How Blockchain affects Business Models in International Banking

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ABSTRACT,

The blockchain technology is transforming industry standards in many fields. Business model innovation becomes a crucial task for settled industry players in the industries affected. Among others, the international payments market recognizes the potential application opportunities of blockchain. What business model implications do players like traditional banks face when adopting blockchain technology for cross-border payment processing? Scholarly work is yet to be conducted on a larger scale to figure out those implications in specific settings of application. This paper compares the Rabobank and fintech start-up Ripple in order to filter out implications to the business model of traditional banks integrating blockchain technology to process international payments. Ripple represents a value proposition offering a 'blockchain-as-a-service' solution, RippleNet, to which traditional banks can simply plug in. Therefore, channeling Ripple's value proposition almost straight to traditional banks to offer faster, less costly, and more reliable cross-border payments using blockchain technology. Further, major implication to the business model of traditional banks are identified in the Key Activities which become fully automated through blockchain based processing. A case study by Chesbrough & Rosenbloom (2002) suggests startups to be more likely to successfully identify and apply alternative business models which capture the value of disruptive technologies in a more sophisticated way. This is assumed to match the causal context of both cases presented. Furthermore, experts interviewed agree on a timescale of at least five years until blockchain based payment systems are realized.

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Keywords

Fintech, Blockchain, Business Model Innovation, Value Proposition Design, Value Networks, Cross-Border Payments, Rabobank, Ripple

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1. INTRODUCTION

1.1 Current Situation and Problem

Conducted in the fields of entrepreneurship, innovation and finance, this interdisciplinary study is motivated by the currently inconvenient conditions, international payment systems are facing. Additionally, major uncertainties about the future of payments globally exist, as several new digital possibilities to pay are emerging (McWaters & Galaski, 2017). For years already, the global system to process transactions of funds and money include several institutions as intermediaries in shifting funds from the sending fund holder to the receiving fund holder. The participation of intermediaries in this process increases processing time of payments up to several days from debiting funds until crediting funds on the receiving fund holder's bank (Ripple, 2018).

Simultaneously, the speed of transacting information has dramatically increased within the recent past, currently reaching real-time exchange of data. As a result, many individuals and specifically organizations face a disparity between the time needed for funds to be transacted and real-time data exchange, essential to many parties part of our global society. The recent increase in popularity of the blockchain technology through the hype of the bitcoin calls up attention in the field of payment systems.

1.2 Research Goal

For this study the goal consists in finding changes to the business model of the traditional cross-border payment provider, i.e. banks, due to the integration of the blockchain technology. Emphasis is further put on the value proposition of traditional banks and how value networks may be influenced by the blockchain integration. To become more specific, in the framework of this research two cases, namely the Rabobank and Ripple, are analyzed for their business models and finally compared to derive the differences between the two business models, hence the implications resulting from being blockchain based as a cross-border payment provider.

1.3 Central Research Question

The central research question in this comparative case study derived from the research goal presented before is as follows.

What are the business model implications for cross-border payment providers integrating the blockchain technology to process international payments?

Having this question as central question leading this research, two sub questions are established to provide a structured focus of the different theoretical components part of it.

1.3.1 1st Sub Question

How is the value proposition of cross-border payment providers changed by the integration of the blockchain technology for processing international payments?

1.3.2 2nd Sub Question

How is the value network of cross-border payment providers influenced by the integration of the blockchain technology for processing international payments?

1.4 Why Rabobank and Ripple

The primary reason for choosing the Rabobank as the first case company is its accessibility due to geographic proximity. Secondly, the Rabobank is an innovatively operating bank, recognizable in its engagement to investigate opportunities the blockchain technology may entail.

The Rabobank was founded in 1972 and adds up to 43,810 employees (Rabobank, 2017). Their revenue amounts to €12,001 billion (2017) (Rabobank, 2017). With 8.5 million customers, whereas 1.2 millions of those are international customers, the Rabobank has more than enough volume in their client base to represent the traditional banking industry.

Representing the perspective of blockchain based cross-border payment providers Ripple makes a contextually well-suited case. Even though Ripple is neither a case many experts are available for, nor a lot of research has been conducted about, their organizational concept seems to perfectly fit this research. This is partly due to their practical application of blockchain technology. Another favorable aspect of Ripple as a case is its inclusion of the regulatory body and traditional banks. Here, Ripple makes a strong case for being a realistic substitute of the traditional banking system compared to other fintech initiatives, like bitcoin, trying to circumvent regulatory authorities instead of collaborating with them. Founded in 2012 under the name Opencoin, it got renamed into Ripple Labs, Inc. in 2015. In 2016 CEO Brad Garlinghouse governed about 150 employees (Wikipedia, 2018).

1.5 Academic Relevance

The past decade broad up new ways for the application of fintech innovations which enables "the delivery of new and innovative services, through digital channels, redefining the customer experience and creating new business models." (Pollari, 2016).

Especially due to its very recent introduction the digitally driven fintech innovation *blockchain* technology is considered as an early phase innovation (Iansiti & Lakhani., 2017). As of today, prevailing literature applies a rather broad focus on how incumbents can manage blockchain as an innovation (Beck & Müller-Bloch, 2017). This research instead, focuses on the specific business model implications for banks in the sole field of cross-border payments. This highly focused scope makes this study one of the first in this overlapping field of entrepreneurship, innovation, and finance. Moreover, the combination of tools described in a later section to analyze the two case companies, make this research unique not only in its focus but also in its design approach.

The relevance and importance not only of future studies but also this study is supported by the recent launch of the first national blockchain research agenda emphasizing the current research gap in this field (dutch digital data, 2018).

Further, the fact that one of the two case companies already fully operates cross-border payments based on the blockchain, adds a unique aspect not included in other studies as such a recent but complete adoption of the blockchain technology is quite rare.

The research design, as well as the findings provide insights for future studies exploring potential connections between the blockchain technology and business model implications in different fields than payment systems.

1.6 Practical Relevance

The findings mainly benefit cross-border payment providers, namely banks, correspondent banks, as well as payment system providers. Those institutions are presented with insights not only into changes to the business model resulting from the integration of the blockchain technology, but also changes regarding the value proposition. Additional value can be derived for organizations in need of third parties processing their payments. In their case value is created through an enhanced payment processing system, making the selection of payment processors

dependent on whether those payment processors make use of the blockchain technology or not.
A further, yet unclear, factor leading to value for businesses, is the new perspective on blockchain based multi-actor value networks and how such value networks can add value to the existing business models.

1.7 Thesis Outline

Following the introduction of this research paper, the theoretical framework will provide an overview about all relevant theories in the fields of this research and grants the reader an understanding why one theory is chosen over another. Afterwards, the methodology used to conduct this research is outlined and explained. As fundament of this research, the findings are presented after the methodology and separated into the current situation of cross-border payments without the use of blockchain technology, and the situation of cross-border payments operated through blockchain technology. As both perspectives are compared in a cross-case analysis, the fifth section of this paper concludes on the actual business model implications by identifying differences in both perspectives, hence answering the three research questions. A conclusion as well as a discussion will close the research paper by emphasizing strengths and weaknesses of the research as an entirety.
Lastly, all references are listed according to APA guidelines.

2. THEORETICAL FRAMEWORK

In this section relevant theories connected to the research are presented and a rough overview of previous research is provided. Relevant fields to consider in this research context comprise the field of fintech enabled innovation, the concept of the blockchain technology, as well as the combination of fintech and business model innovation with separated focus on value proposition design. Moreover a look on business model innovation in connection to the concept of value networks is covered in this study.

2.1 Fintech & Blockchain

2.1.1 Fintech & Financial Innovation

According to a study of 200 academic articles and a coverage of 40 years, Schueffel (2016) suggests a definition of the term fintech, as "Fintech is a new financial industry that applies technology to improve financial activities.".
Fintech in this definition is regarded as an industry which applies a certain technology to create enhanced financial products and services. The study by Schueffel (2016) is assumed to be of great fit in defining fintech in this research, because of its wide coverage in data collection and the way the final definition of the term fintech targets on innovation and improvements of business models.
At this point, it seems natural to include a definition of financial innovation to gain insights into the conceptual framework of innovations in the field of finance. "Financial innovation is the act of creating and then popularizing new financial instruments, as well as new financial technologies, institutions, and markets. The innovations are sometimes divided into product or process variants, with product innovations exemplified by new derivative contracts, new corporate securities, or new forms of pooled investment products, and process improvements typified by new means of distributing securities, processing transactions, or pricing transactions." (Lerner & Tufano, 2011).
Llewellyn (1992) states that one of the crucial differences between innovation at large and innovations in the specific sector of finance, is the influence the regulatory authorities impinge on the development of financial innovations. In regards to the regulatory influence on fintech innovations, the role of regulations is either seen as a catalyst or a restriction (Marcus, 1981).
Blockchain being the fintech of focus in this research, Gartner's hype cycle theory is useful to assess in which state of development the young Blockchain technology currently is in (Linden & Fenn, 2003).

