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"Viability of Payments and Payroll with Blockchain Technology

Finance Project

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Abstract

Blockchain technology is the cutting edge technology for the payment sector and is reshaping the financial industry. It is becoming the backbone of financial transactions in the emerging fintech industry because of its efficiency and effectiveness. This paper aims to investigate the viability of the hefty blockchain technology in the payments sector and payroll companies in human resources for the Etch Company. Essentially, it has introduced a SWOT analysis of blockchain technology on the subsector of payments, which is composed of banks, B2B, P2P/Remittances, and payroll in human resource. This knowledge can be utilized by payments companies to find the most suitable way to implement Blockchain Technology as market analysis.

Recommendations will be proposed about how to implement blockchain technology in the subsector of payments/payroll in Etch Company. This research in overall shows that the viability of blockchain technology in the payments sector is extremely dependent on the individual objectives of applying the technology and the subsector of payments the company has. In particular, companies have to focus on scalability property when identifying the best tradeoff of scalability, security and decentralization in order to develop a blockchain network caused by the scalability issue.

Chiefly, our analysis stated that blockchain Technology is too immature and depends on improvement of the scalability issues. Blockchain Technology is still in the testing development phase. As soon as the finality of scalability has been proved in the blockchain labs, the blockchain network will see massive growth. Analysis indicates that blockchain technology has a significant competitive advantage in security and has been shown to able to be implemented purpose. Finally, the results present that in terms of cost it is logical, obvious and intuitive that it is uniquely cost efficient in comparison with the traditional method in payments.

Introduction

Why is blockchain technology the new mainstream that has disrupted financial services?
Throughout my masters it has been highlighted that Fintech automatizes every financial service with modern technology achieving efficiency and effectiveness. In other work, fintech is the technology that enables financial solutions like contactless and is well known as the marriage of financial services and information technology. Fintech is using new modern technology that is reshaping the financial industry, which is becoming the new paradigm within the industry. One notable example is blockchain technology, which Deloitte (2016) views as having similar importance to value as the internet has to information.

Through money streaming, blockchain technology allows employers to pay their employees in real time payments, thus reducing the time taken between working and getting paid to zero. With blockchain technology you can achieve this and what is called money streaming. Thus, with the blockchain technology you can disrupt how payments and wages by employers can be made. This disruptive cause is opens a new market regarding how payments can be done. This is the value preposition of Etch. Etch is a company which employs a payroll blockchain protocol, enabling construction employees to receive real time payments. In order to assess the viability of Etch and the blockchain technology they are using by comparing it to those of other companies, it is first necessary to understand the payments/payroll sector and the research that has been done. It is essential the difference between blockchain and the network is understood. The network is a series of computer/nodes that are connected. The properties of the network are mainly related to scalability, security, decentralization. According to Carter (2018), Blockchain technology is a distributed ledger upon which new entries structured in blocks are continually inscribed. In other words, the blockchain is the network/data structure and data base in the form of decentralized ledger and is like the brain of the

network. Blockchains have characteristics such as efficiency, auditability, transparency, verifiability, trust, minimization, and immutability. Mainstream blockchain can be likened to elephants that do not forget. The network is the computer and the blockchain is the spreadsheet.

In this research I critically appraise the operations of companies in the payments/ payroll sector on four subsectors: Bank; B2B; P2P/remittances; and payroll in Human Resources. These are the value prepositions of these companies. This is done in order to understand the viability of the business model delivering to the payment industry and to compare it to the traditional/incumbent payment companies using blockchain technology. In addition, this research addresses a market analysis on the current players and innovations in the payment & payroll sector using blockchain technology. The market analysis addresses the analysis from the perspective of the three main properties of the network, which are the scalability, security, and decentralization of payments of the companies that are providing payments services and payroll platforms in human resources using blockchain technology.

It is widely agreed that blockchain technology has extraordinary attributes for particular sectors including government, supply chain and security. However, blockchain technology is not suitable for every industry. There are blockchain that works with Proof of work, which is a consensus algorithm that is extremely costly for the hash power that it requires. In fact, Bitcoin and Ethereum works with Proof of Work so they have a problem of the cost energy. For instance, for saving data it is not the right technology because it is too costly. In fact, it can be good for some kind of data like the Social Security Number because it has to be ensure quality and absolute truth. However, if you utilize Non- Proof of Work like Hyperledger and Ripple you do not have this problem of energy cost. Despite the fact of the energy cost, many people presume it is suitable for every industry, which is not true. Indeed, blockchain technology impacts

and facilitates for the subsector of payments for many reasons Blockchain technology is impacting the big players of payments in the industry, which are banks. For instance, Penser (2018) reported that J. P Morgan has developed Interbank Information Network (IIN) which is a blockchain network for banks. Other players that are having an impact on the payments sector through Distributed ledger technology are the cryptocurrency companies. For example, Ripple Company has opened 100 contracts with financial institutions according to Penser (2018). In fact, the Distributed ledger Technology is a share ledger and more generalized technology than blockchain technology.

Overall, blockchain technology is impacting and facilitating the payments industry and look to have the ability to alter how employers pay employees in real time payments with blockchain technology, which is Etch's company business model in the construction industry. The reason this matters is because construction employees have other financial responsibilities to families, at home and overseas, which do not simply fit around a payday. The construction industry in particular, often has problems with invoice delays. These can result in delays to the payroll of, in some cases, up to 90 days and could potentially lead to liquidity problems for the employees who are unable to cover their other costs. Hence, Etch believes that will solve this problem in the construction industry. Thus, the purpose of this project is to analyze blockchain technology in the payments/payroll sector.

Background

Fintech is the emerging sector of the financial industry with blockchain technology being one of the reasons for this. Blockchain technology is so new that applying new theories to studying blockchains is only just starting. One such theory is Forkonomy, a new theory which explains the study of the “fragmentation of software codebases and protocol

networks compromising distributed networks" research by Alsindi (2018). This theory helps to understand how decentralized networks work. Due to its recent development, new theories and principles are being implemented to better understand the technology that underlines blockchain. However, it can be argued that fintech began with the innovations of the telegraph and the ATM, in 1884 and 1969 respectively. Nowadays, fintech develops faster with innovations like contactless and blockchain technology. Indeed, it is really hard to keep up with all the new fintech companies that have developed, such as Abra, which work to improve customer satisfaction. In fact, the payment industry has been revolutionizing because of the different technology being used.

At the same time, within fintech there is blockchain technology that was begun officially in 2008 when Nakomoto (2008) identified the benefits of it in his paper "Bitcoin: A peer to Peer Electronic Cash System". Through the blockchain technology the cryptocurrency of Bitcoin allows online payments to be sent directly from one to person to another without going through a financial institution. Thus, blockchain technology facilitates payments and removes intermediation of financial institutions. Disintermediation and decentralization are some of the main properties of the blockchain network. According to NASDAQ (2017) with decentralization, "no single entity has exclusive control over data or processes". This main property of blockchain networks can disrupt any industry that has significant third party costs, which, as Carter (2008) points out, most industries do. This is why blockchain technology has potential to reshape every industry because it cuts out middle men. The other key properties of the network of the blockchain are scalability and security. Scalability which is considered the present and future capacity of the network and is mainly measured by the transaction per seconds that can executed by the blockchain network, is the main property that the payments sector is concerned about because of its lack of development. According to the MIT Technology Review (2018), blockchain

allows for the sharing of valuable data in a secure, tamper proof way because of the consensus and cryptographic fingerprint of the blocks.

The basic hypothesis is that blockchain technology will facilitate 99.9% real time payments with smart contract featuring financial ledgers. This will be effective and provide efficiency for employees and employers and will incorporate transparency to the payment process in human resources. In addition, the efficiency that is delivered cuts paper work. Companies like Maersk, for instance, do all their tasks on paper. Deploying blockchain will significantly improve the efficiency of companies like them, by reducing the amount of paper and employees required, and therefore, reducing costs. In contrast, IBM (2018) started applying blockchain to save time and money.

This research will compare the three main properties of the network of blockchain technology, which are scalability, security and decentralization. The research will go on to contemplate an analysis of speed, cost, and transparency. This is how experts analyze blockchain networks along with the ways in which they can be implemented into the payments subsector. Much analysis focuses on evaluating the tradeoff of property in terms of security, stability and decentralization.

Experts opinions on the Blockchain Technology on payments and payroll in HR

Jason (2017) outlines that Ben Bernanke, the Fed, the Bank of England, and Japan are very supportive of blockchain technologies because decentralized distributed ledgers will improve payment systems, efficiency, transparency and auditability.

In addition, Fast Company (2017) highlights that Abra and Circle, which are companies that apply to the blockchain technology, is a viable business model with the ability to compete with businesses like Western Union and MoneyGram because of improvements

to efficiency. Therefore, it's deducted by the experts mention above that companies in the payments/payroll sector have a competitive advantage if they incorporate the blockchain technology.

It is worth examining how the technology is going to disrupt the payroll in human resources. Payroll in human resources, which is a subsector of payments, has to be analyzed as this is where companies like Etch can capitalize on their new business model, especially because it delivers blockchain technology. The company reported (PwC, 2017) that blockchain technology can impact on human resources and the workplace in a transformational way and concluded that it has to start applying the technology in order to achieve higher levels of efficiency and effectiveness. The society for Human Resource Management (2018) discusses blockchain in payroll, arguing that it has competitive advantages, especially in terms of international payments, because of its ability to cut out the middle man and permit less expensive and timely payments globally.

Deloitte (2017) claim “blockchain has the potential to reshape the HR technology landscape”. This is another example from an expert in the field of payments in human resources that believes that blockchain is going to reshape HR by improving its efficiency and effectiveness. This is the vision of Etch, that aims to disrupt the traditional business model of human resources payroll companies. Etch will integrate what no company has integrated before, which is real time payments in payroll for construction employees.

