it is hard to make scientific generalizations. According to Yin (1994) "a case study is generalizable to theoretical propositions and not to populations or universe". The second concern about case studies is that they take too long and result in massive documents. Since the topic of study is relatively novel, the cases lack extensive information, resulting in condensed findings.

In order to conduct a successful case study, the research design contains five components: (Yin, 1994)

1. The study's question:

How can blockchain technology utilized for global payments improve the business models of payment providers?

2. The proposition:

Blockchain technology has the potential to facilitate the more efficient processing of payments.

It is expected that the implementation of the technology is of disruptive nature and will go along with several critical changes in business models. The research proposition is that the implementation of blockchain technology for global payments will result in changes among the following Business Model Canvas components of payment providers;

- Key partners: cutting out intermediaries.
- Key resources: new technological infrastructure.
- Cost structure: lowering transactions fees.
- Value propositions: the ability to offer near-instant transactions.

3. The units of analysis:

Companies in the payments industry which are involved in blockchain projects for global payments. Data for the case studies will be gathered by desk research from papers, journals, reports, news articles, company websites and expert opinions. Additionally, an expert interview is conducted to gather empirical data.

4. The logic linking the data to the propositions:

The data will be linked to the propositions by a technique called explanation building. Explanation building is about finding an explanation of why a particular state of affairs exists. In this case how analyzing why and how companies choose to adopt a technological innovation.

5. The criteria for interpreting the findings:

As the data is of qualitative nature, the criteria to interpret the evidence is significance. The evidence should be important, meaningful and useful in relation to what is to be found out. This is arranged by collecting the data according to the methodology and subsequently filtering the collected data through these criteria to ensure significant evidence. Since this is a multiple-case study, a cross-case analysis is conducted in order to assess the consistency of the findings. Additionally, the empirical data from the expert interview will be used in order to validate the findings.

4. ANALYSIS

Currently, many financial institutions are conducting experiments and pilots with blockchain technology. For this paper, the cases involving cross-border payments are of interest. The implementation of blockchain technology by companies involved in cross-border payments is analyzed. In the end, the cases are compared in a cross-case analysis and an expert interview is conducted in order to validate the findings. Finally, the findings are linked to the theoretical framework in order to understand the implications for business models.

Three cases are selected, which have multiple applications and companies involved. These cases are selected because they involve the most important blockchain projects in the global payments industry. While these cases operate in the same industry, they focus on different segments, making them indirect competitors. The cases help to answer the study's research question by giving an insight into the application of blockchain technology in global payments, the benefits and drawbacks.

4.1 Current situation

First, we start by describing the current situation. Currently, the infrastructure of global payments moves money from payment system to payment system through a series of internal book transfers across financial institutions. Most international transactions are executed through the SWIFT network, a co-operative society founded by seven international banks which operate a global network to facilitate the messaging of financial transfers. Using this messaging system, banks can exchange data for funds transactions between financial institutions. SWIFT provides a network that allows over 10,000 financial institutions in 212 different countries to send and receive information about financial transactions to each other (Transferwise, 2018). SWIFT does not actually send money, it just sends messages between the banks. As a result, other systems requiring more human intervention must be used to transfer the actual funds and this makes SWIFT transfers slow and costly because of the complex nature of these transactions. Subsequently, in order to conduct international payments, a bank has to pre-fund a bank account or establish a line of credit with a correspondent bank. The correspondent bank provides the liquidity for these international payments in local currency accounts overseas, either itself or through partnerships. This construction eliminates the need to maintain individual nostro accounts in many currencies for smaller respondent banks, but it requires many correspondent relationships (Ripple, 2016). A nostro account is a bank account held in a foreign country by a domestic bank, denominated in the foreign country's currency and used for cross-currency settlement. As the demand for cross-border payments is increasing, the system is cost-prohibitive and inefficient (Ripple, 2016). Specifically, the system has four issues:

First of all access: For financial institutions, it is too expensive to fund positions around the world to service cross-border transactions. Instead, they rely on multiple correspondent banks to provide access to global currency corridors.

Second is certainty: Sets of intermediaries route payments and relay messages independent of funds settlement. With several potential points of failure and limited transaction visibility, the system results in frequent errors, unpredictable processing times, and uncertainty in the delivery of funds.

The third is speed: Global payments can take up to seven days of processing time, depending on the currency corridor. The

more parties involved, the longer transactions take to settle, especially across different time zones.

And the fourth is cost: Currently, banks absorb significant costs in order to service global payments, such as payment processing, treasury operations, FX, liquidity and compliance.