2.1.2 Blockchain

The most important financial technology in this research is the blockchain. As the unidentified Satoshi Nakamoto (2008) first introduced the blockchain technology as decentralized accounting system for the bitcoin, his whitepaper "Bitcoin: A Peer-To-Peer Electronic Cash System" represents the basic definition of the blockchain technology. To add to Nakamoto's rather technical definition of the blockchain, the paper "BlockChain Technology: Beyond Bitcoin" by Crosby, Nachiappan, Pattanayak, Verma & Kalyamanaram (2016) contributes as an additional assessment of the blockchain technology. It is decided for both papers on blockchain technology because the bitcoin whitepaper offers a technical insight in how the bitcoin blockchain works, whereas the second paper gives an accessible definition of the blockchain and digs into potential fields of application beyond bitcoin.
For this specific case where the implications of a blockchain integration in the industry of international payment systems is researched, there is not much preceding research available. Most research is reporting about potential areas of application instead of focusing on the specific implications to the actual business model of firms switching to blockchain technology to manage their processes. One example of such a literature is the book "Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business, and the World" (D. Tapscott & A. Tapscott, 2016). Moreover, the credibility of this research and the ground for the assumptions made in regards to the implications to the financial sector especially in the "Blockchain Revolution: (...)" study, are questionable as those are not backed by data (missing references). The fact for these studies to be rather rare and maybe questionable in their validity may be reasoned by the very recent increase in popularity of the blockchain technology in the field of payment services, lack of transparency regarding the sole technical features of the blockchain, and its complexity.

2.2 Business Model Innovation

2.2.1 Literature Review – Business Modelling and Innovation

Besides the blockchain technology, business model innovation takes an important role in the theoretical background of this research. Earlier scholarly literature about business model innovation by the Boston Consulting Group assesses the importance of business model innovation in breaking out of intense competition in times of instability (Lindgardt, Reeves, Stalk, Deimler, 2009). This paper by BCG is in the fast changing world of innovation with its nine years of existence, considered outdated. Additionally, it lacks in the provision of a detailed tool with a contextual framework to also compare different business models across different industries. Comes and Berniker (2008) are investigating how different major organizations as Amazon for instance, are coping with business model innovation as a mean to grow rapidly, shift major business value, and reshape entire markets.
Another study focusing on the purpose of the business model as a tool for driving new ways of innovation is published in "The Oxford Handbook of Innovation Management" in chapter 21

about 'Business Model Innovation' by Massa and Tucci (2013). They report about the twofoldness of the business model, as it enables managers to connect innovation to launched products in particular markets (Massa & Tucci, 2013). The paper by Massa and Tucci is not adopted here as the focus lies on the business model canvas and its components which build the base for a comparative case study.
Taking a different but not relevant perspective on how business model innovation is realized, Malhotra (2009) sheds light on the knowledge management part of business model innovation and how changing business environments, knowledge management systems and business model innovation intertwine to shape maintenance of competitive advantage.

2.2.2 Relevant Literature

However, in this research the business model concept and its role in capturing value of early stage innovations is building the basis for assessing the connection between business model innovation and newly evolving fintech innovations like the blockchain technology (Chesbrough & Rosenbloom, 2002). The paper by Chesbrough and Rosenbloom (2002) is most relevant for this study compared to the previously analyzed academic work, as it focuses specifically on business model innovation in regards to early stage innovations. This is suiting the fact that the blockchain technology is considered an innovation in an early development phase (Iansiti & Lakhani, 2017).
The most commonly known business model tool the *Business Model Canvas* (see Appendix A) is used as an instrument in the following to map the business model components of each case (Osterwalder & Pigneur, 2010). The book "Business Model Generation" by Osterwalder and Pigneur (2010) is building the theoretical backbone of the "Business Model Canvas" which is officially published in collaboration with Strategyzer. Next to being the most commonly used tool for business modelling these days, the *Business Model Canvas* provides a detailed contextual framework to analyze and compare business models, with the possibility to extent it by the *Value Proposition Canvas* described in the next section.

2.3 Value Proposition Design

As an integral part of the business model, this research puts special focus on the value proposition of Rabobank and Ripple.
One of the most well-known books about the value proposition in the context of the business model is "Value Proposition Design" (Osterwalder, Pigneur, Bernarda, & Smith, 2014).
The same book also provides the basis for the illustrative tool of the "Value Proposition Canvas" published in cooperation with Strategyzer (see Appendix B).
To mention further academic work in the field of value propositions, the paper "Value Proposition as a catalyst for customer focused innovation" is a relevant one in this field of study (Lindič & Da Silva, 2011). It provides a thorough understanding of the benefits to be customer centric in the process of innovating and creating value propositions and in how far value propositions itself can help become more customer centric (Lindič & Da Silva, 2011). However, the latter paper is not of relevance to this research due to its focus on the functions of value propositions instead of giving a tool to compare different value propositions content wise.

2.4 Value Network Analysis

Formulated in the second sub question, research of current value networks and value networks enabled by the blockchain technology is undertaken. The most suitable definition for the data aimed for in this research is given by Fjeldstad and Stabell (1998) "(...), the business value system in a mediation industry is potentially a set of co-producing, layered and interconnected networks that enhance the range and reach of the services provided.".
So, networks which improve the range and reach of provided services, i.e. value generated for network actors as their products and services are of enhanced reach to the target market (Stabell & Fjeldstad, 1998). This ideally leads to greater value perceived by the customers of the network actors through a better product and service portfolio enabled by the network.
Other ways to look at value networks, yet not considered for application in this study, are provided by Allee (2015) and Clayton and Rosenbloom (1995). In her book Verna (2015) focuses on how to manage value networks with due regard to social and ethical values underlying the concept.
The concept of value networks defined by Clayton and Rosenbloom (1995) does not suit the research either, because of its broad focus.

3. METHODOLOGY

With this section the methods and techniques used to conduct the research are described. A detailed overview of the research design and the empirical approach used are provided. Moreover, information is illustrated about the research participants, i.e. interviewees, as well as how data is collected.

3.1 Research Design

Based on the research goal, qualitative research in the form of a comparative case study is conducted. The two cases subject to the research comprise the Rabobank as the representative for the current cross-border payment systems stretching across the globe and Ripple as the representative for cross-border payment processing based on blockchain technology. Figure 1 illustrates

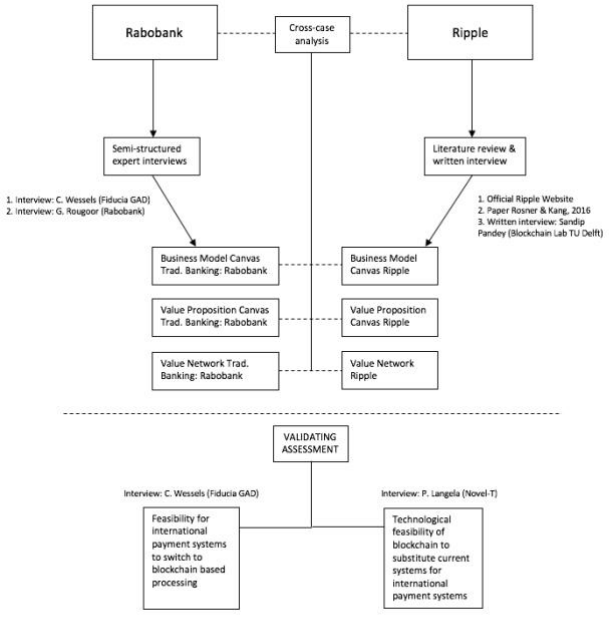

Figure 1. Research Design Illustration

the design of this research. In order to conclude on the business model implications for traditional banks, like the Rabobank, first the business model canvas, the value proposition canvas and the

value network for both case companies are identified in expert interviews and illustrated afterwards.
In the next step the Rabobank is compared to Ripple using a cross-case analysis of the aforementioned canvases and value network settings. Finally, the context of the findings and the feasibility of application are assessed in expert interviews. Here, the feasibility of the predominant international banking system to switch to a blockchain based processing system is evaluated, and whether the blockchain technology is far enough developed to facilitate the full range of global cross-border payments, as reliably as the current system.

