

Blockchain – Creating positive vibes in the Card payment industry

Mr. Yuvraj Sharma

Analyst, SLK Global Solution, Bangalore
Yuvrajsharma61@gmail.com

Miss Barkha Sharma

Barkhasharma166@gmail.com

Dr. Dhiraj Jain

Associate Professor, Symbiosis Centre for Management Studies, Pune
dhiraj.jain@scmspune.ac.in

Abstract

In the modern era, the word Blockchain is thrown around constantly and most of the people have little idea about what it really is. Blockchain has become a buzzword and the debate continues over the use of a decentralized technology in various industries to provide better service to the users. Blockchain has decentralized and distributed technology that records all the transactions without the need for intermediaries. The emerging technology has the capability of changing the way of immutable identity storage and processing of payment in a faster environment. Scalability, user controlled network, flexibility, enhanced transparency, faster cross border transactions, reduced transaction costs, and decentralization are the biggest advantages of the use of technology in financial service and other industries. The present case talks about the issues with respect to the issues that the card payments industry currently faces and explores how Blockchain could help to overcome them while implementing this decentralized technology in their daily processes. Secondary data had been collected from different published sources including blogs, website, journals and articles. A Qualitative approach has used to understand the existing business models used by card payment companies like Mastercard & Visa and identifies the major reasons that force these companies to rely on blockchain as a powerful business tool. The present case concludes with a brief note on the imperative needs of Blockchain over the existing payment facilitation network in terms of saving in processing fees, transparent transaction processing and offers better value to the customers and merchants.

Keywords: Blockchain, decentralization, and card payment

Introduction

Many people have heard of the term blockchain, but only a few of them are aware of this or have a little idea about what it really does in the innovative world. Blockchain could be defined as the chain of blocks that cannot be changed, reversed and manipulated once they are formed. Over the past few years, Blockchain and Crypto-currency have scavenged attention from governments, financial officials, investors and researchers across the world. It is an encrypted digitally distributed ledger that helps participants to make transactions without any interruption from any third party. According to an IBM report, Blockchain technology revolutionize various industries by developing processes smarter; enhance security and transparency in business operations as compared to traditional business processes. Blockchain is disrupting the financial services sector through encrypting the identifying information and reduces the possibilities of a cyber-attack. Blockchain provides a way to execute transactions between parties in an easy and transparent manner (Theodorou and Sklavos, 2019). The approach of sharing multiple copies of same database and independently recorded transaction in block makes it challenging for the attackers. Distributed ledgers, Cryptography, smart contracts and consensus are the crucial parts of a Blockchain eco-system. This distributed technology has the capability to change the way of storing data and carrying out transactions in a more secure manner. Decentralization, transparency and the lack of need for financial intermediaries make blockchain as one of the most lucrative technologies in the finance and the payment industry. Payment innovation, security, speed, high transaction fees and settlement charges are the backbone causes behind the adoption of blockchain into the payment industry. Brown (2018) explored that internet of things (IoT) and faster cross border payments are changing the way the payments are handled. Blockchain is getting more attention after the accepting of the new legislations in the European Union. The new ecosystem contains a consolidated and a collaborative environment and is emphasizing on funding research and exploring blockchain applications (Brown, 2018). According to an ACI Worldwide report (2016), blockchain has capability to support and improve in the current payments and processing infrastructure. In an electronic world, demands of customers are changing fast and the internet of things is increasing their reach into the consumers lives. Along with this, rapid change in technologies and exposure to smart devices are enhancing the needs of ubiquitous payment systems. In order to meet the expectations of the techno-savvy customers and accelerating the transaction processes, blockchain technology could play an important role (ACI Worldwide report, 2016).