Literature Review

Payments Sector

The payments sector is massive in the financial industry, the company (McKinsey & Company, 2016) reported that the global payments sector will generate over $400 billion more in annual revenue compared to 2016, with this revenue being spread throughout the world. Thus, any business entering to this sector with competitive technology can create a substantial impact. With the new technology, payments have gone from banks accounts to e-wallets and metal coins to paper, cashless payments and particularly the token system (Overview of the Payments Industry, 2018). Can be deduct that this is all down to the radical development of the technology that is driving the payments systems. The key drivers in technology that will change the payments process are the following: the Real Time Payments because of customer demand; the Distributed Ledger Technology, which will change the cost model through use of distribution networks or the cloud and not relying on expensive enterprise resource planning, the expansion of payments to non-physical interfaces, and lastly payment platforms like Visa B2B Connect and Unified Payments Interface/free payment systems by Visa/MasterCard/SWIFT (Overview of the Payments Industry, 2018). In terms of switching costs from ERP to blockchain technology the initial investment may be more expensive than Data Base, however in the long term, it will reduce costs as a consequence of efficiency. Hence, all these trend drivers in the technology will disrupt the payments industry and if payment companies combine these four drivers can make a radical impact in payments.

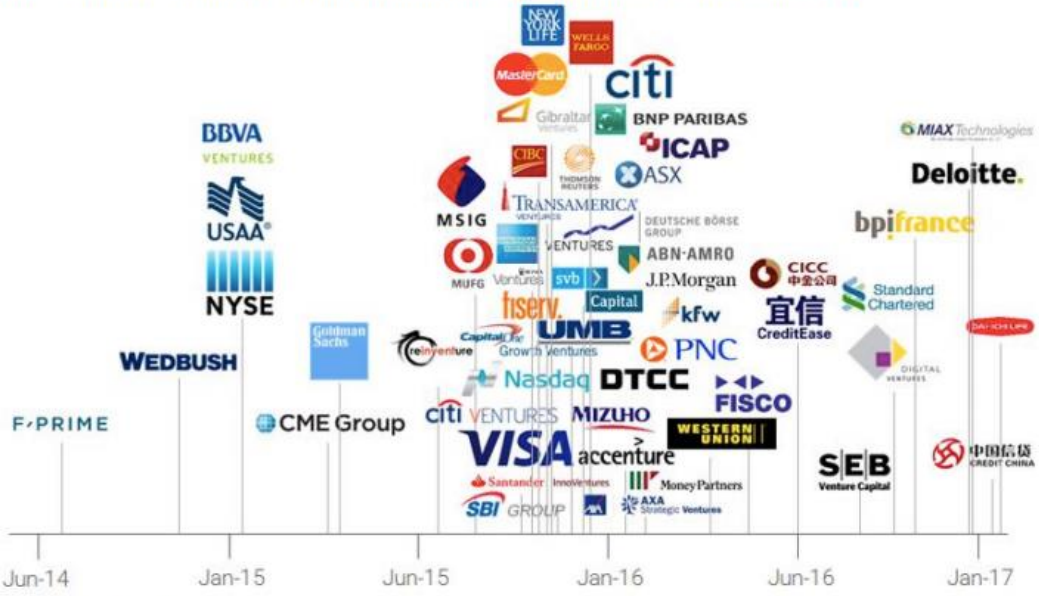
Finally, the company Deloitte (2018) highlights that from an interview of 24 industry experts, the payment systems was seen to be unlikely to be run by banks in the long term. Indeed, one possible explanation for this is that they cannot change the huge legacy infrastructure of payments on banks easily compared to start ups. It seems that

startups, like the company Revolut in 2018, are the key players that will disrupt the payment industry.

Lastly, to underline the potential of blockchain, the company PwC (2016) highlighted that they presume that blockchain technology will be an essential part of the financial institutions technology and the operation infrastructure. Figure 1.1 presents the extent to which competitors are applying block chain technology.

Figure 1.1- Startups using blockchain from 2014 to 2017

Figure 2: The march of financial services firms into bitcoin & blockchain start-ups, 2014 to February 2017



Source: CBInsights, cbinsights.com

Competitive Advantage of Payments in General of Blockchain Technology

Table 1.1- Summary of Competitive Advantages and Limitations

Summary

General competitive advantage of blockchain	General Limitations of blockchain
Processing speed	Network scalability issue
Security	Technology is not 100% developed
Cost-audit trail-reduce compliance and transactions	Cost of implementation
Know Your Customer- reduces Identity verification	KYC-immutable
Efficiency and effectiveness to the business	

Broadly speaking, the key competitive advantage of blockchain technology for the payments/payroll industry, notably speed, cost and transparency. According to Penser (2018), a well-known consultant company in payments mentions four key benefits of blockchain: security; processing speed; audit trail; and Know Your Customer (Identity verification). In terms of security advantages, Penser (2018) mentions that with centralized databases hackers can breach one system and after that they are inside the system doing what they want. In contrast, blockchain platforms are impossible to infiltrate because hackers would need access to the every computer in the system at the same time to be able to enter the system. The security, attributed to blockchain is key for the payments sector as it prevents unethical people obtaining free money.

Furthermore, private blockchains are like building your Dapps on top of the platform of Ethereum and public blockchain is like Bitcoin. Having said that, there is a difference between private blockchain and public blockchain in terms of security. Private blockchain is not more secure than public blockchain but is more tamper resistant. Thus, public blockchains like Bitcoin are considered more secure than the private blockchain because as soon as a hacker is inside the private blockchain it is simple to break the system.

The second competitive advantage of blockchain technology is speed. Penser (2018) discussed how the blockchain platform can connect to all parties in real time in order to make payments. For example, Penser (2018) gave as an example trying to withdraw money from another bank's ATM, where the bank has to confirm that you have enough funds, with this taking time. However, with blockchain technology if the banks are in the same blockchain platform, this happens instantaneously (Penser, 2018). The transaction in blockchain is almost instantaneous because it depends on the block time, number of confirmations required for finality and depends on a consensus mechanism. For instance, the Litecoin has an average of 2.5 minutes block time. Hence, blockchain accelerates the speed of payments significantly so that you can say they are is real time payments.

The third competitive advantage where costs can be significantly reduced is what Penser (2018) calls the audit trail. With blockchain technology compliance decreases significantly because financial institutions do not have to keep redundant audit trails of transactions (Penser, 2018). Indeed, the regulators and auditors only need to enter to the blockchain network to verify transactions, hence, simplifying the process of compliance.

The fourth competitive advantage, according to Penser (2018), is linked to the third one. This is the due diligence of Know Your Customer (KYC). With the blockchain technology the verification of a client by another company does not have to start again as soon as one happens. Therefore, the verification of Know Your Customer will be simplified, which every organization can benefit from.

Since everything is globalized now and KYC is standardized across countries over time blockchain will significantly benefit KYC. One of the best examples why blockchain technology, perhaps has to be applied to be competitive in the payment industry is transfer money across borders. The company Deloitte (2018) highlighted that blockchain

makes transactions faster and simplifies the process so that they reduce material costs. This research identifies key attributes that blockchain technology can bring to payments such as cost, security and speed. The company McKinsey & Company (2017) forecasted that blockchain will have an impact of around $80B to $110B. This concludes that blockchain technology optimizes attributes mentioned above achieving efficiency and effectiveness to the business in the payments process.

Limitations of Blockchain

Considered of equal importance is the awareness of the disadvantages of the blockchain technology that have been encountered. For limitations of Blockchain technology the company Square (2017) contemplate a SWOT analysis of blockchain technology and because they are an advance payments company is good to understand their point of view. Figure 1 summarized a SWOT analysis (Square, 2017) and outlined that the weaknesses are the following, low capacity and processing speed which translates to blockchain, which is the main concern for the financial institutions. Additional weaknesses are challenges with ownership and security against cyber criminals. Furthermore, the technology is not 100% developed. The main challenge of blockchain is the cost of implementation. Likewise, there is a clear view that with further studies and developments of the blockchain technology that this disadvantages will be overcome. On the other hand, it's is questionable how KYC is going to be affected by blockchain. In reference with KYC you have to consider the regulations of each country and these regulations change overtime. Thus, in this sense regulations will deliver a challenge to blockchain.

In sum, the company adds (Square, 2017) that there is a lot of uncertainty about how big the impact is going to be with blockchain technology and how fast it will be implemented. In sum, this technology will disrupt the payment's sector.

Table 1.2: SWOT Analyses of blockchain in the financial industry (Square, 2017)

Strengths	Weaknesses
- Lower risk - Lower cost - Higher efficiency - Able to skip the intermediary - No reliance on third party - Auditable trail - 100% transparent - Unharmed privacy - More secure	- Recent technology (not 100% developed) - Access challenge - Ownership challenge - Low capacity & processing speed - Security against cyber criminals - Storage
Opportunities	**Threats**
- Programmable control mechanisms - Automations - Faster (international) payment transfers - Increase quality of products & services - Speed up bank processes - No reliance on rating agencies - Elimination of trust necessity - KYC database - Instantaneous settlements - Smart contracts in insurance - Improved customer experience	- Huge regulatory impact - A lot of research needs to be done - High investments for implementation - Time-consuming negotiations - Disappearance of existing banking jobs - Uncertainty about the impact

Research Question

The viability of the blockchain technology in the payments sector & payroll companies in Human Resources and Etch Company.

Methodology

In order to research the viability of the blockchain technology on the payments sector and to be objective and not biased a SWOT analysis (Strength, Weaknesses, Opportunities and Thread) will be conducted on every subsector of payments, which in this case are Banks, B2B, P2P/ Remittances and payroll in Human Resources. The internal and external factors of the blockchain technology in payments sector will be analyzed.