3.2 Data Collection Methods

In order to gather the data on Rabobank's business model, value proposition, and value network, semi-structured expert interviews are conducted. For this research semi-structured interviews suit best because the design includes a structured outline of the interview questions, while leaving room for adaptation to the interviewee's responses allowing comparability between cases while ensuring in-depth data quality.
Due to Ripple's short period of existence and nature of business at the moment of the data collection, research on Ripple's business model, value proposition, and value network participation is not exclusively limited to expert perspectives, but includes investigation via Ripple's official website along other websites and academic literature. Due to convenience for the research participant and Ripple expert S. Pandey the interview is conducted in a written form, where answers to the questions in the interview outline are provided in writing.
All interviews on the assessment of the case companies' business models are lasting approximately 60 minutes and are recorded on tape and provided upon request. Interviews serving to validate and assess the findings last circa 30 minutes each. All interviews are recorded and provided upon request. All interview outlines containing the pre-set questions, are provided in Appendix C-F.

3.3 Selection of research participants

The selection procedure of the research participants, i.e. experts, is based on the years of experience in the specific field of international payments and blockchain. The primary factor for the selection of a blockchain experts is whether a potential expert has three years or more experience in blockchain or not. The amount of three years is based on the assumption that expertise in a certain field requires time to build up, however, the topic of blockchain was gaining popularity around 2015. Therefore, three years is assumed to be a decent timespan to be able to gather a deep understanding in the field of blockchain technology. Finding an expert on Ripple itself presents a difficult endeavor due to Ripple's corporate size, its recent popularity, and the complexity reasoned be the blockchain technology they use. Sandip Pandey is considered an expert in this research's scope as a fundamental understanding in the blockchain field is given, as well as decent knowledge of the industry Ripple operates in due to Pandey's work at the Blockchain Lab at TU Delft. Regarding the selection of an expert in financial logistic and payments, for this research the expert is expected to have at least five years of work experience which is assumed to match a decent degree of expertise for this research.
Table 1 introduces the experts with a listing of the facts relevant for selection. In order to see how each of the research participants is involved in the research design see Figure 1.

	Organization	Role in organization	Field of expertise	Years of experience
Gerdinand Rougoor	Rabobank	Business Controller & Client Advisor (Corporations with revenues €5 – 250 million p.a.)	Financial logistics & International payments	>12
Christopher Wessels	Fiducia GAD	Expert for financial logistics and payments	Financial logistics, Cross-border payments, Blockchain	11 (3 in blockchain)
Sandip Pandey	Blockchain Lab at TU Delft	Development	Blockchain application development & smart contracts	3
Peter Langela	Novel-T	Business Developer and Blockchain expert	Business Development, Computer Science, Blockchain	5

Table 1. Research Participants Data

4. FINDINGS

This section presents the findings from the semi-structured expert interviews conducted with G. Rougoor as specialist in financial logistics at Rabobank, C. Wessels expert in payment logistics and blockchain from Fiducia GAD, and blockchain expert S. Pandey from the Blockchain Lab TU Delft.
Methods to illustrate the findings consists of the business model canvas (Osterwalder & Pigneur, 2010). The value proposition canvas (Osterwalder et al., 2014), as well as a map of the value networks which are facilitated through a blockchain based cross-border payment system (Stabell & Fjeldstad, 1998).
Starting off with the findings on the current situation of the cross-border payment systems applied through the case of the Rabobank and the information technology perspective of Fiducia GAD. Further light is spot on the case of Ripple as representative of a blockchain based solution for a cross-border payment system.

4.1 Current situation of cross-border payments in the corresponding banking system

The following three sections entail a description of all findings related to the first case Rabobank and traditional banks in general.

4.1.1 Value Proposition Canvas Rabobank

Table 2 and Table 3 present all findings on the *Value Proposition Canvas* assessment of the Rabobank. The primary customer segment this research focuses on is the one of larger businesses with an annual revenue exceeding €5 million (see Table 4 in section 4.1.2). These corporations make up the segment with the greatest demand for cross-border payments (G. Rougoor, personal communication, May 9, 2018).

	Customer Jobs	Pains	Gains
1	Cross-border payments	Low speed of transfer	High speed of transfer
2	Being efficient	Regulatory limitations	Low costs
3	Serving fast	High costs of transfer	Security of transfer
4	Being reliable	Lack of transaction status	Seamless IT process integration
5		Risk of responsibility forwarding among correspondent banks	

Table 2. Customer Segment Rabobank

The most important job of the customer (account holder) in this perspective is the execution of cross-border payments (G. Rougoor, personal communication, May 9, 2018). Direct pains the customer experiences are essentially the low speed of fund transfer and the high costs incurring for the transfer (G. Rougoor, personal communication, May 9, 2018). A further factor to consider as a pain for customers is the responsibility of the funds which is forwarded to each

correspondent bank involved in the process (G. Rougoor, personal communication, May 9, 2018).
Aligned with those pains, customers perceive high speed of a transfer, as well as low costs of the transaction as major gains (G. Rougoor, personal communication, May 9, 2018).
This leading to the second part of the value proposition canvas. Based on the aforementioned customer pains, enhanced data quality of sending and receiving parties increases the Straight-Through-Processing rate, hence relieve customers' pain of low speed (C. Wessels, personal communication, May 8, 2018). Further, reduced costs and faster processing of the payment are regarded as pain relievers (G. Rougoor, personal communication, May 9, 2018). Another important component is improved standardization across global payment systems which ideally leads to increased speed and reduced costs (G. Rougoor, personal communication, May 9, 2018). The same represents a gain creator, leading to an increased STP rate (C. Wessels, personal communication, May 8, 2018). G. Rougoor (2018) presents the factor of data encryption for ensuring data quality as another important factor of gain creation.

	Pain Relievers	Gain Creators	Products & Services
1	Enhanced data quality for increased STP rate	Globally standardized processing systems	SWIFT
2	Reduced costs for transfer	Increased STP rate	Cash Management Tool
3	Powerful IT solutions	Increased Speed	FX management service
4	Improved standardization across globe	Reduced Costs	Instant Payments
5		Data encryption to ensure security of data exchange	Holland Desks
6		Seamlessly integrated IT solutions	

Table 3. Value Proposition Rabobank

Build upon these insights, Rabobank's value proposition comprises a participation in the SWIFT protocol, hence the facilitation of international payments, and the provision of different currencies (FX management service) supporting the facilitation of cross-border payments (G. Rougoor, personal communication, May 9, 2018). A recently developed product, *Instant Payments*, aims to solve the pain of transfers taking up to four days until fully processed (G. Rougoor, personal communication, May 9, 2018).

4.1.2 Business Model Canvas Rabobank

Providing a more global perspective on the business model of the Rabobank, Table 4 entails each component of the *business model canvas*. Here, SWIFT as a key partner embodies the most relevant aspects (C. Wessels, personal communication, May 8, 2018). In order to participate in the SWIFT network, a SWIFT license is necessary (G. Rougoor, personal communication, May 9, 2018).
As soon as the license is issued, the bank is enabled to process payments internationally (C. Wessels, personal communication, May 8, 2018). The key activities necessary to process a cross-border payment boil down to a liquidity & feasibility check of the sending account, the *routing* (identifying the most convenient way through the correspondent banking framework), the *clearing* (checking and accepting of the information exchanged between correspondent banks), and the *settlement* (the actual transfer of funds between correspondent banks up to the beneficiary account) (G. Rougoor, personal communication, May 9, 2018). Regarding the revenue stream resulting from cross-border payment facilitation, banks realize revenue via a fixed rate for each transaction and a bank specific charge for currency change (if relevant to the transfer) (Rougoor, G. 2018). Furthermore, it may occur that a bank performs a redundant currency change (Rougoor, G. 2018). In this case, banks charge for a currency change even though this bank holds both currencies involved in the transaction and such a currency change would not be necessary in order to settle (G. Rougoor, personal communication, May 9, 2018). Redundant currency changes are solely possible due to a lack of transparency in the correspondent banking system (G. Rougoor, personal communication, May 9, 2018).