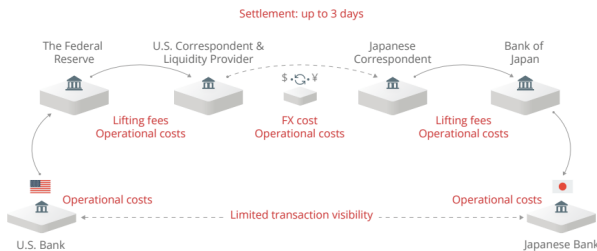


Figure 2. Cross-border payment example (Ripple, 2016)

Above is an example of a cross-border payment, where a United States bank is sending a payment to a Japanese bank. The United States bank transfers funds to a local correspondent bank. The United States correspondent bank holds a nostro account with a Japanese correspondent, which then provides forex for the transaction. The Japanese correspondent debits the United States correspondent bank's nostro account and credits the receiving bank through a funds transfer. As seen, this transaction involves many intermediaries which limits transaction visibility, takes several days to complete and comes with many fees.

4.2 Case studies

Digital assets are cryptographically-secured tokens which can be transferred almost instantly between two parties without the need for a central counterparty. As an asset without counterparty, the tokens can facilitate better provision of liquidity without expensive operational costs which results from opening and maintaining many bank accounts (Ripple, 2016). Here follow several cases involving digital tokens utilized for cross-border payments.

4.2.1 Ripple

The first case is about fintech company Ripple, an enterprise blockchain solution for global payments. Ripple promises a frictionless experience to send money globally by utilizing the power of blockchain. With Ripple people can send payments to anyone in the world in seconds, in any currency, with lower fees than any existing payment system. Ripple promises instant cross-currency payments: people can send one currency and the recipient receives another. Customers are no longer tied to the wide spreads which are currently seen in currency exchange rates, since the Ripple's network finds the best price for currency exchange and liquidity automatically. All transactions are cryptographically secured on the blockchain, and can only be authorized by the account holder, making Ripple a safe method for transactions. Banks and payment providers can use Ripple to reduce their costs and access new markets. Ripple offers banks and payment providers an on-demand option to source liquidity for cross-border payments. Since payments on the Ripple network are nearly instant, it allows removal of credit and liquidity risk from the process, which in turn lowers the costs of banks considerably. Many financial institutions have already joined Ripple's global network.

The first units of analysis are ReiseBank and ATB Financial, which in 2016 have become the first financial institutions to participate in a live cross-border payment using Ripple's technology. The case study involves a live transaction of \$1,000, over the Ripple network, from ATB Financial in Canada to Reisebank in Germany. The transaction exchanged Canadian Dollars to Euro's with a settlement in just eight seconds, instead of the 2 to 6 business days it would normally take. These results show that payment providers can improve their value proposition by offering their customers near instant transactions, instead of the slow processing times their customers are used to at the moment. After the successful pilot, ReiseBank is now working to integrate Ripple in production. The financial institution is planning to use Ripple to expand its operations from Europe to the rest of the world and believes that Ripple's technology can benefit all banks providing international payments. By relying on the Ripple network instead of the traditional infrastructure, Reisebank and ATB Financial circumvent several intermediaries in the process, which affects their key partners and key resources. After the successful pilot, Frank Boberach, head of product management at ReiseBank concluded: "In the future, Ripple will enable cash-to-account and account-to-cash transfers, not just with ReiseBank but with institutions from all over the world" (Ripple, 2016).

The next units of analysis are financial institutions using xRapid, one of Ripple's solutions, in the remittance corridor between the United States and Mexico. The solution eliminates delays in global payments and lowers costs. Aggregated results from several pilots for xRapid are analyzed. These companies saw a 40 to 70% cost reduction compared to traditional foreign exchange broker fees during the xRapid pilot. An average payment took about two minutes, compared to today's average cross-border payment time of two to three days (Ripple, 2018b). These results show that the cost structure of payment providers can be significantly improved, by reducing the liquidity costs associated with the current process. The CEO of Viamericas, a remittance company in Mexico, Paul Dwyer displayed excitement at the development, stating: "We were very pleased with our pilot results. It's clear that xRapid can lower liquidity costs while increasing payment speed and transparency in a way that facilitates rigorous compliance controls. We believe that digital assets like Ripple will play a key role in the future of cross-border payments, helping to safely address some of the structural inefficiencies of legacy settlement infrastructure as their adoption grows. We look forward to exploring next steps with Ripple" (Technewsleader, 2018). By improving the speed and the visibility of payments, payment providers can offer improved value propositions to their customers. Additionally, by relying on Ripple's network instead of the traditional infrastructure, these payment providers circumvent several intermediaries in the current payment process, this, in turn, affects their key partners and key resources.

The last unit of analysis is Santander Group. Santander is, with over 133 million customers and nearly 14,000 retail branches, one of the largest banks in the world. Recently, the global banking giant launched a Ripple based application for cross-border currency exchange. The app One Pay FX, is initially made available for Santander's customers in four countries: Spain, Brazil, Poland and the United Kingdom. Santander plans to offer the technology to more countries and will eventually support instant payments. The app is launching after two years in development and makes Santander one of the first banks to offer blockchain-based foreign exchange payments for customers (Ripple, 2018). It shows that payment providers can improve their key resources with the addition of payment

applications for customers which facilitate instant cross-border payments. Ana Botin, the executive chairman of Santander, stated that *'blockchain-based protocols for making payments are far faster, more efficient and more cost-effective while being safe and secure at the same time. The technology would allow Santander banks users to make transactions that would be available for the receiver on the same day when the initial transaction was made, which is the experience expected from a bank like Santander'* (Globalcoinreport, 2018). By living up to the expectancies of their customers, Santander bank improves their value propositions with faster and more cost-effective payment processing.