Objectives

- To understand the challenges faced by the card payment industry
- To explore the existing payment ecosystem and the new ubiquitous decentralized payment system
- To identify the imperative needs of blockchain over the existing payment facilitation network

Literature review

Background of the study

In order to streamline the business processes and transactions, Blockchain technology could play a significant role. By using this technology, firms could establish communication between suppliers, partners and customers. Using this disruptive technology, organisations could continuously improve their business processes and explore new opportunities that could help in building more efficient and robust business models. (Fein and Reijntjes, 2018) found that the adoption of Bitcoins in the cross payment industry could be understood with the help of BitPesa which was a new payment innovation to send payment between two parties without any intermediaries in Kenya. This type of similar system was used by Ripple for cash transfer in developing countries where local infrastructure was unable to support the payment system. Brown (2018) found that many major financial institutions and financial start-ups had expressed their interest to adopt the newly emerging disruptive technology to perform various activities such as accounts payable and accounts receivable, manage payments history and automatically issue both invoices and payments etc. In order to better compete with other competitors and meet the expectation of the customers, Mastercard has also launched its own Blockchain network. In addition, Mastercard is also a part of the enterprise Ethereum Alliance that supports implementation of blockchain in various applications. Visa has also realized the strength of this disruptive technology and has created a B2B Connect payment platform to improve the types of cross border payment options. Along with this, American express has also developed a payment system to improve the speed and functionality of the existing card payment ecosystem. The present case also explores the issues card payments industry currently faces and explores how Blockchain could help to overcome those hurdles. Furthermore, the case-study also compares the existing payment ecosystem and new ubiquitous payment system.

Challenges faces by the card payments industry

(Buchanan and Naqvi, 2018) found that the finance industry is emerging and is currently facing a lot of issues. Visa and Mastercard are the biggest payment companies and are handling around 150 million transactions per day globally. In order to understand the need for a decentralized technology, it is necessary to have an understanding of the working of the current payment ecosystem used by payment companies. Moghe (2018) found that at least four parties including a merchant, cardholder, cardholder bank and a payment gateway interchange (Amex, Visa and Mastercard) were required in a typical card transaction. In the current payment system, only when a transaction had occurred would the fees go to all these intermediaries. For example, if a shopper purchases any item of worth \$100 then intermediaries will charge between 1.5 to 3.5 percent and the merchant receives only \$96.50. Moghe (2018) also found that the Card

company would also charge \$20 per dispute in case of a dispute reported between the customers and the merchants. Besides, several other types of fees like maintenance fees, processing fees and other service charges would also be included with the existing card payment system. According to Williamson (2018), the financial institutions were charging an average of 2% of the transaction costs as card processing fees. The charges would also have been higher as most card payment card providers were not transparent about their charges. In card payment, charges were distributed between the two intermediaries including card issuing bank and the card network like Mastercard and Visa. Moghe, (2018) also explored that, along with several advantages of blockchain, the technology was still esoteric and had confused the retailers and the shoppers. Highly volatile price could even fall by 10 percent in value in just a day. Besides that, the complexity and the lack of familiarity with what was going on in the background and wasn't used widely also scared the retailers in not adopting this technology (Moghe,2018). Further, scalability and constraint by the number of transactions performed concurrently by early blockchain protocols like Ethereum were also creating challenges for shoppers. However due to its enormous potential, next generation blockchain technologies used by Ripple, IOTA and Stellar are quickly fading the early blockchain protocols constraints. Besides that, the government's legal position on adopting blockchain and concern around the illicit use of cryptocurrency started speculating whether cryptocurrency would be banned or not considered as legal tender (Casey and et.al., 2018).

How Block-chain affects the card payment industry?