	Customer Segments	Value Proposition	Channels	Customer Relationships	Revenue Stream	Key Resources	Key Activities	Key Partners	Cost Structure
1	Individuals	See Table 2	Official Website	Customer Acquisition	Fixed rate for each transaction	SWIFT license	Liquidity & feasibility Check of sending account	Correspondent banks	Cost-driven business model
2	SMEs		Personal Meetings	Self-service (standard banking)	Charge for currency change	Soft- and hardware	Routing	SWIFT	Driving down costs while increasing speed
3	Corporations > €5 million annual revenues		Networking Events	Client specific personal assistance up on request	Redundant currency change	Men power	Clearing		Most relevant costs: labor + IT
4			Holland Desks			Facilities (building/ offices)	Settlement		Trend: labor costs decr. while IT costs incr.

Table 4. Business Model Rabobank

Following a cost-driven business model, the main goal of traditional banks is to drive down costs while increasing speed of processes in general (C. Wessels, personal communication, May 8, 2018). According to Rougoor (2018), a trend can be identified in which labor costs (which make up the largest part of the total costs for the Rabobank) are decreasing, while the costs related to IT solutions are continuously increasing.

4.1.3 Value Networks Rabobank

Figure 2 provides a possible way of a network illustration for the SWIFT protocol. Within this value network the four main actors identified are banks, either sending or receiving funds via the SWIFT protocol, banks' customers in the form of account holders, software providers delivering IT solutions enabling to channel the created value to the customer, and the government as regulatory body setting the operational frame for the SWIFT

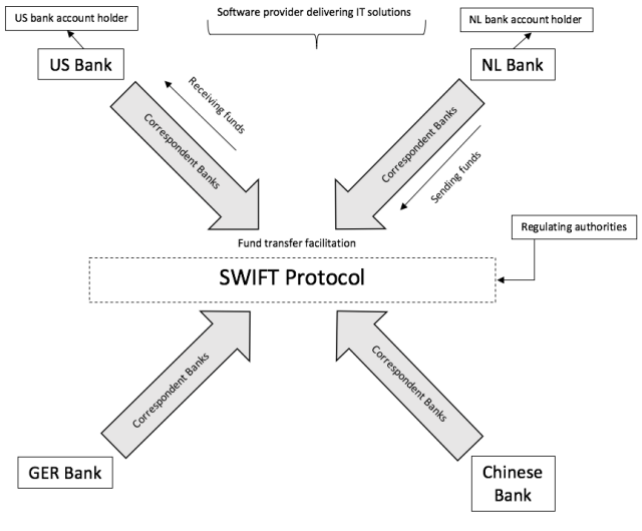

Figure 2. Value Network Illustration for Rabobank

protocol, hence for banks part of the SWIFT network (C. Wessels, personal communication, May 8, 2018). The value created breaks down to the facilitation of relatively fast and reliable cross-border payments and the facilitation of each bank's partial value proposition (C. Wessels, personal communication, May 8, 2018).

4.2 Blockchain Technology – A Definition

The initiator of the bitcoin, S. Nakamoto (2008), defines the blockchain as a peer-to-peer network. "The network timestamps transactions by hashing them into an ongoing chain of hash-based proof-of-work, forming a record that cannot be changed without redoing the proof-of-work." (Nakamoto, 2008). Another definition for the blockchain comes from a collective of experts form the Sutardja Center Berkeley "A blockchain is essentially a distributed database of records, or public ledger of all transactions or digital events that have been executed and shared among participating parties." (Crosby et al., 2016).

Applying this to financial transactions, the blockchain is a distributed ledger keeping track of every transaction between parties participating in the blockchain protocol. Depending on the specific blockchain protocol used, each transaction is subject of a consensus which can either happens, meaning the transaction is going through, or it is declined by the network up front. Consensus is necessary to eliminate the problem of double-spending which normally is checked by the banks involved. Such a consensus is enabled by a hash-based system making every blockchain protocol participant an approver of the transaction. In case everyone gives its consent, the transaction is executed. The term hashing plays an important role here, as a hash can be defined as an encrypted code comprising all data relevant for the specific transaction. The hash of the first transaction also represents part of the data making the hash for the second transaction. The second transaction's hash (also including the first transaction's hash) is part of the third transaction's hash, and so on (see Figure 3). So, hashing is the process of connecting all data blocks with each other to form a chain including every data point ever created. In order to participate in the blockchain every participant has to agree up on the existing chain of blocks. The entire process of hashing and consent is automated potentially enabling real-time settlement of transactions.

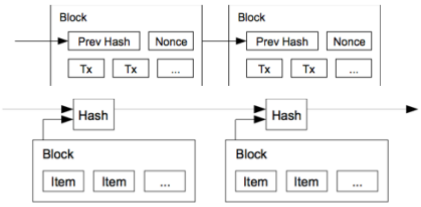

Figure 3. Blockchain Hashing Process

Additionally, the hashing process creates a highly secure database which is only theoretically possible to hack as changes in any block part of the blockchain would change the hash of that block and so the entire chain would run into an error comparable to a domino effect. One must mention that a more in-depth technical definition of the blockchain in its entirety does not match the scope of this research.

4.3 Situation of cross-border payments with the use of Blockchain Technology

Coming to the second case of this study, the most relevant findings on Ripple's business model are presented in this section, to be followed by a cross-case analysis in section 5.

4.3.1 Value Proposition Canvas Ripple

In the case of Ripple, Table 7 (section 4.3.2) shows customers are being segmented into banks, payment processors, money transmitters, and other financial institutions (Rosner & Kang, 2016).

The main job these customers need to perform is sending money globally, i.e. processing cross-border payments (Rosner & Kang, 2016). Pains these customers are experiencing with using traditional ways to send international payments are low speed of transactions, high costs incurring for transaction, limited transparency, and a lack of standardization across the global payment system (Ripple, 2018).

	Customer Jobs	Pains	Gains
1	Cross-border payments	Global payment systems	Increased speed of transfer
2		Low speed of transaction/delays	Low costs
3		High costs of transfer	Reliability of system
4		Limited transparency	Scalability of transactions amount
5		Lack of standardization across global payment systems	

Table 5. Customer Segment Ripple

Regarding the counter side of the *value proposition canvas* especially lower total cost per transaction, enhanced standardization across the global payment system, and increased speed of payments processing make up *pain relievers* (see Table 6) in this context (Ripple, 2018). Shedding light on the *gain creators* for Ripple's customers, the aspect of new revenue opportunities requires special highlight. Through the offering of new ways to process value transactions, banks in a direct sense, as well as corporations in an indirect sense, can create new ways to generate revenues (Ripple, 2018).

	Pain Relievers	Gain Creators	Products & Services
1	Lower total costs per transaction	Lowered total costs per transaction	RippleNet
2	Increased speed of payments	Faster settlement times (i.e. increased speed)	xCurrent
3	Improved standardization across globe	Streamlined legal framework	xRapid
4	Powerful IT solutions	Seamlessly integrated IT solutions	xVia
5		Low network maintenance & operation costs	
6		New revenue opportunities	

Table 6. Value Proposition Ripple

Taking all the aforementioned information into consideration, Ripple offers banks and other financial institutions to join RippleNet (Ripple, 2018). The solution RippleNet functions as the umbrella for three sub-solutions, xCurrent, xRapid, and xVia. xCurrent is "a standardized technology enabling the ability to message and settle transactions between banks with increased speed, transparency and efficiency." (Ripple, 2018). xRapid allows "access to an on-demand liquidity pool of digital assets that eliminates the need to hold nostro accounts in destination currencies (Ripple, 2018). xVia is "a web services layer providing corporates with the ability to securely originate real-time payments with rich data attachments." (Ripple, 2018).

Target customers for xVia are corporates, banks, payment providers and individuals looking to optimize their payments experience with their bank (Ripple, 2018). Three solutions essentially facilitating the broad integration of RippleNet among different customer segments through interoperability.

Part of the value proposition but not explicitly mentioned in Table 6 is the protection against *Denial of Service* attacks on the Ripple network. Denial of Service attacks are blockchain network specific attacks where malicious actors try to compromise the validity of the consensus, hence disrupt the settlement process. Either an attack targets on creating influence, or the attack aims to overwhelm the servers to paralyze the entire network (Rosner & Kang, 2016). In order to create a Ripple account, the account holder is required to deposit a small amount of XRP crypto coins. This significantly low amount, however, rises enormously as soon as an attacker tries to gain huge influence by establishing many accounts (Rosner & Kang, 2016). Even if many accounts are established, Ripple's protocol destroys 0.00001 XRP per transaction. Practically, this amount is negligible, however, it makes it extremely expensive for attackers to compromise the network by flooding it with fake transactions (Rosner & Kang, 2016).