The research recognizes that fintech and blockchain technology are new in the finance industry. Hence, there is not too much research in this area and it's necessary that this research mostly utilizes articles and reports and occasionally papers to assimilate what is happening right now in the market with the study cases and get the most from up-to-date developments.

Payments in Banks

Strengths

One expert (Accenture, 2017) in the industry reported that the benefit on banks of using blockchain technology and stated that by replacing the traditional database system with a distributed ledger system, banks can mitigate or completely remove reconciliation costs and at the same time improve data quality or enforce standardization. Accenture (2017) highlights similar advantages of blockchain technology that Penser (2018) did by focusing on the areas of finance reporting, compliance, business operations and Know Your Customer. In addition, Campbell (2017) identified the crucial benefits for banks of blockchain technology including timely clearing, settlement of cross-border payments/remittances, fraud and error reduction, lower administrative cost, trade finances, identity, and removal of paper trails. This suggests that adopting blockchain technology in banks is important for optimizing and simplifying operations. Having said this, it seems the banks have to apply blockchain technology in banks. Overall, speed, cost and security are the main strengths for payments.

Financial Impact

To understand the significant monetary administrative impact that blockchain technology has for banks, Accenture (2017) stated the strong savings for banks came from the middle and bank office processes as financial reporting costs can be decreased by 70% as a result of shared distributed ledger, which means there is one single source of verified data. Moreover, Accenture (2017) adds that compliance costs can be reduced from 30% to 50% because it increases transparency, the cost of which can be mitigated up to 50% by almost eliminating reconciliation and confirmation. Furthermore, Accenture (2017) claims that savings for operations like Know Your Customer can be huge savings up to 50% because of having a single database across the banks. In general, we can deduce that banks on average will have saving approximately 50% in implementing blockchain technology, which is a significant financial impact, making operations more profitable for banks. Hence, blockchain technology can be the backbone technology for banks in the near future because it will change their operations infrastructure. Furthermore, Accenture (2017) identified the infrastructure cost of 8 of the 10 largest investment banks can be mitigated up to 30%, which means savings of around 8 to 12 billion for banks. Even though the cost of changing the infrastructure of banks is high, these financial figures suggest that banks have to implement blockchain technology sooner or later.

Moreover, in terms of the general economy blockchain technology has substantial benefits. Barrdear and Kumhof (2016) who work for Bank of England, conclude that blockchain technology can increase GDB by 3% because it reduces real interest rates, distortionary taxes and monetary transaction costs. Broadly speaking, blockchain technology can reshape the economy, as the main participants, i.e. banks, implement it into their infrastructures.

Weaknesses

With blockchain technology in payments in banks there are some flaws that have to be addressed. According to the Financial Times (2016), the current weaknesses are immutability, scalability and cost of energy to operate the blockchain network.

Firstly, immutability is a problem for payments for banks because of human error. For instance, if a database is immutable it raises the possibility that if employee input an additional zero accidentally into a transaction, significant losses could occur. The second problem, which is most likely a concern for banks is the limited scalability, in other words, the transaction capacity of the network. For example, Ethereum and Bitcoin blockchain have consensus that every node of the network has to verify the transaction and as a result this decreases the number of transaction per seconds. On the other hand, there are other projects that are working within those limitations of scalability such as Hyperledger Fabric that can deliver a blockchain with 10,000 transaction per seconds. In addition, there are other projects working towards this issue of scalability like Litecoin and Ripple. For instance, EOS and Steem try to solve this problem with delegate proof of stake (DPOS) by reducing the number of validating nodes and as a result can increase the transactions per seconds significantly.

Thirdly, the transaction cost is another flaw that is needing to be overcome. Bitcoin can process only 7 transaction per second with an average of cost of .84 cents (June 9, 2018). McCabe (2017) points out that one transaction utilizes the equivalent energy that 1.5 average households do in one day. In addition, if assuming the majority of businesses in the world work with blockchain technology, at this point there would be insufficient energy to handle this technology. The excess of electricity is a concern and if not used properly it would be wasted. Therefore, there is a lot of research in this area needed to overcome the cost/energy issue.

Overall, these flaws tend to be the result of the technology being too immature. As soon as more experts develop in the space it is more likely these weaknesses will be overcome.

Opportunities

In general, blockchain technology has to be applied because of its strengths compared with the traditional technology that banks are employing for payments. The traditional method of transferring money used by banks is SWIFT. SWIFT technology arguably has some advantages over blockchain technology for transferring funds regarding cost, speed and, particularly, security. However, in terms of security SWIFT is not that secure because it is more likely hackers can attack the system easily. For example, Bangladesh hack, hackers broke the SWIFT system and stole around $81 million from the Bangladesh central banks (Financial Times, 2016). There is an increasing number of financial institutions deploying blockchain technology in order to cut costs joining companies like Ripple (Financial Times, 2017). Ripple is a company that focused on transferring money abroad for big financial institutions for very low fees compared to those of the traditional method SWIFT. The Financial Times (2017) stated that the SWIFT Company is exploring blockchain technology to implement in its system. Penser (2018) claims that SWIFT is studying if blockchain can help banks to the reconciliation of their international accounts in real time achieving global liquidity. Hence, in others words, it's suggest that SWIFT Company is consent the competitive advantage of blockchain technology. Thus, Ripple has become the competitor of Swift for transferring funds according to the Financial Times (2017). In fact, banks are not really using Ripple for any more than trials with the blockchain technology. These facts, again support the point that banks have to incorporate blockchain technology to benefit from the attributes.

Current Players

In every subsector of payments the blockchain technology has been deployed different to improve efficiency and effectiveness. For instance, banks around the world, according to Financial Times (2017), are exploring the potential benefits of applying blockchain for payments and using blockchain to launch their own digital currencies. Moreover, the Financial Times (2017) comments that Switzerland's UBS has a project to create and implement a utility settlement coin, a digital currency for payments by issue tokens convertible to cash on deposit in central banks. In other words, a utility settlement coin is a way to implement blockchain technology that promotes the benefits mentioned above and also to make more efficient back office tasks. The Financial Times (2017) believes that central banks are considering issuing their own digital currencies. According to Penser (2018), one of these is J.P. Morgan with an Interbank Information Network (IIN) implemented by Quorum that is a permissioned work through the Ethereum blockchain. The banks objectives are to reduce the compliance among member in the network and reduce problems of delayed payments. Blockchain technology is essentially for enhancing the payment process. Campbell (2017) states that JP Morgan sees the advantages of blockchain and joins a team of banks as RBC, Australia and New Zealand Banking Group in launching a new initiative to launch INN, which in the future most banks will join. Though Jaime Dimon, CEO of Chase is against Bitcoin, he however agrees that the technology behind Bitcoin has a competitive advantage (Campbell, 2017). The competitive advantage of the INN is that it will improve customer experience, decrease the amount of time of money transactions from weeks to hours and mitigate the cost of payments of delay (Campbell, 2017). Hence, applying the Interbank Information Network to the banks and seeing the success over time it's possible that SWIFT technology will be replace and more banks will join INN.

On the other hand, the next wave of development in blockchain technology is a cloud-based blockchain platform which is in implementation in Fujitsu and Three of Japan's Largest Banks according to Campbell (2017), they have stated that the IT provider is

developing a cloud based blockchain platform especially for money transfers between individuals as well as for banks, and they are investigating whether it is a superior process. A cloud-based blockchain platform is then, another way to implement blockchain in banks for payments in order to compromise security. However, clouds are more likely get hacked because in mainstream clouds are in someone else's computer.

Case study in banks - Santander & Ripple

The best tradeoff of this property of blockchain networks, according to Scherer (2017), for banks and financial institutions tends to be less decentralization, more scalability and better performance. Therefore, the financial institutions have to find the perfect tradeoff for this property of blockchain network and to focus on increasing scalability to be able to perform the payments process with blockchain better.

Having said that, in order to understand the best tradeoff for banks let's analyze one of the banks that was the one that introduced blockchain technology in UK, which is Santander. Santander and Ripple made a partnership to implement blockchain-based messaging systems called xCurrent, which permits banks to make transfer of funds between currencies in seconds (Financial Times, 2018).

Scalability, Security and Decentralization

Santander has said that they chose Ripple to apply a Distributed Ledger technology because the speed and transparency would improve international payments (Ripple XRP News Tech, 2018). The Distributed Ledger Technology they designed aims to be scalable and highlighted that they can convert dollars into other currencies in 2 seconds in

comparison to the 3 days the traditional method took. In fact, Zhao (2018) states that this blockchain network xCurrent does not use XRP, the cryptocurrency from Ripple

Some of the consensus mechanisms which are being evaluated in terms of security include indicators of proof of work, proof of stake, proof of authority and proof of Elapsed Time. The decentralization property of blockchain can be measured with the miner's nodes of the network, though they do not specify the miner's nodes to be validated.

Evaluation of the subsector

In conclusion, according to the case study of Santander and Ripple we can outline that banks cannot use blockchain technology yet for cross border payments because of scalability and privacy issues. The private blockchain does not have this problem of privacy. The Chief cryptographer David Schwarts said: "I will concede, we haven't gotten there yet" (Finextra Research, 2018). Thus, the blockchain technology that would allow banks to handle high scalability has not yet been developed. Essentially, the blockchain technology which is the distributed ledger, is mainly for efficiency but the scalability is not yet sufficient for the transaction capacity needed by banks. In fact, recent improvements in the blockchain technology suggest that sooner or later this issue of scalability will be solved by the addition of layers of a software stake with a more relaxed trust model as payment channels. For example, Lightning is a layer of software on top of the Bitcoin platform that improves the problem of scalability. Lighting software will be less secure because it has to sacrifice security to obtain more scalability and will also be less frictionless. Remember that the properties of the Blockchain Network are a tradeoff. Therefore, all banks' blockchain projects are working towards this issue. Hence, it's widely agreed that blockchain technology is not sufficiently developed.