This case is in line with the study's proposition. It seems that Ripple's technology facilitates payment providers to process payments more efficiently and in turn lowering costs significantly by up to 70%. The data gathered is important because it involves prominent companies working together with one of the top blockchain companies. The data is meaningful because it contains results from multiple applications and the opinions of experts. Finally, the data is useful because it aids in answering the research question.

4.2.2 Utility Settlement Coin

The second case is about the collaboration of financial institutions on the development of Utility Settlement Coin, a new form of digital money which they believe to become an industry standard to clear and settle international trades over the blockchain. Our units of analysis are UBS, the Swiss bank, Deutsche Bank, Santander, BNY Mellon, ICAP, NEX, Barclays, HSBC, State Street, MUFG, the Canadian Imperial Bank of Commerce and Credit Suisse. They have joined forces to harness the power of decentralized computer networks and improve the efficiency of the financial market. The group is pitching the idea to central banks and aim to launch in 2018. According to Hyder Jaffrey, head of fintech innovation at UBS, *'Utility Settlement Coin allows to eliminate the waiting time for payments to arrive, which frees up capital trapped during the process. The idea is to develop a new, streamlined payment mechanism for institutional purposes, that could potentially replace clearinghouses and other intermediaries that sit between buyers and sellers of assets'* (Financial Times, 2016). The idea behind the concept is that banks will use the Utility Settlement Coin to bypass the need for inefficient and costly fiat liquidity from central banks. The Utility Settlement Coin aims to let financial institutions settle transactions without the wait for fiat money transfer to be completed. Instead, the financial institutions will use digital coins that are convertible into fiat money instantly at central banks. The coins can be converted into different currencies and are stored on the blockchain, allowing them to be swapped quickly for the currency traded. This leads to reducing the time and costs of post-trade settlement and clearing (Financial Times, 2016). Utility Settlement Coin is fully backed by cash assets held at a central bank, thus spending a Utility Settlement Coin is spending its paired fiat currency. And because the digital coins will be backed by cash at a central bank the coins are free from credit risk, since cash at a central bank cannot default (Finextra, 2017). This affects the cost structure of payment providers significantly by reducing settlement costs and liquidity costs. The primary goal of Utility Settlement Coin is wide sector adoption of the blockchain platforms that interoperate with each other. Most likely the Utility Settlement Coin will be used in the interbank market in the beginning, allowing banks to repay each other in different currencies. Allowing for more efficient processing of payments instead of going through the current cross-border settlement infrastructure. By utilizing a new

infrastructure based on blockchain technology, financial institutions change their key partners and key resources by changing the way they settle transactions over a new technological infrastructure that does not require many respondent relationships. Additionally, instead of holding local currency in many nostro accounts around the world payment providers can just hold digital assets on their own balance sheets and use it to make markets with any other currency, simplifying the key resources even more. The next step will be enabling banks to settle securities transactions via the Utility Settlement Coin blockchain, however, this requires all the relevant securities to be transferred to blockchain systems to gain the verification and settlement benefits of the technology (Finextra, 2017).

This case is in line with the study's proposition. It seems that Utility Settlement Coin facilitates banks to process payments more efficiently which frees up capital trapped during this process and in turn lowers the costs. The data gathered is important because it involves the collaboration of many financial institutions on a promising blockchain project that has the potential to change today's financial infrastructure. The data is meaningful because it contains case progress results and expert opinions. Finally, the data is useful because it helps to make a stronger case in order to answer the research question.

4.2.3 Stellar Lumens

The third case is about Stellar Lumens. Stellar is considered as an open source protocol for exchanging money. The Stellar Development Foundation is the company maintaining the open source decentralized network and the organization does not charge people or institutions for using the network. It's a nonprofit organization that covers its operational costs through donations and 5% of the initial tokens issued. Corporate donors of Stellar include BlackRock, Stripe and Google. Although it is the offshoot of Ripple, there are some philosophical differences. Ripple focuses on providing solutions to banks and Stellar on the other hand aims to simplify the payment system for people. Payment providers can use Stellar's digital asset, called Lumens, to facilitate cross-border payments. Instead of relying on nostro accounts globally, banks will conduct transactions using Lumens and subsequently rely on market makers to convert the Lumens into local fiat currency.