A second implicit part of Ripple's value proposition is *Atomic* and *Straight Through Settlement* which makes the solution for the inefficient process of *routing* in the traditional correspondent banking system. So called "market makers" are liquidity providers similar to correspondent banks in the traditional banking system. In this case Ripple's protocol enables different "market makers" to compete for offering the lowest price for liquidity provision (Rosner & Kang, 2016). Moreover, the algorithm building the backbone of Ripple's cross-border payment system, automatically searches for the cheapest *routing path* in the liquidity market making liquidity providers, next to competing for sole price matters, also competing for spread. Thus, making the traditional process of routing not only faster but also less costly (Rosner & Kang, 2016).

4.3.2 Business Model Canvas Ripple

Customer Segments and Value Proposition being defined in the previous section, the main channel Ripple is communicating to their customers is their official website. Not only providing general information about Ripple as an organization, the website also serves as a mean to showcase their value proposition through different whitepapers or digital brochures (Ripple, 2018). A second important channel for Ripple to communicate to the external world is the one of press releases, public press, but especially their own news lettering (Ripple, 2018).

As Ripple still remains in the phase of being a start-up, their relation to customers is more of a co-creating and transformative nature, rather than transactional.

Ripple figures out three different ways to generate revenue at the moment. The revenue streams of Ripple are venture capital in the form of series B investments, sale of Ripple's XRP cryptocurrency, and sales of ILP (interledger protocol) software (Pandey, 2017). The internet at large, blockchain technology, human capital, as well as ILP soft- and hardware build the core of resources needed for Ripple (S. Pandey, personal communication, June 11, 2018). Due to Ripple disrupting an industry which is highly regulated, they find themselves in partnerships with several federal agencies regulating the relationship of financial institutions (e.g. banks) with third-party vendors (Ripple) (Rosner & Kang, 2016).

	Customer Segments	Value Proposition	Channels	Customer Relationships	Revenue Stream	Key Resources	Key Activities	Key Partners	Cost Structure
1	Banks	See previous section	Official Website	Customer acquisition	Investments (Series B investments)	Internet	Maintaining the ripple protocol and its accessibility	Financial institutions	Network maintenance
2	Payment processors		Digital communication channels	Support for integration of interface	Installation/ licensing fees	Blockchain Technology	Improving protocol and its algorithms through R&D	Office of the Compt-roller of the Currency (OCC)	Human resources (Developers, blockchain experts, integration, support)
3	Money transmitters		Press releases	Knowledge sharing/ transfer	Sale of XRP crypto coins	ILP soft- and hardware	Mitigating negative developments in the protocol	Consumer Financial Protection Bureau	
4	Other financial institutions			Development support	Sale of ILP software	Men power: Developers, experts, sales agents		Federal Deposit Insurance Corporation	
5	Corporations					Facilities (building/ electricity)		Federal Financial Institutions Examination Council	

Table 7. Business Model Ripple

All components of the business model presented above create a *Cost Structure*. According to Pandey (2018) Ripple's cost structure is mainly ruled by network maintenance work and human resources comprising developers, blockchain and crypto experts, integration and support staff.

4.3.3 Value Networks Ripple

Figure 4 shows a possible illustration of RippleNet (Ripple, 2018).

"RippleNet is a decentralized global network of banks and payment providers using Ripple's distributed financial technology, which provides real-time messaging, clearing and settlement of financial transactions." (Ripple, 2018).

Through their blockchain enabled global network Ripple not only connects banks but payment providers, digital asset exchanges and corporations, thus opens up the sphere of cross-border payments also for non-bank payment facilitators and liquidity provider (S. Pandey, personal communication, June 11, 2018).

The same build the interconnected grid of network actors (S. Pandey, personal communication, June 11, 2018). Ripple itself playing the facilitating and maintenance role, traditional banks using the network to send money globally, and corporations making use of xVia to seamlessly connect to the network (Ripple, 2018).

The major value in this network is derived by the interoperability of the network through the ILP interface (S. Pandey, personal communication, June 11, 2018). Interledger Protocol enables one global standard to connect all network participants (Ripple, 2018). Due to each network participant's agreement on the single standard, the entire value proposition of Ripple to process cross-border payments in real-time is possible (Ripple, 2018).

Important for understanding the process of RippleNet is the feature of distributed settlement and public ledger instead of an bank specific ledgers. "In distributed settlement, a ledger is distributed among, and algorithmically updated by, the collective actions of Ripple users, rather than a central party." (Rosner & Kang, 2016). Through distributed settlement, the network becomes a decentralized one. A public ledger opposing the individual ledger practice, where each correspondent bank updates its own ledger, the public ledger functions as an aggregated ledger for all protocol participants. This

automatically eliminates the issue of double-spending (Rosner & Kang, 2016).

A second value network identified by Pandey (2018) is the Internet of Value. One can imagine the Internet of Value as a network like our traditional internet where not only information can flow without hurdles in real-time and end-to-end, but value as well (Leonard, 2017). A particular product or service evolving out of the IoV are micropayments even across borders (Ripple, 2018). The IoV is fundamentally enabled by the blockchain at large and more specifically by the interoperability of ledgers through the ILP which embodies similar characteristics as the HTTP standard in our current World Wide Web (Ripple, 2017). Therefore, actors in the IoV network encompass potentially everyone in the future.

However, the meaning of this value network is limited and may be even more limited in the future as the meaning of value is diversifying (S. Pandey, personal communication, June 11, 2018).

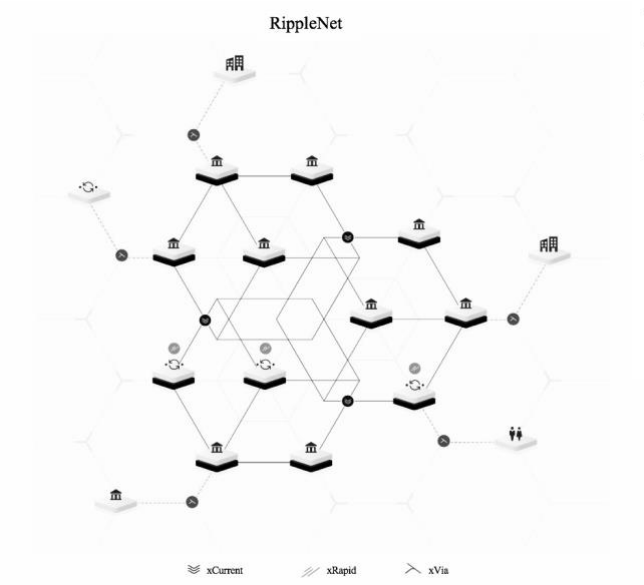

Figure 4. Value Network Illustration Ripple

5. CROSS-CASE ANALYSIS

The previous section presents all findings on the traditional situation of cross-border payments by means of illustrating Rabobank's business model and the situation in which blockchain technology provides the basis for cross-border payment processing in the case of Ripple. This section aims at gathering the main business model implications for traditional banks resulting from the integration of blockchain technology for global payment processing.

At this point, it is necessary to explain the difference in nature of business between Ripple and the Rabobank in order to guarantee a better understanding of this sections arguments.

Part of the outcome of this research is the identification of Ripple following a business approach not only based on blockchain empowered solutions but also on being a network provider for financial institutions rather than aiming for substituting traditional banks as a whole. The solution package Ripple is offering includes traditional banks, like the Rabobank, as a customer segment (Ripple, 2018). Therefore, the illustrated implications to the business model of traditional banks are mostly reasoned by the hypothetical shift from the traditional SWIFT protocol to RippleNet as the main cross-border payment network.

5.1 Implications to the Value Proposition

In order to answer the first sub-question in this research, focus lies on the Products & Services of Table 9. Whereas the Rabobank offers a SWIFT license, thus enabling cross-border payments, Ripple in contrast can be regarded as the blockchain based counterpart to the SWIFT protocol. RippleNet includes the three solutions xCurrent, xRapid, and xVia. Of special interest in this study's context, xCurrent is "an open, neutral protocol, Interledger Protocol (ILP), which enables interoperation between different ledgers and networks. It offers a cryptographically secured, end-to-end payment flow with transaction immutability and information redundancy. It is designed to comply with a bank's risk, privacy and compliance requirements. It is architected to fit within a banks existing infrastructure, resulting in minimal integration overhead and business disruption." (Ripple, 2018).