In summary, banks are implementing blockchain technology in multiple ways, such as developing utility settlement coins with a blockchain platform, building Interbank Information Network INN throughout the Ethereum Blockchain and creating cloud-based blockchain platforms. This indicates, that applying blockchain technology has different approaches that can achieve specific goals. In addition, certainly, the evidence mentioned above suggests that blockchain technology development has a lot to do before it reaches its full potential. Therefore, the best way to implement blockchain technology for banks is to find out the best tradeoff of scalability, security and decentralization for banks, which is still something being explored.

Table 1.3 – Summary - Market analysis in Banks

Summary - Market Analysis

Subsector of Payments		Top Current Players	Technology	Explanation	Evaluation of the Subsector
Top Banks	1	J.P. Morgan	Interbank Information Network (IIN)-Ethereum	Reduce the compliance between members in the network, improve customer experience, decrease the amount of time money transactions take from weeks to hours and mitigate the cost of delays to payments.	Banks cannot use blockchain technology yet for cross border payments because of the scalability.
	2	UBS	Utility settlement coin	Create a digital currency for payments by issuing tokens convertible to cash on deposit in central banks.	Delivered efficiency, reduces data problem and brings instant settlement
	3	Fujitsu and Three of Japan's Largest Banks	Cloud based blockchain platform	For money transfers between individuals and banks	
	*	Case study- Ripple & Santander	The Distributed Ledger Technology based messaging system call Xcurrent	Blockchain network called xCurrent does not use XRP, permits banks to make transfers of funds between currencies in seconds	Future projects, Lightning is a layer of software in the Bitcoin platform to improve the problem of scalability. Lighting software will be less secure because have to sacrifice security to obtain more scalability and as well is going to be less frictioness.

Threats

The main challenge for banks using block chain technology can be summarized as regulatory threat. The threats related to regulations are uncertain because, according to the report by the Fintech Network (2016), no organization has yet regulated its blockchain technology. This is an issue for business owners using the blockchain technology, as they do not know if future regulations will affect their businesses. Moreover, another potential threat to consider is cyber-attack, since even secure systems can be broken.

Table 1.4 - Summary - SWOT analysis in Banks

Summary - SWOT Analysis

Subsector of Payments	Strengths	Weaknesses	Opportunities	Threats
Top Banks	Reduce reconciliation cost and the same time improving data quality or enforcing standardarization Finance report, compliance, business operations, Know Your Customer. Settlement of cross-border payments/remittances, fraud and error reduction, lower administrative cost, trade finances, identity, removal of paper trails. Optimizes and simplifies the operations	Immutability, scalability and cost of energy to operate the blockchain	Increasing number of financial institutions deploying blockchain technology in order to cut costs.	Regulatory Cyber threat even though the blockchain is highly secure it can be broken. 51% of crytocurrencies have been attacked creating the problem of double spend coins

Payments in B2B

Strengths

The second biggest subsector in payments is B2B. IBM is one of the biggest contributors and developers of the blockchain technology in this area. The company IBM (2018) reported that big companies are putting a lot of time and funds to gain the benefits of implementing blockchain technology. This indicates that companies already know the extra value that it can deliver to their businesses. IBM (2018) states that, "blockchain has the potential of a trans-formative technology". This view suggests that blockchain will transform overall business operations. IBM (2018) highlights that blockchain generally addresses issues like trust about security and the speed to business operations. For instance, in terms of speed in transferring funds in B2B there is a three-day settlement and with blockchain technology you can turn out approximately a settlement in 5 minutes, according to PYMNTS (2017). Again, the transaction settlement depends on block time, confirmation need and consensus mechanism. This technology is certainly substantially faster. PYMNTS (2017) claims that blockchain technology makes B2B payments superior for businesses and all operations can be simplified by the distributed ledger.

On the other hand, blockchain provides unique identity which translates to better security (IBM, 2018). For example, B2B companies can use blockchain to track, audit, verify and make assurances about the provenance of their products and payments. According to IBM (2018), this will reduce fraud for companies.

Blockchain technology is important for B2B payments as it significantly helps with the efficiency of the payments process. As a result, it is recognized that in the payments subsector blockchain technology helps achieve speed, and transparency for payments, as well as reducing costs.

Financial Impact

Unfortunately, there is not much evidence of the financial impact of the Blockchain technology in B2B at this point, however, Mckinsey (2017) forecasted that blockchain will lead to savings of approximately $50 to $60 billion in cross border B2B payments. This figure underlines the point of the advantages for international businesses adopting blockchain technology to achieve efficiency in their oversees payments.

Weaknesses

In the area of B2B, there are similar flaws to those with banks, though we can also highlight issues about scalability. In addition, another more important flaw that has to be addressed is the one highlighted by the Payments Journal (2018), which is the lack of skills developers in blockchain technology. Hence, if businesses implement blockchain technology and have problems with the system aren't many skilled workers that understand the technology who can fix the problem. The fintech sector has definitely developed more skilled workers in the area of the blockchain technology. The the lack of skilled workers in blockchain technology is due to the innovative nature of this technology, which means that at this stage the software, industry, ecosystem, product and services are all at an early stage of development.

Opportunities

In the area of B2B, the same payments system is used as in banks, which is the traditional SWIFT system mentioned previously. However, IBM (2018) discusses the revolution of blockchain technology and claims that afterwards this will be replaced by the actual B2B payments system and processes. In fact, PYMNTS (2017) outlined that SWIFT are using blockchain and distributed ledger APIs to increase the performance of money transfers.

This indicates that even though SWIFT is the traditional technology in this field, it too is applying the technology of blockchain to improve its payments processes.

Current Players

There are different methods for applying Blockchain technology in B2B payments. One way is to implement it as Master Card is, by testing their own blockchain network for B2B transactions (NASDAQ, 2018). A 2017 article in Forbes discussed Master Card's launch of a blockchain solution that provides a new way of business transaction that meets the needs of financial institutions. The article also points out that Master Card also initially wants to implement B2B transactions to address transparency, security, and cost for international payments. Hence, Master Card realizes the extra value of blockchain especially for cross boarder payments. In addition, Visa, one of Master Card's competitors, is doing the same thing, creating its own blockchain platform for payments processes and using application programming interfaces (Visa, 2018). It can be argues that Visa and MasterCard need more resilient networks. For example, Visa recently had a service outage for small business on a weekend, meaning there were no services for credit card services (Financial Times, 2018). Nonetheless, we can see that the key players in B2B payments are engaging with blockchain technology

Another method for incorporating blockchain technology for payments in B2B is using platforms like that of TraDove. TraDove uses smart contracts on top of the Ethereum blockchain to develop a B2B platform, using tokens as global payments systems for transactions. Investors in this include the former CFO of Morgan Stanley Phil Duff and, former CEO and Chairman of Bank of America Richard Rosenberg (Blockchain-Based Platform Becomes a B2B Disruptor, 2018). Ultimately, TraDove aims to construct the biggest platform for B2B so that businesses can work, advertise and market their products and services through use of the blockchain technology. TraDove's competitive advantage is that it removes third parties when it comes to payments (Blockchain-Based Platform

Becomes a B2B Disruptor, 2018). Therefore, business interested in doing business with other business using TraDove's platform are more likely to benefit substantially, because the blockchain technology there are using leads to a reduction of business operations costs.

Case study in B2B- Visa

In order to understand the superior tradeoff of the three properties of blockchain in B2B payments companies, it is worth analyzing the case of Visa, one key player in this subsector of payments implementation. Visa launched its first pilot phase, the blockchain B2B Connect, last year in order to use the platform to improve cross border payments. This is done by achieving direct payments between institutions with the assistance of the Blockchain startup Chain (CoinDesk, 2017).

Scalability, Security, Decentralized

The method Visa is applying blockchain technology with is the Visa Token Service VTS, which allows payments without the exposure of account details (Visa, 2018). Hence, the priority for Visa is greater security in the transactions rather than on issues of scalability. Indeed, security is one main competitive advantage of blockchain. The company Square (2018) explained that tokenization is the process of protecting data by replace it with an algorithm called token. This token achieves maximum security to the business as Visa transfers its funds. Above all, token is a piece of code representing a digital asset. Another attribute of having a token is that it address the liquidity problems of international payments.

Evaluation of the subsector

In conclusion, Visa is focusing in using the technology blockchain technology mainly for security and may achieve liquidity in the future through tokenization. Beach (2018) suggests that using cryptocurrency will enable banks to fund other accounts by using a global currency. This could be of particular importance for countries in areas like Africa and Latin America where local currencies are illiquid. Broadly speaking, Visa is achieving its objectives with blockchain technology by improving security and performance through the disintermediation of B2B payment processes.

We can see then, that companies like Visa are implementing or creating their blockchain platforms through B2B, while other companies like TraDove are implementing blockchain throughout Ethereum. In other words, TraDove is a private blockchain on top of an Ethereum platform. The best way of approaching blockchain technology depends on the business and how big its operations are. If the company is not that big and wants to do business with another company, it is beneficial to do so through the TraDove platform, using the platform to simplify processes to achieve reductions in costs. However, if the company you want to do business with is not on the TraDove platform or the company is not big enough, the best suitable option would be to launch a platform through the Ethereum blockchain, or to develop a new blockchain which takes into account the company's own platform parameters.

In Summary, there are many ways you can benefit from incorporating blockchain in payments in B2B, but companies have to find the best suitable method to incorporate ledger qualities such as efficiency, transparency, auditability and verifiability to find the best tradeoff of decentralization, scalability and security.