The units of analysis are IBM and KlickEx, which have an ongoing partnership with Stellar and have successfully used the Stellar blockchain to settle cross-border fiat transactions in near real-time. IBM is an industry leader in open-source blockchain solutions built for enterprises. In collaboration with technology partners KlickEx Group, a regional cross-border payments system delivering financial infrastructure for emerging markets, and the Stellar Development Foundation, a diverse group of financial institutions are working with IBM to simplify the clearing and settlement of global payment transactions using blockchain technology. The collaboration is affecting the key partners and key resources because of the utilization of a new technological infrastructure to settle transactions, cutting intermediaries out of the process. The partnership strengthens the use of Stellar as cross-border payments technology by making the digital connection of the fiat currencies on both ends of the transaction. This project involves a network of banks and encompasses 12 currency corridors. Although the platform is currently limited to cross-border payments involving Fiji dollars and British pounds, it is planned that the new interbank payments network will process up to 60% of all cross-border payments in the South Pacific's foreign exchange corridors by 2018. This new technological solution allows

banks to send money in real time whereas the old process typically took days (Storeofvalue, 2017). Near instant transactions lower settlement and liquidity costs, improving the cost structure of payment providers. So far, they have prototyped a universal payment solution to support multiple payments with a low fee structure, low operating costs, and real-time settlement. By improving the speed and visibility of cross-border transactions, payment providers can improve their value propositions. IBM plans to utilize Stellar through their settlement ledger for bridging currencies for foreign exchange and alternative assets. With their partners and clients, IBM is currently evaluating the operational integrity of the platform, take an inside look at the technology & business models, and assess the potential for first-mover advantages.

Jesse Lund, head of IBM Blockchain stated in an interview: *“Probably banks will start to refocus on what they were invented for, safeguarding deposits, paying a decent low-risk rate of return and making loans from those deposits. Charging fees simply to intermediate payments is lame”* (Lund, 2018).

This case is in line with the study’s proposition. It seems that Stellar’s network facilitates payment providers to process payments more efficiently, in near real time, and in turn cutting out intermediaries and costs. The data gathered is important because it involves a technology industry leader working together with one of the top blockchain companies, which has remarkable donors sponsoring the project. The data is meaningful because it contains case progress results and opinions of experts. Finally, the data is useful because it brings us closer to answering the research question.

4.3 Challenges and drawbacks

It seems that blockchain can resolve a number of problems currently facing the payments industry. However, as the saying goes, when you have a hammer everything looks like a nail. We have to take the drawbacks and challenges into consideration to come to reliable conclusions. Before blockchain can be fully implemented as a viable alternative that can garner trust from the public, payment providers and fintech companies are still facing a number of challenges. There is the question of how blockchain solutions can integrate with existing banking and payment systems and also with each other. In order to make the technological switch, there needs to be collaboration and consensus between different parties and stakeholders which will take time. Then there is regulatory uncertainty. Currently, there lacks a central standard or organization that monitors and regulates blockchain protocols. According to Chris Huls of Rabobank, *‘eventually there will have to be some form of central governance but, all parties will need to be careful where*

the power lies” (Fintech Network, 2017). Considering the power of blockchain lies in its decentralized nature. However, it will take time to develop internationally accepted regulations, which slows down innovation and wide-scale adoption. Also, experts question whether the technology would be able to handle the volume that comes with the scale of institutional markets. For instance, the global payment network SWIFT processes of up to 30 million messages in a day. This volume requires a significant amount of infrastructure and computing power. Then there are question marks regarding whether these developments will cause central banks to issue their own digital coins. Lund stated: *“I expect that we’ll see, sometime this year, a central bank at least putting its big toe in the water to issue a digital denomination of their fiat currency into the wild,”* (Lund, 2018). Subsequently, there are case related concerns such as those among Ripple investors that the company is pushing the blockchain technology to banks without promoting the adoption of its underlying digital coin XRP. Many of its partners are not using the XRP for liquidity, but rather the blockchain technology itself as a tunnel for money transfer. If more and more banks choose to avoid using the digital coin, the currency will see a major loss in its appeal and security. Another concern is that Ripple owns about 60% of circulating XRP, and even though the likelihood of a massive sell-off is minimal, they have the 51% advantage and hence control the blockchain. This fact would beat the most appraised characteristic of blockchain technology, namely its decentralized nature. Finally, experts are questioning whether this technological disruption will actually benefit processes in the end. Blockchain is ranked in the ‘Peak of inflated expectations’ on the Gartner Hype Cycle. Gartner does not expect large returns on blockchain until 2025 (Gartner, 2016). Which means companies will have to try different blockchain projects to assess if there is value for them in blockchain technology and determine if there will be cost savings, new revenue possibilities or improvements in their customers’ user experience. However, obtaining that value may require companies to wait until the technology is more robust and more reliable (Pettey, 2018).

4.4 Cross-case analysis

Next, a cross-case analysis is conducted in order to assess the consistency of the findings. During the analysis of the cases, many similar features of blockchain technology utilized for global payments are recognized. These features are aggregated in the left column of the table below. For every case is checked whether it meets the characteristics, so in the end, the consistency of the findings can be determined.