	Customer Jobs		**Pains**		**Gains**	
	Rabobank	Ripple	Rabobank	Ripple	Rabobank	Ripple
1	Cross-border payments	Cross-border payments	Low speed of transfer	Low speed of transfer	Increased speed of transfer	Increased speed of transfer
2			Regulatory limitations	Global payment systems	Low costs	Low costs
3			High costs of transfer	High costs of transfer	Reliability of transfer	Reliability of system
4			Lack of transaction status	Limited transparency	Seamless IT process integration	Scalability of transactions amount
5			Risk of responsibility forwarding among correspondent banks	Lack of standardization across global payment systems		

Table 8. Comparison of Customer Segments Rabobank & Ripple

According to Chesbrough and Rosenbloom (2011) "technologies that make little or no business sense in a traditional business model may yield great value when brought to market with a different model.". Instant Payments part of the value proposition of the Rabobank exhibit similarities to xCurrent, however, the realization of Instant Payments on a larger scale (i.e. comprising every transaction processed, not only particular ones), remains unrealized (G. Rougoor, personal communication, May 9, 2018). Therefore, one implication to the value proposition of traditional banks seems to be greater realized value due to blockchain enabled products and services with large-scale value, like xCurrent.

	Pain Relievers		**Gain Creators**		**Products & Services**	
	Rabobank	Ripple	Rabobank	Ripple	Rabobank	Ripple
1	Reduced costs for transfer	Lower total costs per transaction	Reduced costs for transaction	Lowered total costs per transaction	SWIFT	RippleNet
2	Increased speed of transaction	Increased speed of transaction	Increased speed	Faster settlement times (i.e. increased speed)	Cash Management Tool	xCurrent
3	Improved standardization across globe	Improved standardization across globe	Increased STP rate	Streamlined legal framework	FX management service	xRapid
4	Enhanced data quality for increased STP rate	Powerful IT solutions	Globally standardized processing system	Seamlessly integrated IT solutions	Instant Payments	xVia
5	Powerful IT solutions		Data security	Low network maintenance & operation costs	Holland Desks	
6			Seamlessly integrated IT solutions	New revenue opportunities		

Table 9. Comparison of Value Proposition Rabobank & Ripple

Digging into xVia, Ripple offers banks, payment providers, as well as corporations a standard interface API (application programming interface) that facilitates a seamless docking to RippleNet (Ripple, 2018). Payment tracking and delivery confirmation, capital efficiency gain, and improved reconciliation through rich data attachments build the core of xVia (Ripple, 2018). According to Rougoor (2018) the lack of transaction status is perceived as a *pain* by Rabobank's customers. Ripple solves this problem with xVia and furtherly provides a tool to manage capital more efficiently which is as well the goal for the Cash Management Tool offered by the Rabobank (G. Rougoor, personal communication, May 9, 2018). Here, Ripple offers a solution relieving pain and creating gain for Rabobank's customers through seamlessly integrable IT solution enabling customers to track their payments and free up capital resources.

5.2 Business Model Implications

Looking into *Customer Relationships* in the case of the Rabobank, the self-service for standard transactions is potentially broadened to all sorts of transactions due to the interface solution xVia.

Moreover, the current setting of *Key Partners* which traditional banks collaborate with changes through the adoption of solutions like those delivered by Ripple. As blockchain in the case of Ripple enables a banking system without correspondent banks as middlemen in the transaction, those disappear as an implication for the business model of traditional banks . SWIFT as the sole partner for sending funds globally is substituted by Ripple and its RippleNet as cross-border payment network provider.
Lastly, the trend identified by Rougoor (2018) where labor costs decrease while IT related costs are rising, deems to be supported by the integration of blockchain solutions, as Routing, Clearing, and Settlement get fully automated and need no men power except for the process protocol maintenance.

5.3 Value Network Implications

Rougoor (2018) identifies the main value network to be SWIFT. SWIFT as a globally connecting network facilitating international payments through a single protocol (G. Rougoor, personal communication, May 9, 2018). However, SWIFT lacks a comprehensive standardization connecting different financial institutions from different countries (G. Rougoor, personal communication, May 9, 2018). In the case of Ripple the solution RippleNet with its three components is identified as the most relevant value network (S. Pandey, personal communication, June 11, 2018). Whereas the SWIFT system lacks transparency, a single standard to connect every network participant, and automation, RippleNet combines transparency regarding processing and transaction status, high degree of process automation, security through blockchain encryption, and efficiency due to a single standard used to connect each network actor (Ripple, 2018). Here, RippleNet presents a clear case for new value generation not only compared to the value proposition of banks, but also for the enhanced network infrastructure compared to SWIFT.
Further comparing the potential for value networks in both cases, Ripple introduces the idea of an Internet of Value (Leonard, 2017). The IoV brings blockchain enabled cross-border payments to the next level by facilitating micropayments (Ripple, 2018).
According to Pandey (2018), doubts about this network's meaning are justified. Nevertheless, in case of realization of the IoV, this network setting yields promises of payments being revolutionized in their fundamental application framework.

	Customer Segments		**Channels**		**Customer Relationships**		**Revenue Streams**		**Key Resources**		**Key Activities**		**Key Partners**		**Cost Structure**	
1	Rabobank	Ripple	Rabobank	Ripple	Rabobank	Ripple	Rabobank	Ripple	Rabobank	Ripple	Rabobank	Ripple	Rabobank	Ripple	Rabobank	Ripple
2	Individuals	Banks	Official website	Official website	Customer acquisition	Customer Acquisition	Fixed rate for each transaction	**Investments (Series B Investments)**	SWIFT license	Internet	Liquidity & feasibility check of sending account	**Maintaining the ripple protocol and its accessibility**	Correspondent banks	**Financial institutions**	Cost-driven business model	Network maintenance
3	SMEs	Payment processors	Personal meetings	Digital communi-cation channels	Self-service (standard banking)	**Support for integration of interface**	Charge for FX change	**Installation / licensing fees**	Soft-and hardware	Blockchain technology	Routing	**Improving protocol and its algorithms through R&D**	SWIFT	**Office of the Comptroller of the Currency (OCC)**	Driving down costs while increasing speed	Human resources (developers, blockchain experts, integration, support)
4	Corporations >€5 million in revenues	Money transmitters	Networking events	Press Releases	Client specific personal assistance up on request	**Knowledge sharing/ transfer**	Redundant currency change	**Sale of XRP crypto coins**	Men power	ILP soft-and hardware	Clearing	**Mitigating negative developments in the protocol**		**Consumer Financial Protection Bureau**	Most relevant costs: labor + IT	
5		Other financial institutions	Holland desks			**Development Support**		**Sale of ILP software**	Facilities (building /energy)	Men power (Developers, experts, sales agents)	Settlement			**Federal Deposit Insurance Corporation**	Trend: labor costs decr. while IT costs incr.	
6		Corporations								Facilities (building /energy)				**Federal Financial Institutions Examination Council**		

Table 10. Comparison of Business Model Rabobank & Ripple

Another implication to the business model of the Rabobank affects the *Revenue Streams*. In case of blockchain solution integration via Ripple, the charge for FX rate processing changes drastically, as blockchain technology enables Atomic and Straight Through Settlement and automates the FX activities (Rosner & Kang, 2016). Additionally, Atomic and Straight Through Settlement also change the *Key Activities* for traditional banks because Routing, Clearing, and Settlement appear to be fully automated by the RippleNet protocol and processed in real-time (Rosner & Kang, 2016).
The public ledger method which is essentially the core of blockchain based transaction processing, is only one ledger publically maintained and "algorithmically updated by, the collective actions of Ripple users, rather than a central party." (Rosner & Kang, 2016). Making use of the public ledger method, eliminates the problem of double-spending (Rosner & Kang, 2016). At the moment, the double-spending problem is dealt with in the first *Key Activity* of the transaction processing where the sending account is checked for liquidity and feasibility of the transaction, occasionally even by hand (G. Rougoor, personal communication, May 9, 2018).

6. A PRACTICAL PERSPECTIVE ON THE MERGE OF BLOCKCHAIN AND BANKING

The key findings of this research are depicted and two perspectives on the global cross-border payment processes are compared to each other. According to Iansiti and Lakhani (2017) the blockchain technology currently positions in an early stage of development. Therefore, this section briefly assesses whether international banking systems are able to shift to a blockchain based processing system, like Ripple offers. In addition, an assessment of the technological capability of the blockchain as a technology to substitute currently deployed cross-border payment systems is presented.