Table 1.5 – Summary - Market analysis in B2B

Summary -Market Analysis

Subsector of Payments		Top Current Players	Technology	Explanation	Evaluation of the Subsector
Top B2B platform	1	Master Card	Blockchain Network for B2B	Testing implementation of B2B transactions to address transparency, security, and cost of international payments	Wants to do business with another company that is on the Trandrove platform; use of the platform to simplify every process to achieve reductions in costs.
	2	Visa	Blockchain platform & using API	For payments process	Doing business with companies which are either not on the Tandrove platform or not big enough. Best suitable option in these cases is launch of a platform through Ethereum blockchain or development of own blockchain with own platform parameters.
	3	TraDove	Daap in top Etherum-B2B platform	Global payments systems for transactions in B2B so the business can work, advertise and market their products and services	
	*	Case study- Visa	Blockchain Network for B2B with tokenization	Use the platform to improve cross border payments by achieving direct payments between institutions.	Find the best suitable method to incorporate ledger qualities such as efficiency, transparency, auditability and verifiability to find the best tradeoff of decentralization, scalability and security.

Threats

PYMNTS (2018), points to a number of the challenges that B2B and banks have. Santander and MasterCard are examples of financial institutions to recently demonstrate their interest in blockchain that have faced challenges related to talent and profitability in their attempts to deliver blockchain technology. Furthermore, Moody's 2018 report highlighted the ways Canadian and Swiss banks can be affected by blockchain technology, focusing on issues like fees for cross border transactions. In other words, blockchain technology has created a challenge for some banks because the efficiency it achieves leads to some fees that banks traditionally charged customer for, and were the basis of bank profits, are no longer applicable. This means that banks risk losing customers to other fintech startups charging less for financial services, if they do not drop these charges. Essentially this strength of the blockchain technology could be seen as a creating a threat to the profitability of big financial institutions.

Table 1.6 - Summary - SWOT analysis in B2B

Summary - SWOT Analysis

Subsector of Payments	Strenths	Weaknesses	Opportunities	Threats
Top B2B platform	Speed in transferring funds in B2B where there is a three-day settlement. With blockchain technology settlements can be turned out in approximately 5 minutes . Make B2B payments superior for business and all operations can be simplified by the distributed ledger. Security	Scalability Lack of skills devopers in blockchain	SWIFT are using blockchain and distributed ledger APIs to increase the performance of money transfers.	Losing talent and profitability

Payments in P2P/Remittances

Strengths

Payments and remittances in P2P are a big subsector of payments. When it is time to transfer money to your friends or family there is a wide variety of companies, which transfer money, to choose from. Certainly, you have to identify things like the lowest fees, the most secure way and to consider the processing speed. The writer suggests that it is worthwhile considering a company that incorporates blockchain technology.

According to Fast Company (2017) there are a number of competitive advantage for companies using blockchain, such as its ability to work simultaneously on millions of devices, and to offer cheaper, and safer record keeping than banking systems do. They can transfer virtual currencies like Bitcoin as a proxy for traditional currency exchanges and substantially reduce costs (Fast Company, 2017). Therefore, it appears that choosing a company to transfer funds with blockchain technology is going to be cheaper and faster, since these companies do not have to go to the Foreign Exchange Market (FOREX) to exchange into other currencies.

Overall the main benefits in P2P payments systems are speed, cost, and transparency. Therefore, opting for a company that uses blockchain technology in payments (cross-currency) is a suitable option.

Financial Impact

The impact of adopting blockchain technology in P2P/remittances is significant. The Company International Finance Corporation (2017) reported that the global remittance business makes $40 million in fees annually and the fees are around 2% to 7% of the total transaction value. Bank wire transfers are even more expensive, amounting to around

10% to 15 %. Blockchain technology can deliver substantial saving in fees by avoiding these costs.

The company McKinsey & Company (2017) report that cross border P2P payments can lower costs and at the same time increase the speed of transactions. As a consequence, the remittance sector should save approximately $3 to $5 billion over the next 3 to 5 years.

Weaknesses

The main flaws of payments in P2P and Remittance in related to the transactions and low transition capability of the blockchain technology. This impacts on scalability for the companies that provide these services. Firstly, the cost of transferring funds across borders with Bitcoin is higher compared to Money transfer Operators like Western Union, TransferWise, etc. as reported by Finextra Research (2016). Thus, Bitcoin is more costly, however, with the new decentralized technology pioneered by Ripple this flaw can be overcome along with other flaws like energy costs, which will not operate with the POW mechanism (Finextra Research, 2016). Again these are flaws that will be overcome as blockchain technology develops. According to Finextra Research (2016), scalability is another weakness because it is a complex process involving risk. Again there is an indication that this technology is so innovative that there is a need to develop areas around it in the future.

Opportunities

The traditional method through which companies transfer money in P2P/remittances is SWIFT. Fast Company (2017) explains that traditionally company settle remittance funds using wire or SWIFT within the network of International banks. This network, however,

does not allow for the transfer of small amounts of money ($5 or $10) because of the fixed fees which make such transfers too expensive.
Fast Company (2017) highlights that new startups are bringing more convenience to customers transferring money in terms of fees, but they are still generally using SWIFT, so the impact of lowering the cost of transaction is limited.

On the other hand, despite the criticism of cryptocurrencies like bitcoin, the blockchain technology employed by start-ups cuts out the middle man, in this case the banks, so costs are significantly reduced. Indeed, blockchain technology used by companies that transfer money for people is not free of cost. Remember that there is a high initial cost of implementation, standardization and data structures across partners with blockchain. However, costs are lower than those of SWIFT, because mainly because third parties, like FOREX, are cut out, which accumulate costs when transferring fiat to fiat.

The P2P and remittances subsector of payments is where a lot companies competing for the market share of profits can be found. Some of these use blockchain technology and the some do not. Perhaps because blockchain technology is relatively new there are more companies for P2P payments that do not use blockchain technology. However, companies are increasingly wanting to implement blockchain technology to transfer money. For example, as Detrixhe (2018) highlights, TransferWise is considering implementing distributed ledger technology through Ripple.

Current Players

The International Finance Corporation (2017) has identified the key players in each country that have adopted blockchain technology in crypto-based cross border payments for P2P. These include “Abra and Ripple in the United States, BitPesa in Kenya, BitSpark in Hong Kong, OkCoin in China and OkLink/Coinsensure in India, CoiNnect Mexico/Argentina, Rebit and Coin.ph in the Philippines”. Fast Company (2017) discusses

how Abra transfers money. Basically they exchange the money into Bitcoin or Litecoin, transfer it across borders using blockchain as a payment rail, and then settle the amount in a local currency on the other end. In fact, the customer never knows they have transferred money through a Litecoin transaction.

In addition, other companies that apply blockchain technology in payments of P2P include Bitwala, which has Decentralized Application, known as Dapps, launched by Bitwala Messenger in which customers can communicate and send money to others using Altcoins; and users can transfer money without countries limitations (Berns, 2016). This suggests that there are a lot of players entering into this subsector with blockchain technology.

The players in the P2P payments sector who use blockchain technology can fix the weaknesses of web based social finance apps like Venmo, TransferWise, and WeChat because, compared to the distributed apps that run on a blockchain, Dapps provides immutability, security, privacy, and efficiency and does not have the specific geographic limitations as discussed by Berns (2016).
Therefore, for traditional companies like Western Union to remain competitive they have to incorporate blockchain technology. According to Fast Company (2017), Western Union is working to implement blockchain. Indeed, at the end of the day, traditional players like Venmo, WeChat, and TransferWise have to incorporate blockchain to stay competitive in the market and to be profitable.

Study case in P2P- Abra

Abra is a P2P Payments Company that facilitates transfer funds between smartphones and deposits funds with the blockchain technology. It has a similar business model to Revolut, however, the difference is the technology that they use for transferring funds.

Scalability, Security and Decentralized

Abra joined the Litecoin Network by implementing blockchain technology. Litecoin is a P2P cryptocurrency that can instantly and can transfers funds across borders almost zero cost (Weusecoins, 2018). This means that Abra transfers money transfers fiat to Litecoin and then from Litecoin to another country's fiat.

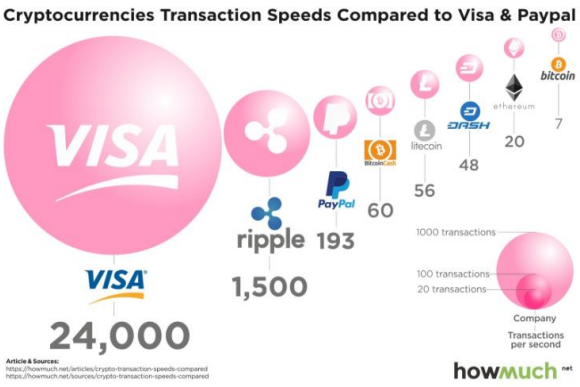
In fact, Litecoin is an open network, completely decentralized and permissionless, which means anyone can transfer money through them. In terms of scalability, Abra theoretically has the capacity to do 30,000 transactions per second on chain and off chain is not limited, instead, Visa accounts for 24,000 transactions per seconds. This is presented in figure 1.2, using figures from How much Net in 2018. In addition, the average Litecoin Blockchain cost could be significantly less than a cent according Coin Central (2018). Therefore, it could be argued that the Litecoin Network is better to use than Visa because of the former's high scalability and lower cost. Litecoin Blockchain has improved its scalability by reducing the average time of building a block to 2.5 minutes and having both off-chain and on-chain transactions.

Thus, we can assume that Litecoin's blockchain network solves the scalability problem, however, it is too soon to make this statement conclusively since it has not proven itself over a long period of time. Security can be measured by examining Proof of Work, which is what they use. In order to measure how decentralized the network is, it is worth examining measures like the number of nodes which are composed of mining nodes, full nodes and light nodes. In fact, it is difficult to tell how many nodes are in the network because there are invisible nodes.