	Utility Settlement Coin	Ripple	Stellar Lumens
A new payment infrastructure for cross-border payments based on blockchain technology.	X	X	X
Digital assets that allow near-instant transactions to anywhere in the world.	X	X	X
Near instant currency exchange with lower fees.	X	X	X
Lowering transaction costs significantly.	X	X	X
Cryptographically secured transactions on the blockchain.	X	X	X
Improving the traceability and visibility of transactions.	X	X	X
Elimination of payment settlement times, which frees up capital trapped during the process and reduces costs.	X	X	X

An on-demand option to source liquidity for cross-border payments, eliminating the need for nostro accounts.	X	X	X
Removal of credit and liquidity risk from the process and in turn reducing costs.	X	X	X
Replacement of intermediaries in the payment process	X	X	X
The ability to offer blockchain-based payment applications to customers, which facilitate more efficient payments.		X	X
An open-source decentralized network for the processing of transactions.			X

As seen in the cross-case analysis, almost every feature can be found in each of the case studies. This can be explained by the fact that the cases share a similar purpose. Yet, two features lack the consistency of all three cases. Namely, the ability to offer blockchain-based payment applications to customers and an open-source or decentralized network. The amount of met features does not say anything about relative value, as for instance, some payment providers might prefer a centralized network, whereas others might not. Nevertheless, taking the results from the cross-case analysis into account, we can conclude that the findings of the case studies are consistent, as all major features are found in the three cases.

4.5 Expert Interview

In order to validate the results from the case study, data from an expert interview is taken into account. Jesse Lund of IBM answered several questions during an interview covering the topic of blockchain technology utilized for global payments. He is the Head of Blockchain, Financial Services Solutions at IBM, leading IBM's blockchain market development, solutions engineering, digital currency strategy and client engagement for banking and financial services. IBM has a partnership with Stellar Lumens, thus Lund 's answers are mainly centered around that area. His answers on the topic of blockchain technology utilized for global payments can be summarized as following: (Lund, 2018)

IBM provides a validating presence on the Stellar network adding transaction processing for IBM's cross-border payments solution. The principal feature of their cross-border payments product is an application and service to transfer funds peer to peer while using Lumens in the background. Stellar is an element of IBM's blockchain strategy, supporting interoperability with leading public networks. The features mentioned by Lund confirm the study's proposition of the potential of more efficient processing of global payments.

IBM is already using Lumens in cross-border payments. Currently, at low volumes, but Lund expects that to ramp up as they launch the official branded product. Currently, the prototype is live and IBM is getting clients on board to the production version that will launch somewhere in 2018. A lot more Lumens payment volume will be seen as the transaction volume grows.

IBM chose Stellar over other cryptocurrency platforms because of its design, which supports a scalable, secure digital asset registry and built-in distributed exchange that facilitates real-time clearing and settlement across multiple asset types. Lund's explanation is in line with the findings from the case studies, the platform enables the improvement of key partners, key resources and value propositions. IBM's added value is the validating and operational presence on the public Stellar network that makes it more attractive for enterprises to deploy assets and solutions on publicly accessible blockchain networks.

Lund stated that their solution sounds similar to Ripple's technology, he acknowledges a similar pattern with Ripple where one of two primary modes of operation is the use of a digital asset to bridge between fiat currencies supporting real-time forex and the transfer of value with finality. But with Stellar, the vision goes much further. Lumens is the default native asset a built-in store of value and digital asset like XRP that is great for a lot of things, many still untapped. Stellar is much more of a platform that invites and supports the issuance of any other type of digital asset, security tokens, utility tokens, commodities, fiat currencies issued by commercial banks or central banks, etc. Stellar is thus is a highly robust digital asset and token registry foundation upon which IBM has developed a token lifecycle management system. This means that banks who do not like XRP or Lumens or other cryptocurrencies will have the opportunity to utilize digital tokens from issuers who they determine to trust. IBM is actively working with commercial banks and central banks around the world to issue these tokens, and according to Lund, they are making tremendous progress. Stellar will be the place within the IBM Blockchain Platform where these assets live because they must live on a publicly accessible network to be truly useful and universally transferable. This is further facilitated by the distributed asset exchange and order book that exists within the Stellar network, which means as more assets become available on the Stellar network, entirely new forms of primary and secondary markets will begin to emerge. According to Lund, this is the really exciting set of use cases that IBM will tackle next for financial services. Lund's answer validates our result from the analysis, which is the change in key resources for payment providers as a result of the implementation of a new infrastructure platform which utilizes digital assets for transactions. On the surface what IBM is doing with Stellar today looks similar to Ripple at first sight, but the vision, technology and the roadmap that IBM is now jointly developing with the Stellar Development Foundation is far more comprehensive. There is a lot more Lund could say around the ownership and distribution policy of Ripple in comparison to that of Stellar, but he considers that touchy subject and wants to stay on a good note with Ripple, because he admires what they have done and what they are doing.