6.1 Is Banking ready for Blockchain?

Firstly, according to Wessels (2018) the blockchain technology is a very young technology, thus gives rise to many questions which yet remain open. The blockchain technology is not expected to substitute current systems within a time frame of three years (C. Wessels, personal communication, June 11, 2018). Issues concerning data policies, especially the 'right to be forgotten', take an important part in presenting challenges to a potential blockchain implementation (C. Wessels, personal communication, June 11, 2018). Nevertheless the blockchain is considered relatively reliable, further elaboration of potential sources of failures in the development of blockchain based processing systems is required (C. Wessels, personal communication, June 11, 2018).

However many concerns are present, Wessels (2018) believes in the adoption of decentralized networks to be realized but in a timeframe of approximately five to ten years. Moreover, it is underlined that fintech companies like Ripple are taking a decent track to deliver solutions which make such a shift to blockchain possible (C. Wessels, personal communication, June 11, 2018).

6.2 Is Blockchain ready for Banking?

Regarding the blockchain technology from a perspective of Gartner's hype cycle theory, blockchain expert Langela (2018) positions the blockchain between the *peak of inflated expectations* and *trough of disillusionment*. Last year, there have been billions invested into blockchain pilot projects, where some investments may turn to real-life application projects (P. Langela, personal communication, June 14, 2018).

Looking into the aspect of security of financial data exchange through blockchain infrastructures, the system is proved to be highly secure not least because the factor of security is incorporated into the core design principles of Nakamoto's whitepaper on the bitcoin (P. Langela, personal communication, June 14, 2018). Nevertheless, many other aspects require further addressing (P. Langela, personal communication, June 14, 2018). Moreover, the system's internal reliability is according to Langela (2018) guaranteed by its decentralized nature, as no central point of failure exists anymore and potential risk for system failure is spread among participating nodes. Recent news present claims by Asian banks stating to develop blockchain solutions with the ability to process millions of transactions per second. Therefore it is assumed that solutions with the ability to handle the total amount of cross-border payments are only a matter of time to arise (P. Langela, personal communication, June 14, 2018). To be more specific, Langela (2018) believes applicable blockchain solutions in the financial industry to be available within the next five years.

7. CONCLUSION

Chesbrough & Rosenbloom (2002) identify the ultimate role of business models in regards to capturing value of innovative technologies to ensure the technological core of the innovation finally delivers value to the targeted customers. Ripple provides a case for a business model different to that of the Rabobank in which key factors of the business model as well as the value proposition match corresponding *gains, pains, pain relievers, and gain creators* of the customer better than the Rabobank does, hence gives Ripple a stronger market position compared to currently applied solutions. Here, the value proposition of Ripple presents a strong argument for what Chesbrough and Rosenbloom (2002) further suggest: "(...), a start-up seems likely to be less constrained in the evaluation of alternative models.". The immense regulatory burden financial institutions face and the heavy structures of the Rabobank due to its organizational size make it difficult to quickly and agilely find ways to make use of innovative technologies like the blockchain. Additionally the Rabobank as a stand-alone organization is less likely to benefit from an implementation of blockchain technology in the field of cross-border payments. This is mainly due to the value network character of blockchain technology illustrated by RippleNet. The major value in the setting of RippleNet is derived by connecting financial institutions across borders using one single standard for integration, i.e. the ILP. This new approach Ripple makes use of can be described as a 'blockchain-as-a-service' business model, thus corresponds to the main arguments by Chesbrough and Rosenbloom (2002).

Moreover, the assessment by Wessels (2018) suggests a switch from the predominant system, SWIFT, to blockchain based processing within the next three years to be highly unlikely, not least because of compliance with laws as the 'right to be forgotten'. Further, both experts agree on the blockchain technology to remain an early stage innovation which requires more research to gain more sophisticated insights into how blockchain technologies implicate privacy policies, data management and archiving practices (C. Wessels, personal communication, June 11, 2018; P. Langela, personal communication, June 14, 2018).

The current international banking system is about to be disrupted by fintech innovations like the blockchain. This study indicates major implications to the value proposition of traditional banks, as well as a transition towards, more secure, transparent, and automated processes in cross-border payments facilitated through blockchain technology.

7.1 Theoretical Implications

As an outcome of this study the academic field obtains a perspective on how the young blockchain technology is affecting the sector of international banking. This contribution is relevant as the research on how business model innovation and blockchain intertwine remains unavailable. This is partly also due to the rare real-life application cases for blockchain technology in the financial world. As interest in blockchain is rapidly rising not only in the business world but also in the academic world, further academic work can be based on the findings of this study.

7.2 Practical Implications

The findings derived in this study not only support and ease management's assessment of detailed implications to the business model of traditional banks through a blockchain integration, but also provide an expert perspective on the time horizon expected until blockchain finds application in international banking.

Further, findings suggest that blockchain technology is less likely to be successfully implemented by traditional banks in an isolated way. Instead, it seems more viable for banks to collaborate with fintech organizations, like Ripple, to capture value from the blockchain technology on a larger scale.

8. LIMITATIONS

Examining limitations of this qualitative case study, the scope of the targeted data is considered quite broad, therefore finding a decent expert to interview on the entire range of the business model is difficult. This issue is dealt with, using reasonably specialized selection criteria for experts to be selected as research participants. Further, the differing methods used for data collection in each case, may yield harm to the comparability of the findings on each case. In order to encounter this problem, interview outlines with similar structural and contextual questions are used in the collaboration with the experts Rougoor, Wessels, and Pandey.

Comparing Ripple and Rabobank leads to the conclusion, that the Rabobank and Ripple do not target the same customer segments, rather is the Rabobank a potential customer of Ripple. This may pose questions on the validity of the business model implications for traditional banks gathered through a comparison of the Rabobank with Ripple. However, through the new business model of Ripple and the proposition of RippleNet as a future solution, the business model implications for the Rabobank are assumed to be validly filtered out and presented, as blockchain in this setting is offered as a product or service to banks like the Rabobank, thus Ripple's value proposition is channeled straight to their customers.

Besides facing a general lack of experts on Ripple, academic literature on blockchain enabled business model innovation is rare. Nevertheless, the sources used for the data collection seem to be valid and accurate. The data collected is assumed to be clear, accurate, and of decent coverage for the purpose of this study.

9. FURTHER RESEARCH

Scholarly literature by Iansiti and Lakhani (2017), as well as the experts interviewed identify the blockchain as an early stage innovation. Langela (2018) figures the blockchain technology to be past its 'peak of inflated expectations' on its way to real-life application based on the hype cycle by Gartner (P. Langela, personal communication, June 14, 2018; Linden & Fenn, 2003). This indicates huge potential of technological development for the blockchain, thus ground for ongoing research dedicated to gain insights on how blockchain technology interacts with different industries and potential beneficiaries, also beyond the financial sector.

According to Rosner and Kang (2016), the decentralized governance of the Ripple protocol poses new risks and challenges to the system itself. Where the traditional system is operated, updated and changed by one central party (i.e. SWIFT) changes and updates to the Ripple protocol building RippleNet occur through majority consent of nodes (i.e. financial institutions participating in the network) and not through a regulated central authority. How will the regulatory framework for such a decentralized governance structure look like?

Moreover, Mattila (2016) argues for blockchain's decentralized nature of consent to potentially create a trend for disintermediation. Ongoing research is necessary to investigate more global implications on the viability of banks in their current function as intermediating middlemen and whether blockchain makes banks' current function as those obsolete in the long-term. What will be further implications to business models across different industries and our society at large?