By measuring decentralization (i.e. the number of nodes), we can see how resilient the Litecoin's network is. In this case, we can assume that it is sufficiently decentralized to provide resilience, particularly since through the Litecoin's platform $99 million has been transferred with a charge fee of just .40 cents. Considering that this the transaction took only 2.5 seconds, we can say that it is both incredible fast and less costly than the traditional system (Global Coin Report, 2018). Thus, it is believed that Litecoin can deliver

a superior tradeoff of decentralization, security, and scalability for financial institutions. As a consequence, joining their Blockchain Network is a good possible option to implement blockchain technology.

Figure 1.2- Transactions per seconds of top cryptocurrencies



Evaluation Subsector

In summary, Abra would be better off choosing Litecoin than choosing another open blockchain platform, like Bitcoin, despite Litecoin being slightly less secure than Bitcoin because of the bigger blocks, the shorter block time and the lower net hash. However, this security tradeoff is compensated for by smaller mining fees and an increase in scaling for users (CoinCentral, 2018).

This evidence suggests that the best method of transferring money in P2P or Remittance is to choose a company that uses blockchain technology like Abra, as this would reduce fees, increase security and remove geographical limitations. However, when choosing a company to transfer money, it is important to consider two things, which are the

technology the company is using and its business model. Considering these things will help gain an understanding of why the company has lower fees than others.

As an example, even though Revolut does not use blockchain technology the business model is so efficient that you can transfer money cross borders for zero fees. In this case then, we can say that the business model outweighs the technology they are using.

This evidence suggests that the best way to apply blockchain technology for payments in companies dealing with P2P/remittance is to do so through a cryptocurrency. One option would be Bitcoin, as it is the more secure and highly valued in the market than BitPesa is. Another way is to do as Abra has done and move to Litecoin's Blockchain Network. The method involves transferring money to a cryptocurrency and then to the fiat of the other country. This method increases speed, reduces costs from the inability to choose a bank or using FOREX, and also increases security because of the cryptographic nature of cryptocurrency protocol networks.

Table 1.7 – Summary - Market analysis in P2P/Remittances

Summary -Market Analysis

Subsector of Payments		Top Current Players	Technology	Explanation	Evaluation of the Subsector
Top P2P companies/remittance	1	Abra and Ripple in the United Sta			P2P/remittance is to do so through a cryptocurrency. One option would be Bitcoin, as it is the more secure and highly valued in the market than BitPesa is. Another way is to do as Abra has done and move to Litecoin's Blockchain Network. The method involves transferring money to a cryptocurrency and then to the fiat of the other country. This method increases speed, reduces costs from the inability to choose a bank or using FOREX, and also increases security because of the cryptographic nature of cryptocurrency protocol networks.
	2	BitPesa in Kenya			
	3	BitSpark in Hong Kong			
	4	OkCoin in China			
	5	OkLink/Coinsensure in India			
	6	CoiNnect Mexico/Argentina			
	7	Rebit and Coin.ph in the Philippin		*Use Blockchain Technology	
	8	Western Union	Western Union is working to implement blockchain		
	9	Venmo , Wechat, TrasferWise	Must incorporate blockchain to stay competitive in the market and to stay profitable		
	#	Bitwala	Dapps using Altcoins	Customers can communicate and send money to other using Altcoins and users can transfer money without countries' limitations	
	*	Case study - Abra	Exchange funds throught Litecoin	Transferring across borders using the digital currency blockchain as payment rail, and settling the amount in a local currency on the other end. The customer never knows the transfer money throughout a Litecoin transaction.	

Threats

The key challenge in P2P and Remittance payments is related to educating people about blockchain technology and building customer trust by explaining how companies use the technology. Cointelegraph (2015) comments that the first challenge of blockchain technology is this need to educate people about how it works. Without this knowledge and trust it is unlikely that people will want to use these services. However, for companies like Abra, this is less of a challenge, because they transfer funds across borders with Litecoin without customers knowing.

Another disadvantage is that there is no central regulatory body that regulates payments across borders, a point which has been highlighted by Ray (2018). This absence creates greater risks, and may help attract unethical people to the area of blockchain technology. Cyber risk is also a challenge worth considering, because even if the network is resilient, miners has the power in the Proof of work mechanism, so that the cryptography can be broken.

Table 1.8 - Summary - SWOT analysis in P2P/Remittances

Summary - SWOT Analysis

Subsector of Payments	Strengths	Weaknesses	Opportunities	Threats
Top P2P companies/remittance	Blockchain works on on millions of device simultaneously, offering cheaper, and more safe record keeping than banks systems.	Scalability	Wire or SWIFT do not allow small amounts of money to be transferred because of fixed fees, which are expensive for these types of amount.	Educating people to understand the technology is a challenge
	It is cheaper and faster because the companies do not have go to the Foreigh Exchange Market (FOREX) to exchange into other currencies	Cost of transferring funds across borders with Bitcoin is higher compared to Money transfer Operators like Western Union, Transferwise	Startups still use SWIFT, thus the impact of lowering costs for transactions is limited, it therefore is a non-disruptive payment technology. TransferWise is considering implementing distributed ledger technology throughout Ripple.	No central regulatory body that regulates payments across borders.

Payments/payroll in HR

Strengths

There is little research to evidence the benefits of blockchain technology in the area of human resources, however, the writer considers that the technology would be very beneficial to this area. One expert in the industry, PricewaterhouseCoopers (2017), argues that blockchain technology has four benefits for human resources, which are the following: it removes back office work, so reduces reconciliation; it removes third party involvement especially at the middle point of transactions; it delivers immutable evident transactions, putting business logic into a single transaction; and improves mobility and cross border payments. In summary, blockchain technology delivers the financial benefits that banks have directly to the sphere of human resources in terms of transactions. This means that blockchain platforms optimize the processes for employers and employees in payroll.

The company Rise (2018) identified the benefits of implementing blockchain technology in human resources, involving aspects of security access, payroll, insurance, payroll, and expenses work performance, history of employment. For Rise, this suggests that blockchain technology works in human resources as a digital key. Blockchain technology has a big impact on human resources because it appears that it can help address many tasks involving employment records and payroll.

On the other hand, Rise (2018) also highlights the major benefits of international payments for employees, such as the following: increased speed of payments; reduced cost of transactions; ability to track financial transactions; and security from cyber-attacks. Indeed, it has observed ways that blockchain technologies have benefited different areas in payments, such as speed, cost reduction of transactions, and increases in security, auditability, verifiability, and transparency.

For instance, Rise (2018) explains that payroll oversees is costly and takes time to process because of the third parties involved in it and because FOREX adds costs as well. Therefore, no matter in what subsector of payments you are in, one area where companies can seek potential competitive advantages is with international payments.
Rise argues that blockchain can improve defenses against cyber threat by using distributed consensus mechanisms and decentralized databases. This is a sensitive area in human resources due to the personal data involved in it. This evidence indicates how blockchain technology is reshaping every department of a company and the industry as a whole.

Financial Impact

Companies are considering implementing blockchain technology in the area of human resources because the use of it in payroll can have a massive impact in terms of money. According to Santander (2015), by 2022 blockchain technology can reduce costs by around $20 billion annually. With this in mind, blockchain is expected to transform the human resources industry significantly in the near future by streaming payments in real time.

Weaknesses

In human resources payroll some flaws of the blockchain technology have been identified. These include that validation is too slow and takes energy functions only in Proof of work blockchains. It is worth noting that the longer blockchain goes, the more energy is needed to maintain the same transaction speed (Why Blockchain Is Not Yet Ready for Payroll Prime Time, 2018). Thus the companies will have to invest in power. In terms of low validation of blockchain technology, transactions have been validated through nodes and a block cannot be finished until all nodes have finished their work (Why Blockchain Is Not Yet Ready for Payroll Prime Time, 2018). In fact, it appears that when the blockchain is

running an add check pointing can address this. Thus, with deep exploration of the technology, it is assumed that this won't be a flaw in the future. Thus, it is believed that blockchain technology is at too early a stage of development to be implemented to payroll. However, with technological changes happening so quickly there is hope that companies like Etch will overcome these flaws.

Opportunities

Snider and Sutner (2018) review the traditional technology that human resources have utilized for payroll and how different software, like Enterprise Resource Planning Systems (ERP), with different features has been created.

Companies use different software for payroll, this can be based on the premises, in the cloud or can be delivered through SaaS (Snider and Sutner, 2018). A payroll system based on the premises are the traditional systems available for vendors, like Kronos, Oracle, SAP, and ADP. According to Snider and Sutner (2018), these systems work effectively for many customers.

The second payroll system is called HR on premises + cloud. Some companies on HR payroll space offer cloud payroll software, while other companies use cloud payroll and others use other payroll system premises from the same vendor.

The third payroll system that has now achieved some popularity is SaaS. Snider and Sutner (2018) explain that SaaS is a payments system based only on the cloud. Vendors for this system include Ultimate Software, Workday, and Ceridian.

In contrast, the new blockchain technology is more likely to be superior than the software because it brings the competitive advantages mentioned above, especially for international payroll. SAP and Oracle, in particular, are now integrating blockchain, which in the case of SAP is called SAP HANA. Indeed, many traditional companies realizing the value of blockchain and have started to incorporate it into their traditional systems. Above all, one of the main opportunities of blockchain network is for international/global payroll.

Current Players

There multiple ways you can implement blockchain technology to payroll in the Human Resources. The company RISE (2018) discussed that one way to implement blockchain technology is to create their own blockchain based corporate currencies which means his to develop his own token in order to transfer value across organization without the intermediation of third party cost of reconciliation. The best example that fit in this description is Chrono Bank, which is a Australian bank develop his own blockchain platform for HR with her own token called LH Token and uses the token to pay workers without going through banks according to Society for Human Resources Management (2018). Thus, this token is key in order to minimize operational cost in general.