The future of Stellar Lumens is IBM's cross-border payment solution leveraging Lumens as a bridge asset to facilitate real-time forex for the final settlement of payments. IBM's goal for 2018 is to create operational corridors and subsequently to grow and operate a network that facilitates instant, real-time cross-currency clearing and settlement of all payment types and values with low costs. Lund's vision of the future validates the findings from the case studies and confirms new value propositions and improved cost structure for payment providers by offering instant cross-border payments with lower costs and better visibility to customers.

On the question whether IBM will issue their own token Lund stated that there are no plans for IBM to issue its own token

today, but they are aggressively working with commercial banks, central banks, and other financial institutions to issue other digital assets on the Stellar network to be used in the same way or as an alternative and complement to Lumens. Lund thinks they are very close to central banks issuing their own digital assets, probably on the Stellar network.

On the questions whether the Universal Payments Solution will be used to perform settlements for SWIFT, Lund stated that they are in active discussions with longstanding and important clients CLS and Visa to explore opportunities for alignment with their universal payments solution. IBM has not signed any definitive agreements specific to this topic with those parties yet. Their goal is to utilize this IBM-owned solution in a way that supports their clients market development plans. Lund's team has no direct interaction yet with SWIFT, but they are very open to collaborate with them. SWIFT does not do settlements. SWIFT is only concerned with messaging. Settlement is achieved through correspondent banking which is what IBM has fundamentally re-engineered with the universal payments solution, for example combining SWIFT's messaging protocol with a digital asset to combine with settlement together on a single network in real time. Stellar is the asset registry and settlement network underlying the IBM solution. Lund's answer is interesting because it confirms a change in key partners for payment providers. It is clear that blockchain technology allows for the elimination of maintaining nostro accounts and as a result changes the relationships payment providers have with partners globally. Yet, it seems that IBM, and as a result Stellar, are open to collaborate with the current network for transaction messaging, SWIFT, changing the dynamic of the partnership payment providers currently have. This is interesting because Ripple is trying to replace SWIFT's role in global payments, whereas Stellar, as a result of the IBM partnership, is open for collaboration.

On the question how the regulatory environment is impacting IBM's ability to execute in the greater blockchain market, Lund answered that IBM has a strong relationship with most regulatory agencies around the world. IBM is closely monitoring the evolution of regulatory sentiment on blockchain technology and will continue to work closely with regulatory organizations around the world to ensure regulatory compliance in the adoption of blockchain technology.

Lund stated that it is IBM's intent to pitch Stellar as a solution for partners looking for more efficient payments. When pitching blockchain to prospective clients a common concern is seen, which is that banks and large corporates seem hesitant to hold cryptocurrency's on their balance sheets due to regulatory restrictions and volatility. That's why IBM provides two types of operation in their universal payments solution, a gross settlement option using a digital asset bridge like Lumens, and a net settlement option that allows counterparties to replace nostro accounts by dynamically issuing each other digital fiat tokens on the shared settlement ledger like Stellar. As more assets get digitalized on Stellar and interoperable blockchains, Lund believes the gross settlement option will become the preferred type of operation because it does not require counterparties to have an agreement in place prior to transacting.

Lund foresees a future for banks where they will start with providing access to cryptocurrency's in their wealth advisory services and maybe even building their own exchanges. He also sees stable coins being a focus area in the near term, which gives the cryptocurrency community and fintech developers more liquidity and stability to work with. This is where the first true digital USD will start in his opinion. Lund does not think

banks will hold much cryptocurrency's until volatility improves, which requires more stable money in than currently flowing in and out. According to Lund, the world still needs banks to create credit, so they will never go away, but their payments business is under attack. This is an interesting vision of Lund because it confirms a threat for the customer relationships model banks currently have with their clients.

Lund sees global trade and trade finance in general as low hanging fruit for positive disruption using blockchain. In his opinion, this is just the beginning and he is pleasantly satisfied with the pace of adoption. In his opinion, the biggest challenge is the paradigm shift in thought and behavior, once that hurdle is cleared, it's going to be a new financial world.

To conclude this interview, many of the features from the case study findings are mentioned during the interview. These features help to understand implications for business model components. The data from this interview validates the findings from the case studies. Several new insights are gained which are taken into account in the subsequent chapters.

4.6 Link to theory

Having identified the use for and benefits of blockchain technology for cross-border payments, a close look is taken at the implications for the business models. By using the Business Model Canvas we have a clear overview of the different elements of business models. With the results from the case studies taken into account, we can see which elements of business models will be affected upon implementation of blockchain technology. Taking the results into account, the following components of the Business Model Canvas of payment providers involved in cross-border payments are affected:

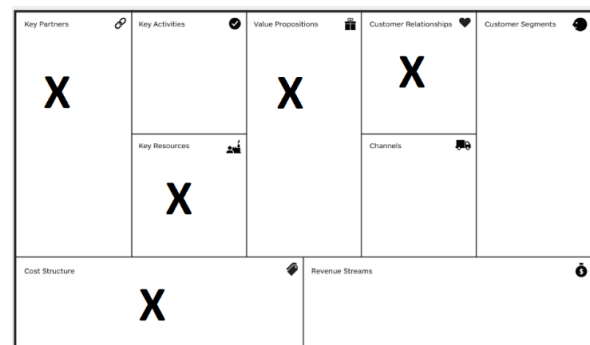


Figure 3. Business Model Canvas implications

4.6.1 Key Partners

The implementation of a distributed infrastructure makes intermediation unnecessary. It reduces the need to have multiple parties involved in payment transactions, leading to a streamlining of the process. Instead, payment providers will be working closely with blockchain companies that will provide the infrastructure. Here follows a value network overview illustrating the current situation as well as the new situation using Ripple's network as an example:

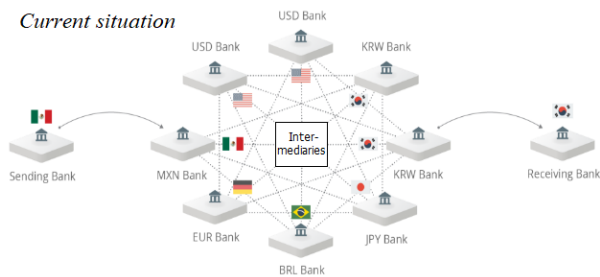


Figure 4. Value Network overview

In the current situation, funds move from payment system to payment system through a series of internal book transfers across financial institutions. Currently, a bank has to pre-fund a bank account or establish a line of credit with a correspondent bank. The correspondent bank provides the liquidity for these international payments. This requires many correspondent relationships and intermediation of other parties. Each intermediary obstructs visibility, creates a potential point of delay or failure and adds costs.

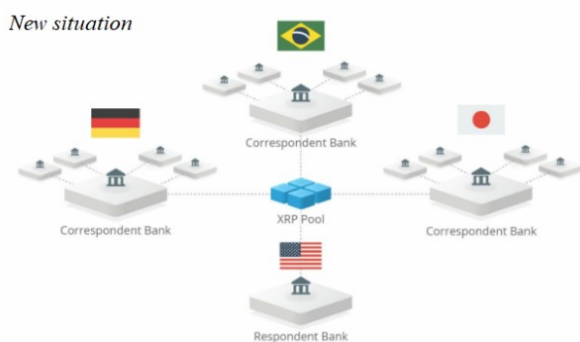


Figure 5. Value Network overview (Ripple, 2016)

Blockchain technology enables the streamlining of cross-border payments by connecting liquidity suppliers and liquidity takers. Instead of holding funds in nostro accounts around the world, trading parties can hold digital assets on their own balance sheets and utilize this for currency exchange. This results in different partnerships as we know today. Instead of having many correspondent relationships, payment providers can connect to the blockchain network to make use of more efficient processing of global payments, cutting out many intermediaries as a result.

4.6.2 Cost Structure

At the moment, banks incur significant costs processing cross-border payments. Current settlement times lead to high liquidity costs, processing costs and operational costs. For liquidity providers correspondent banking is capital intensive, requiring global operations and holding liquidity in local currencies worldwide. Less than ten banks in the world provide liquidity for global payments leading to uncompetitive rates (Ripple, 2015). Also, each intermediary increases the rate, causing smaller banks and end customers experience even worse rates. Blockchain technology helps banks to lower these costs. Costs are tremendously reduced by reducing settlement times, which in turn removes credit and liquidity risk from the process. Using digital assets does not require maintaining multiple nostro accounts, decreasing liquidity costs while simplifying and reducing cash management and account maintenance costs. Blockchain technology can reduce staff costs for settlement-

related processing and trade failures reducing payment operations costs. With no settlement times for cross-border payments associated Basel III costs can almost be completely eliminated (Ripple, 2016). Furthermore, depending on the financial activities foreign exchange costs and treasury operations costs can also be reduced. Results from the Ripple cases show a cost reduction from 40 to 70% for global payments, depending on volume and activities. This element of the Business Model Canvas has probably the most promising potential and biggest implication in case of global adoption of blockchain technology, with a potential to save financial institutions up to \$80 billion a year (Wyman, 2015).

4.6.3 Key Resources

Blockchain technology has the potential to create simplicity and efficiency by establishing new financial services infrastructure and processes. Instead of holding local currency in nostro accounts around the world payment providers can hold digital assets on their own balance sheets and use it to make markets with any other currency. By consolidating liquidity into one digital asset pool to facilitate international payments, banks can allocate less total liquidity to service the same volume of global payments. Banks can hold its domestic currency only and maintain one account with digital assets. The bank only needs enough of the digital asset on hand to service its largest expected payment obligation (Ripple, 2016). This simplifies the key resources banks need.