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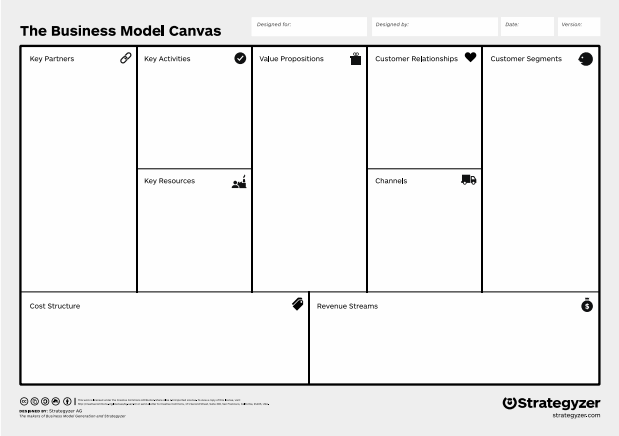
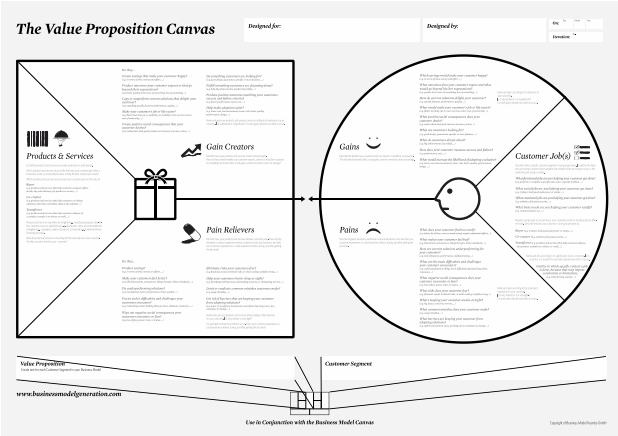
APPENDIX

Appendix A:
Business Model Canvas by Osterwalder in collaboration with Strategyzer



Appendix B:
Value Proposition Canvas by Osterwalder, Pigneur, Bernarda & Smith in collaboration with Strategyzer



Appendix C:

Interview Outline for data collection on current banking situation. Conducted with G. Rougoor (Rabobank) & C. Wessels (Fiducia GAD).

Interview Outline
Fiducia GAD/ Rabobank
Interviewer: Sven Magnus Degener
Student no.: s1746936
Interviewee: Christopher Wessels (Expert in financial logistics and blockchain at Fiducia GAD); Gerdinand Rougoor (Expert in financial logistics at Rabobank)

Method: semi-structured expert interviews

For the following questions consider the case of a traditional bank like the Volksbank in Germany transferring funds from a German bank account to one in the United States:

1. **Business Model** current situation of international transfer processing systems

- Between which *customer segments* are banks differentiating in such a context?

now switch to section 2 of the interview outline

- Through which *channels* are the product offerings described by the answers to the questions in section 2 communicated and delivered to the customers?
- In what sense do *customer relationships* play a role in this case?
- What *revenue streams* are resulting from the value proposition derived in section 2?
- What *key resources* are necessary to perform and deliver the components previously explained (customer segments, channels, customer relationships, revenue streams)?
- What are *key activities* involved in the transaction of money internationally?
- What are *key partners* of such a bank in processing such a transaction from crediting until debiting the funds?
- All the previous elements of the business model should ideally lead to a cost structure. What is the *cost structure* of traditional banks in the given context?

***now switch to section 3 of the interview outline

2. **Value Proposition** current cross-border payment providers

- What *gains* or *benefits* do customers expect in this context?
- What are *gain creators* in the business model of traditional banks in the context of international payment processing?
- What are *pains* customers experience in the given context?
- What are the *pain relievers* for customers offered by traditional banks to counter the aforementioned customer pains?
    - Is there any product or service that offers relief of the aforementioned pains for customers?

Do those ease the process where the process is difficult or challenging?

- What is part of the *value proposition* of traditional banks in this context?

now switching back to initial position in section 1 of the interview outline

For the 3rd section of this interview outline the focus lies on value networks. Those are defined as a "business value system in a mediation industry is potentially a set of coproducing, layered and interconnected networks that enhance the range and reach of the services provided." (Stabell, C. B., Fjeldstad, O. D. 1998).

3. Value networks of current cross-border payment providers

- Considering the given definition above, can you define such a system or similar structures within the current system of transferring payments internationally?
- Option 1 if yes: In case of such systems existing, can you explain the system and its participating actors?
- Option 2 if not: Can you think of a reason why there are no such systems in place?
- Add-on option 2: Do you see potential areas of application for such a value network concept in the field of international payment processing systems?

Appendix D:

Interview Outline for data collection on blockchain based cross-border payments. Conducted with Sandip Pandey (Blockchain Lab TU Delft)

Interview Outline
On Ripple
Interviewer: Sven Magnus Degener
Student no.: s1746936
Interviewee: Sandip Pandey (Expert in blockchain development at Blockchain Lab TU Delft)
Method: semi-structured expert interviews

For this interview, please consider only the scope of cross-border payments and the corresponding process of sending funds from one account to another. To ease to the comparison later on, please use the example of sending funds from a Dutch bank account to a US account.

1. **Business Model** of blockchain based cross-border payments in case of Ripple

- Between which customer segments does ripple differentiates in their business model?

*** now switching to section 2 of this interview outline ***

- Through which *channels* are the product & service offerings described by the answers to the questions in section 2 communicated and delivered to the customers?
- In what sense do *customer relationships* play a role in this case?
- What *revenue streams* are resulting from the value proposition derived in section 2?
- What *key resources* are necessary to perform and deliver the components previously explained (customer segments, channels, customer relationships, revenue streams)?
- What are *key activities* involved in the processing of cross-border payments in the case of ripple?
- What are *key partners* of ripple in processing such transactions from crediting until debiting the funds?
- All the previous elements of the business model should ideally lead to a cost structure. What is the *cost structure* of ripple in the given context?

*** now switch to section 3 of the interview outline ***

2. Value Proposition of blockchain based cross-border payments in case of Ripple

- What *gains* or *benefits* do customers expect in this context?
- What are *gain creators* in the business model of ripple in the context of cross-border payment processing?
- What are *pains* customers experience in the given context?
- What are the *pain relievers* for customers offered by ripple to counter the aforementioned customer pains?
- What is part of the *value proposition* of ripple in the context of cross-border payment facilitation?
- What *products* or *services* are offered that are developed based on the aforementioned customer expectations, pains and jobs?

*** now switching back to the second question of section 1 ***

For the 3rd section of this interview outline the focus lies on value networks. Those are defined as a "business value system in a mediation industry is potentially a set of coproducing, layered and interconnected networks that enhance the range and reach of the services provided." (Stabell, C. B., Fjeldstad, O. D. 1998).

3. Existing or potential **value networks** in the case of Ripple

- Considering the given definition above, can you define such a system or similar structures for ripple?
- Option 1 if yes: In case of such systems existing, can you explain the system and its participating actors?
- Option 2 if not: Can you think of a reason why there are no such systems in place?
- Add-on option 2: Do you see potential areas of application for such a value network concept in the field of international payment processing systems?

Appendix E:

Interview Outline for validation interview on the feasibility of blockchain application for banking. Conducted with Christopher Wessels (Fiducia GAD).

Interview Outline
Fiducia GAD
Interviewer: Sven Magnus Degener
Student no.: s1746936
Interviewee: Christopher Wessels; Blockchain Expert at Fiducia GAD
Method: semi-structured expert interviews

This interview aims at gathering an expert perspective on whether the current international banking system is able to switch to blockchain based processing within a timeframe of approximately three years or not.

1. Do you think the global banking system currently operated via SWIFT is able to switch entirely to a blockchain based network solution within 3 years?
    a. If yes: why do you believe it can?
    b. If no: can you identify reasons why such a shift is not possible for the global banking system?
    c. If no: do you believe that the international banking system can ever shift to a blockchain based solution and why?
        i. Can you identify a likely time period until such a change may be realized?

2. What are challenges which may occur in the shift to blockchain?
3. Are there currently solutions available in the market which are suitable for replacing SWIFT?

Appendix F:

Interview Outline for validation interview on the development stage of the Blockchain technology to substitute current banking systems. Conducted with Peter Langela (Novel-T).

Interview Outline
Novel-T
Interviewer: Sven Magnus Degener
Student no.: s1746936
Interviewee: Peter Langela; Blockchain Expert at Novel-T
Method: semi-structured expert interviews

This interview aims at gathering an expert perspective on whether the currently available blockchain technology can be applied for the processing the majority of global payments.

1. According to Gartner's hype cycle, where do you position the blockchain technology at the moment?
2. Why do you position it there?
3. Irrespectively of the previous questions, is the blockchain technology - from a technological perspective - secure enough against attacks or internal system failures to transact personal financial data on a large scale?
    a. If not: Do you think it ever will be secure enough? If yes, what time horizon do you expect?
    b. Is the security of the blockchain harmed when increasing the amount of transactions?
4. Do you think any blockchain can currently handle the total amount of cross-border payments globally?
. If not: How long do you believe will it take until blockchain is ready to handle such amounts of transactions?
5. Do you think there are fintech companies already in the market that do a good job applying blockchain technology in a way which makes sense for future applications?