Study Case in payroll –Bitwage

Why many International companies are outsourcing HR companies for payroll? Other way companies save money on payroll systems when have employees working on other countries they contract company called Bitwage
(Society for Human Resources Management, 2018).
Essentially, Bitwage deliver to international employees and employers faster payments and take out the high commission from banks and Money transfers services according to the company Uphold (2018). Hence, Bitwage company enhanced the across borders payroll.

Scalability, Security, Decentralized

The company Bitwage uses the technology to enable and improve international payments with Bitcoin and the company business model is that employees and contractors around the world can be paid in their local currency exchanging fiat to bitcoin and then into local

currency (Society for Human Resources Management, 2018). Thus, the employer makes the payment to a bank account, Bitwage exchanges it to Bitcoin and sends it to employees. Bitwage states that it will pay out within 48 hours. In terms of scalability of using Bitcoin, Bitwage functions at 7 transactions per seconds which represents low scalability of the Bitcoin Network. However, it is highly secure because Bitcoin works with Proof of Work and the Network is highly decentralized, immutable and resistant. Nevertheless, Lightning is super scalable, which the layer of on top of Bitcoin, and subsequently Bitcoin, might overcome the problem with scalability. It is possible that Bitwage chooses Bitcoin because of its secure protocols network. One possible explanation is that in the area of human resources, which works with personal identity, it is vital to be secure. In addition, anonymous networks find it hard to comply with KYC and AML requirements, which is another challenge for human resources.

To summarize, payroll companies are using cryptocurrency to gain exponential competitive advantages.

Study Case in payroll – Etch

Another option is to adopt blockchain technology in payroll, which is what Etch does. Etch's business model involves using beacon technology, tied to blockchain based smart contracts, to create an employment record for construction employees. This makes it possible to make payments in real time using a fiat pegged ERC20 token backed by funds in a bank escrow account. In other words, Etch has developed its own token through the Ethereum blockchain to manage the payroll of construction employees. Essentially, it is a payroll based blockchain platform for the sector of construction that pays in real time.

Scalability, Security, Decentralized

The scalability of Ethereum is 20 transactions per seconds according to How much Net (2018). Instead, Etch Company builds a Dapps on top of Ethereum so that the dynamics are different. Hence they can dictate their parameters and as a result can obtain more transaction per seconds, which means more scalability. This is the most suitable tradeoff of scalability, decentralization and security for Etch. The security is Proof of Work and operates through a decentralized Ethereum network, with the level of decentralization depending on the parameters

Evaluation subsector

Overall, it appears that payroll companies are focusing more on security than scalability when applying blockchain technology, because they are using the most secure public blockchain networks Bitcoin and Ethereum.

As soon as the business of these payroll companies gets bigger they will need better scalability. Thus, it could be the case that they move to another public blockchain network like Litecoin or use off-chain tech like Lightning

Therefore, there are several ways to apply blockchain technology to payroll in HR, such as the following: outsourcing a Bitwage that transfer's money through Bitcoin; creating your own platform like ChronoBank; launching a platform through a blockchain network like Ethereum. Indeed, the best way to implement blockchain technology depends on the circumstances of the company. However, generally speaking, it is more likely that large companies will launch their own blockchain platforms with their own tokens and in that sense create their own parameters. If considering launching their own network it is essential that they are secure and administered. However, construction companies could consider joining a payroll platform like Etch, which will allow a degree of the payroll efficiency, as efficiency is what this focuses on.

In contrast, for small companies in other industries the most suitable way to implement blockchain technology in payroll in terms of cost would be to outsource a company like Bitwage .

Another big issues that has to be considered which are key to successfully saving money with the international payments and payroll is managing the risk associated with the volatility/ fluctuations of the cryptocurrency when transferring funds. In fact, the volatility of this cryptocurrency is very high.

Initially, a stable coin was a cryptocurrency that maintained a constant value and minimized the fluctuations of the market. There are five main ways you can manage volatility risk in order to have a stable coin, including delivering your own token as pegged to a fiat like Etch, using smart contracts, selecting a stable coin like Circle, outsourcing a company that manages risk like Uphold, and lastly minimizing the time spend in cryptocurrency when exchanging fiat to cryptocurrency and cryptocurrency to fiat.

In exploring how this can best be achieved, it is worth analyzing three stable coins, Tether, Bitshares and Circle. Tether is an old crypto asset focusing on providing stable coin on the Bitcoin Blockchain, which is pegged to the value of fiat. Attempts at pegging the values to create a stable coin have failed. Therefore, no one has yet found the right way to make this possible.

There are companies that handle the volatility risk by contracting companies, which is what Bitwage does. According to Uphold (2018), when using Uphold Connect, "Bitwage users can receive their bitcoins as the stable currency of their choice for free, avoid exposure to bitcoin volatility, and safely store their hard earned wages in the cloud". Thus, in the marketplace there are companies that dedicate their business to managing cryptocurrency volatility.

As mentioned above, attempts at creating a stable coin have failed, and it seems more effective to manage volatility risks by reducing the time spent on the cryptocurrency by outsourcing to a company that can manage these risks for you. In summary, the volatility of the cryptocurrency is not of great concern because there are multiple

ways to mitigate this risk. However, essentially, the best way to address this risk depends on the specific circumstances of a business.

Table 1.9 – Summary - Market analysis in HR & Payroll

Subsector of Payments		Top Current Players	Technology	Explanation	Evaluation of the Subsector
HR & Payroll platforms	1	Chronobank	Blockchain platform for HR with its own toke	Australian bank develops its own blockchain platform for HR with its own token called LH Token and uses the token to pay workers without going through banks	Payroll companies are focusing more on security than scalability when applying blockchain technology. More likely that large companies launch their own blockchain platform with their own token and, in that sense, create their own parameters. Small companies in other industries are best suited,in terms of cost, to implement blockchain technology in payroll by outsourcing a company like Bitwage . Attempts at pegging the values to create a stable coin have failed. Therefore, no one has yet found the right way to make this possible. Manage volatility risks by reducing the time spend on the crytocurency and instead outsoucing to a company that manages the risk for you.
	*	Case study - Bitwage	Exchange funds through Bitcoin	Deliver paymets to international employees and employers faster. Enhanced the across borders payroll.	
	*	Etch	Dapps at top of Ethereum	Etch business model is to use beacon technology tied to blockchain based smart contracts to create an employment record for construction employees to make payments in real time using a fiat pegged ERC20 token backed by funds in a bank escrow account.	
	*				

Threats

The biggest challenge in payroll in human resources is the General Data Protection Regulation. GDPR also introduces new laws, like the right to be forgotten and the right to amend personal data (Keeles, 2018). Blockchain has the attribute of immutability which means all data cannot be deleted or changed. Though it is difficult to change the data, it is not impossible because you can store hashes of personal data in blockchain but still need Data Bases in such cases. Complying with these regulations will be a challenge for human resources departments.

Table 1.10 - Summary - SWOT analysis in HR & Payroll

Summary - SWOT Analysis

Subsector of Payme	Strengths	Weaknesses	Opportunities	
HR & Payroll platforms	Removes back office work to reduce reconciliation, removes third parties, delivers immutable evident transactions, creates business logic into single transaction, and can make cross border payments and improve mobility.	POW -low validation of blockcahin technology validates the transactions through nodes and a block which cannot be finished until all nodes have finished their work.	SAP and Oracle, in particular, are now integrating blockchain. In the case of SAP it is called SAP HANA	One of the biggest challenges in payroll in Human Resources is the General Data Protection Regulation.
	Security access, payroll, insurance, payroll, expenses work performance, history of the employment. Blockchain technology works in Human Resources as a digital key.			GDPR introduces new law like the right to be forgotten and the right to amend personal data.
	Increases the speed of payments, reduces cost in the transaction, and tracks the financial transactions and security that addresses the cyber-attacks.. Increases the security, auditability, verificability, and transparency Improve defences against threats to cyber security using distributed consensus mechanismx and decentralized databases.			

Recommendations for Etch

It is evident that every blockchain company desires an extremely secure hybrid platform. This would be decentralized (bringing efficiency) and centralized (bringing privacy). In addition, blockchain companies want a highly scalable blockchain (off chain and side chain), stable coin (best mechanism) and proof of stake, however these options are in a testing phase and are not sufficiently developed at the time of writing. Thus, it is recommended that the options go through more testing.

1-Recommendations for develop your private Blockchain Network-

In order to be objective 3 scenario-recommending advantages and disadvantages have been developed.

First Scenario- regarding a permissioned blockchain with token

Considering the evidence discussed above and the results from this research, it is recommended that Etch, creates their own private/permission blockchain platform with their own token as soon as it scales with at least 10 employer contracts. This would allow them to create and design their own parameters as was the case with the Interbank Information Network project by Quorum, in which the utility settlement coin was used in banks. In this sense, it would be possible to create the best platform blockchain network with the most suitable tradeoff between scalability, decentralization and security. This would involve selecting the best tradeoff of scalability, decentralization and security focusing on scalability. The level of security in Proof of Work mechanisms is, in fact, normal and acceptable.

In this scenario the company can create value through the token and create liquidity, though there would be a degree of risk involved as the token could be volatile against fiat money.

Second Scenario-without a token

After scaling in a significant amount of contractors through Ethereum, Etch has another option, which the writer highly recommends. This would be to create a private blockchain network through Hyperledger or R3 and develop a hybrid platform (decentralized and centralized) with specific parameters, which has no issues with tokens, endorses policy consensus, and requires no proof of work.