Secondly, payment providers will rely on a new infrastructure of decentralized networks, enabling banks to message and settle their transactions with increased speed, transparency and efficiency. As a result, financial companies gain the ability to offer blockchain-based payment applications for customers. These applications enable customers to settle transactions instantly, around the clock. This blockchain network application can power real-time payments for their customers, increasing speed and transparency for the customers while at the same time reducing costs and providing a higher quality of service

4.6.4 Value Propositions

The needs of today's corporate and retail transaction banking customers have evolved. In addition to sending high-value payments, customers require the ability to send international low-value payments on demand and in real time (Ripple, 2018). Payment providers gain the ability to offer customers near-instant cross-border payments with greater visibility into settlement, instead of the traditional waiting times of several days. Additionally, sending payments over a blockchain network facilitates payments with significantly lower costs than customers are used to currently. Blockchain technology could help payment providers to operate continuously, 24 hours a day, offering the processing and completion of payments to customers at any time, day and night.

4.6.5 Customer Relationships

As banking products move toward a more consumer-centric and mobile-friendly model, blockchain can play a natural role in that evolving relationship, as it could provide a framework that improves efficient operations and improves security of these solutions.

Distributed financial infrastructure comes with a level of autonomy that makes trust unnecessary. Thus, banks can lose some of their transactional control. So while it could allow others to play in the transactional market, banks lose trust in order to maintain the financial well-being of customers. This

can lead to more competition since the safety and transparency of blockchain opens the way for new and small players which are now less dependent on customer trust. The opportunity for a change in customer relationship is a situation where banks start advising and educating customers on the reliability of services. Yet, one development is it gets away from that single point of authentication, which many institutions have enjoyed to this day.

4.6.6 The research question

To conclude the findings of this paper, we answer the research question: How can blockchain technology utilized for global payments improve the business models of global payment providers?

According to the findings of the research, our initial proposition; blockchain technology has the potential to facilitate the more efficient processing of payments, is correct. Yet, the magnitude of the implications were underestimated. It seems that this innovation has broader implications for business models. Blockchain technology enables banks to transact instantly and directly with any other bank partner around the world, with the option to source liquidity from a competitive market of third-party liquidity providers, with end-to-end visibility and transparency of transaction delivery. Digital assets minimize settlement risk and eliminate the need for banks to set up nostro accounts globally, resulting in a lower total cost of settlement. Blockchain technology has the potential to be a force of technological disruption, challenging the established practices in payments and the business models, but will require collaboration between innovators, incumbents and regulators, adding complexity and delaying implementation. In the end, the potential lies not just in the cost savings but the possibility to enable new business models. Blockchain technology makes use cases like global disbursements, international cash pooling, low-value remittances and micropayments possible and profitable (Ripple, 2016).

5. CONCLUSION AND DISCUSSION

Payments are the cornerstone of global economic activity. Yet, as the modes of payment become more convenient and inventive, the settlement of payments is still tangled up in old technology and inefficient infrastructure. Blockchain is a new technology with the potential to facilitate the more efficient processing of global payments. For banks, blockchain technology offers a new model for cross-border payments. It reduces risks and operational costs, facilitating banks the opportunity to leverage their existing operations to build profitable low-value payment services. Blockchain technology enables payment providers to directly transact with others and allows them to introduce competitive cross-border payment services to attract new customers. Banks that adopt blockchain technology can offer their customers improved payment services that are faster, less expensive, and come with better visibility into delivery status. These changes lead to new financial services infrastructure which carries the potential to transform today's business models. Blockchain technology is disrupting SWIFT's model with near instant cross-border payments. One would expect blockchain solutions to outgrow SWIFT in a rational world because it is faster and cheaper and not more difficult to implement. Logically, regulators should prefer Ripple because near instant transactions significantly reduce liquidity and credit risks. But we do not live in a rational world, and SWIFT has the benefit of incumbency. Based on existing correspondent banking arrangements, SWIFT may

seem less frightening to banks. Additionally, we have seen that there are intentions for collaboration. The good news is that whoever prevails, or even if they coexist, cross-border payments will get faster and cheaper. Furthermore, there are some concerns regarding the adoption of blockchain technology in payment systems. As described in the paper, different fintech solutions try to combat the inefficiencies in the payments industry. For a widespread technological change of infrastructure, there needs to be collaboration and consensus between different parties which might slow down growth. Also, the lack of a monitoring organization regulating blockchain protocols causes uncertainty. These factors make the preparation of business model innovation promising but also troublesome. We can conclude that blockchain technology is an innovation that impacts the current infrastructure in the payments industry and generates potential for new business models.

The research implications of this paper are in its delivery of insight into how new technology affects business models. Furthermore, the findings produced new research possibilities, which can be interesting to further explore. The practical implications lie in the insight into changes in payments as a result of the implementation of blockchain technology, and in what directions companies have to think to adapt their business models. Blockchain is a technology with a potentially disruptive power, yielding a number of implications discussed in this paper. The payments industry is possibly experiencing a similar technological disruption as the telecom industry, which came along with radical changes in players and business models (Li, Whalley, 2002). Therefore it is advised payment providers adopt a similar approach where they start rethinking their strategies and begin identifying opportunities and threats.

This paper explores a 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 documentation on the topic expands methods such as literature review, qualitative study based on direct feedback from companies using blockchain technology and possibly quantitative research verifying the proposition offered by this study may become more appropriate.

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