The competitive advantage of applying this approach are that you eliminate three main hazards of the blockchain technology, the first of which is the volatility created by having a token. This approach would also eliminate the high cost of electricity and address scalability issues involved with having a endorse policy consensus. Having a endorse policy consensus means having less validators to the nodes, these messages can be sent faster and the blockchain network becomes more scalable. Otherwise, it can take the proportion of Byzantine Fault Tolerance to validate the nodes, which is (2/3+1). The best example of this is WeTrade, which is the most advanced project of banks with Hyperledger that do not require a token. Their success suggests that developing something from scratch is unnecessary, when something already exists that has been well proven by experts. Lastly, in this scenario you do not need to create value thorough a token, but rely on other ways to create value, such as vendor lock-in (clients must pay too much money for the service that they cannot leave) and end-user adoption driving network effects.

Third Scenario - Top of a public blockchain

Another option for Etch would be to can create their own platform on top of Lightning, Litecoin or MetaHash, in order to achieve scalability in the future. The disadvantages of Lightning are that they do not support token issuance but are instead denominated in Bitcoin. In addition these projects mentioned above are in currently in the testing phase because they are relatively new. Therefore, at this stage there is too much uncertainty

about building blockchain at the protocol layer, meaning that it is not yet clear what the real advantages of this system are, which is why it is not being recommended.

2-Recommendation for the future scaling solution

There is no concern about scaling blockchain network in order to able do more transaction per seconds because Ethereum is working on scaling projects, such as Raiden (off-chain) and Plasma (side chain). Therefore, scaling is unlikely to be an issue in the future.

If in the future Etch has multiple contracts with construction employers, this may create a lot of congestion/traffic in the Network. Therefore, launching their own private blockchain network and upgrading and integrating the mechanism from the Raiden and Plasma Ethereum projects is recommended. Using the Plasma mechanism as a side chain and giving each contractor their own blockchain network, would convert evrything together and help deliver the higher scalability which is the main goal. In addition, using the Raiden mechanism is recommended, as it is off-chain and consequently reduces costs significantly, since transactions inside the network are free of cost and deliver higher scalability. Raiden is a good solution for micropayments that reduce costs. Furthermore, the Bitcoin project of Lightning (off-chain) and Drive chains (side chains) are similar projects to Ethereum (Raiden & Plasma) that address the same scalability issues.

The Blockstream-Liquid project highly recommends using his trust model that has less validators to the nodes and side chains that can communicate with each other through an arbitrage. This would be beneficial for Etch, as it is possible to make new contracts and partnerships between companies through this system, and it can also help companies become more scalable.

Thus, in the future Etch can make any upgrade from these projects mention above to address the scalability issues.

3-Recommendation for stable coins and manage volatility risk

First Scenario- Choose a stable token

According to the evidence discussed above, in the past stable coin has failed. However, it can be argued that no one has convincingly proven the best approach for pegging a cryptocurrency with a fiat. Certainly, it is recommended to choose a stable coin with a more robust system, which will be more stable through time, such as MakerDAO (Dai). Research by BitMEX (2018) concludes that the "most advanced stable coin system has been developed is Dai token". Thus, it can be considered a powerful mechanism system for the stability of a token. Therefore, choosing a stable coin is less expensive, however it can be less secure because as it is unknown when the peg will break with the fiat, and there is no control over the decisions made by the stable coin's company. This would be problematic for Etch.

Second Scenario- Develop your own stable coin

Choosing to develop your own stable coin is an experimental process of selecting the superior stable coin mechanism which must be part of ongoing research. Indeed, it is advisable to develop your own stable coin using a combination of the more successful mechanisms already found in the area of stable coin. For example, according to BitMEX (2018), the Dai stable coin mechanism combines six possible stabilization mechanisms. Developing your own stable coin gives the creator control over the decisions made. Though this is the most expensive process, it would allow companies like Etch to make decisions specific to their needs. However, this would involve Etch needing to be completely focused on this process and continuing to research improvements of the peg mechanism.

On the other hand, having learnt that Etch has recently entered a partnership with Pier Protocol, this option could be advantageous because they will be able to apply the most up-to-date research on stable coin.

Third Scenario - Time spend in the token to fiat

Another option which is highly recommended to managing the volatility risk is to reduce the time spent on Etch's token (which is pegged to a fiat) by converting it to fiat when the construction of employees are paid. This would reduce volatility risks over time and make sure that the pegged of Etch's token has not been lost. The benefit of this strategy/scenario is that it can be implemented with the other two scenarios and the exposure to volatility risk is reduced. Otherwise, a company like Uphold can be outsourced, that manages volatility risk for you. However, this is not recommended as it delivers additional costs, and would put Etch at a monetary disadvantage.

Conclusion of recommendations for Etch

In summary, after analyzing the multiple scenarios/strategies available to Etch, the most suitable and advantageous is the approach that involves developing a hybrid private blockchain network with an endorsed policy consensus. This scenario involves being without a token and upgrading with the new projects like Plasma and Raiden for greater scalability in the future. Integrating the trust model of Blockstream-Liquid project would also be worthwhile. As a result, Etch would avoid volatility risk. In the future, it would also be beneficial to integrate POS, to reduce electricity costs, when it has been more thoroughly tested.

At the end of the day, having a global platform network for the construction industry's employers and employees can help them to interact and relate with one another. It could, for instance, through use of machine learning techniques, help identify similar interests

of employers from different countries and help to make partnerships. In addition, employees can choose to join a construction project if an opportunity has been highlighted by the platform.

Furthermore, after one year of the new Etch blockchain network being set up, when the main competitive advantage should be clear, it is also recommended that the company converts the Etch blockchain network to open source, to apply needs specific to the area of human resources in payroll. This will help Etch to have a strong position in the market, and to have a busy model and algorithms that will be extremely difficult to copy. This will lead to a demand by individuals and business people to build their Dapps on top of Etch to create payroll systems for other industry with their own parameters. In this way, it will not be necessary to work directly with your customers (saving the cost of human resources), making faster development of the Etch Blockchain Network possible, and saving costs and adding significant value to the company. This is a similar path to that followed by Ethereum, but is more specific to the needs of human resources, however, there is greater scope to expand to other industries. Ultimately the aim should be to develop the most trusted network in human resources in the world, to the extent that companies validate the credentials/employee ID of their potential recruits. In this way the platform could become like Facebook or LinkedIn but more trusted in the area of human resources. This could mean Etch reshaping the industry of human resources.

Future Projections

The first projects to research in the future should be concerned with a deeper investigation of scalability properties, as this is the main concern with blockchain networks at the moment. This would help gain an understanding of the correct ways to apply private Etch's blockchain network in the future.

It would also be worthwhile exploring and investigating the best suitable tradeoff of scalability, security and decentralization of a blockchain network for Etch.

Thirdly, projects could investigate the efficient costing of implementing blockchain technology compared to traditional payroll software. This would help identify targets when contracting more employers. Thus, as discussed above, such a project would be initially a large investment, but in the long term would be truly efficient compared to the traditional software.

Finally, more in-depth research about the best mechanism of stable coin, to upgrade the Pier Protocol should be undertaken.

Conclusion

In conclusion, at this point in time blockchain technology is immature, meaning that is in the testing and developing phases, with results not being too concrete. It is the writer's estimation that in the near future blockchain technology will be the backbone of financial transactions. It has been 10 years since Satoshi Nakamoto the father of blockchain technology released his paper Bitcoin: A Peer to Peer Electronic Cash System in (2008), marking the beginning of cryptocurrency and blockchain technology. This short space of time indicates that a lot must still be discovered to improve the blockchain technology for payments in terms of Scalability, Security and Decentralization. This conclusion is in line with the thematic research of the Bank of America's Merrill Lynch (2017), who concluded that there is “considerable potential for distributed leger technology to form part of the future of payments infrastructure”. This is because the validation function is cheaper and faster, though is not yet completely tested. In contrast, research by Broby (2018), titled "Regulating the “Dark Side” of financial blockchain”, states that blockchain is suitable for specific cases. However, Broby argues that it has flaws of processing power and time (only

for the case for Proof of Work) and its key weakness is that the information is not always visible. This last point is what he considers to be blockchain's "dark side". With this in mind, we can say that the viability of blockchain technology in the payments sector is extremely dependent on the objective of the company applying the technology and the subsector of payments they are in.

In the payments sector in general it is suggested that blockchain technology is viable for the security of payments and is efficient in terms of cost. However, the technology is not scalable enough to be able to handle large transactions yet. With all the research labs and projects working on the issue of scalability, there is hope that in the future this issue will be solved by adjusting the tradeoff of scalability, security and decentralization.

Therefore, for the payments in banks, B2B and P2P/Remittances blockchain technology is not completely viable at this moment because of the scalability issue. There are ongoing tests in the beta projects into blockchain payments, however, no concrete conclusions have been made yet. Lighting Network's work with off-chain technology, seems to have the potential to solve the scalability concern in the near future in exchange for some relaxation of the security and trust models. In terms of the subsector of payments and payroll, in human resources blockchain technology is viable if the subsector's priorities are related to security and efficiency in payroll. In summary, the main benefits of applying blockchain are cost (fee exchange currency and reducing back office tasks, cutting out the middleman), security, and speed (cross border transactions and clearing and settlement). Lastly, it is believed that the countries that are going to be most impacted by blockchain technology are the ones without banks accounts that want to transfers funds across borders, this is the key area where there is a competitive advantage of this technology.

Limitations of the Project

The main limitation of this project is that in the market analysis of blockchain technology, the study did not analyze every companies' payments in each sector, whether they had implemented blockchain technology or not.

The second limitation of the project is related to the fast pace of developments within the subject. This year has already seen a lot of discoveries and developments of new blockchain technology. As a consequence, it is very hard to recommend and predict the directions and possibilities of the technology in the future. This means that the recommendations must rely on the current state of the situation of the blockchain technology. Lastly, the research was completely objective.

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