Meijer, (2016) studied Blockchain and its impact on the payments industry. A Credit Suisse report explored the disruptive impact of Blockchain technology on the payments industry. The major impact of this technology could be seen in the form of reduce risk to card schemes such as Visa or Mastercard and overcome the need of a central clearing house (Meijer, 2016). On the other hand, Citi bank also produced a similar report according to which fin-tech firms and governments should consider Blockchain as a complement to the existing systems. After adopting this disruptive technology several business processes of central banks such as automated tax collection, financial payments tracking and direct control over the monetary policies etc. would be affected (Olnes and Jansen, 2018). Financial institutions would lose their privileged status in the absence of an automated clearing house (ACH) system and current checking accounts. According to the World Economic Forum (WEF) research report, domestic payment systems were better in term of speed, costs, security and up to-date from the technology perspective (Lavazova, Dehling and Sunyaev, 2019). However, developing countries like Africa and so on were facing challenges related to technology up-gradation, lack of good quality payments infrastructure and an inability to handle real-time settlement in an appropriate manner. Under this scenario, Block-chain payment platform could be beneficial for cross border transactions from speed, time and from a security point of view. Faden (2017) explored that Blockchain promised to accelerate speed and reduce the cost of trade finance.

Encrypted distributed ledgers, low-cost global payment processing services, secure and low cost real transaction factors were attracting FinTech firms to adopt this new emerging technology in their day to day business. Canellis (2018) explored that three financial techno-savvy giants including Deutsche Bank, HSBC, and Rabo bank have been conducting the first cross-border, commercial transaction powered by Blockchain. Banks have performed live trade by using the IBM Blockchain Platform “we.trade”. According to Marcus Muller (2017), global head of wealth and CIO office, 10% of the global GDP would be tracked by decentralised Blockchain technology by 2027. In order to gain deeper insights Muller conducted a SWOT analysis on the promising Blockchain technology in the financial sector. High transparency, decentralized network, versatile application and highly secure data were the main strengths of this technology. However, access to permission, trust in the new technology, scalability and limited memory capacity were the main weaknesses of this decentralize technology (Casey, and et.al., 2018). Along with volatility and scalability, Marcus further explored that several opportunities would be gained by Fintech companies after adopting the new emerging technology. The positive impact of digital technology could be seen in the form of faster business processes execution, low transaction cost, reduction in infrastructure cost and overcoming the chances of cyber-attacks. Furthermore, along with several opportunities some threats like that technology failure, regulatory barriers, institutional hurdles and political opponents that can create challenge while adopting and implementing Blockchain in financial industry also exist in market. Nikhilesh, (2017) examined that due to the emergence of a promising Blockchain technology, 63% of German banks change in their business model. On the other side, most of the European banks would take implementation decision after successful deployment by other market participants. Big US IT giants including Amazon, Apple and Paypal are urging the US Federal bank to change their ecosystem to perform real time transaction with the help of decentralize technology. However, big firms also want the government to play a major role in monetary transactions (Detrixhe, 2018).

Comparison between existing payment ecosystem and new ubiquitous decentralized payment system

Existing payment ecosystem

Ebrahimi (2018) explored that credit card processing fees charged by companies can be complicated and overwhelming. Different types of merchant account fees are associated including transactional fees, incidental fees, and scheduled fees while doing card transaction. Percentages and per item dollar amount are the two main types of transactional fees assessed every time for a given transaction. Along with this, the scheduled fees and incidental fees were the main cost of operating a merchant account and would show up on the monthly bank statements. Credit card associations (American express, Mastercard and Visa), credit card issuing banks (like Chase and Wells Fargo), credit card processors, merchant account providers were the major parties involved in card payment transactional flow. The card processing and

parties involved in transactions could be understood could be better understood with the help of the below flow diagram:

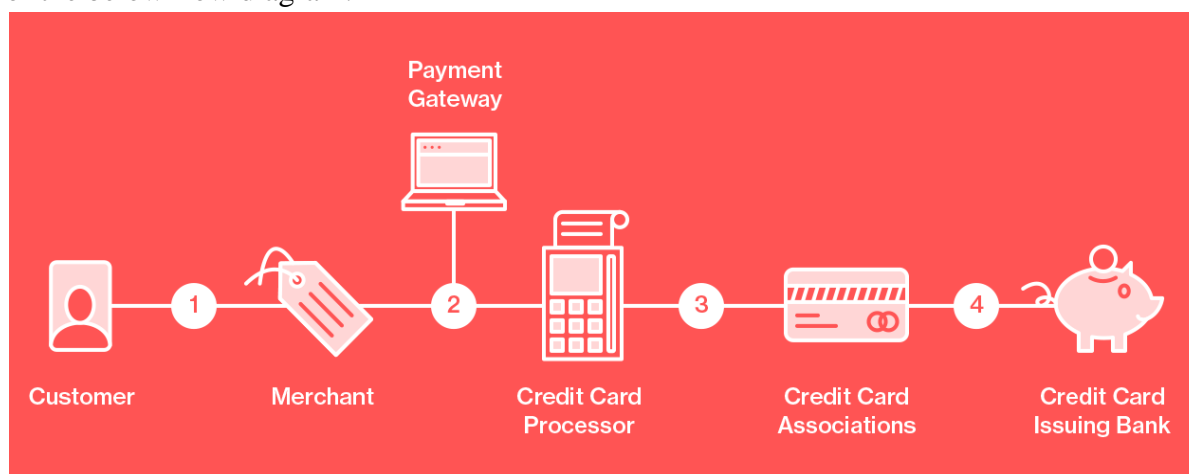


Figure 1: Parties involved in card transaction

(Source: Ebrahimi, 2018)

In the card transaction, credit card processor or acquiring banks act as messengers between merchants and credit card associations. Merchant account providers support the acquirer to carry out several activities like sales and other support etc. Researcher defines the typical scheduled card payment and incidental fees charged by card companies while doing every transaction, further details of price range are included in the appendix (Ebrahimi, 2018).

Mathieu (2018) explored that card processing companies are charging processing fees of approx. 3 percent on each transaction. In 2017, Mastercard had generated \$6.2 billion in transaction processing revenue. It was high as compared to \$5.14 billion and \$4.35 billion revenue generated in 2016 and 2015. It is estimated that card provider firm charged \$5.45 billion processing fees up to 30th September, 2018. Visa has also reported \$8.92 billion revenue in financial report by processing fees. From the expensive nature of card payment companies, it is clear how Mastercard and Visa were producing their service revenue by currency conversion, other maintenance and support services and cross-border transaction processing activities (Mathieu,2018).

Blockchain based new ubiquitous decentralized payment system

Further researchers explored the need of Blockchain technology in terms of providing distributed ledger technology and decentralizing money through increasing transparency in peer to peer transactions. However, scalability and volatility were the main concerns related to the pioneer Blockchain powered payment solutions. In term of transaction, Bitcoin and Ethereum were slow and they support roughly 15 transactions per second. In addition, the volatile nature of crypt-currency was such that it did not fit to serve as a medium of exchange and failed to speculate prices in long term scenarios etc. which proved to be the main hurdle behind implementing decentralized payment systems. However, some Fintech companies were working towards increased scalability of cross-border transactions without having to depend

on traditional systems (Sheetal and Venkatesh, 2018). Ripple firms were continuously focused on improving the financial transaction between cross-border banks. A San-Francisco based company was using Blockchain technology to transfer funds fast by handling around 1,500 transactions per second. In the crypto space, firm were facilitating international transactions though their private access networks, XRP. With help of an example, the working of XRP could be better understood. Bank X wants to send \$1,000,000 to another cross border Bank Y. In order to execute this transaction, Bank X needs to buy equal \$1,000,000 worth of XRP and send it to the Bank Y ripple wallet. Within minutes, Bank Y could convert this amount to the currency in wanted. Nevertheless, Blockchain investors argued that Ripple was a centralized firm as it still owned 62% of all XRP and hence could easily manipulate the price to its liking. SWIFT, VISA and Deloitte were concentrating on increasing the investments in R&D focusing on Blockchain technology in order to enhance efficiency of international bank transactions. Well known banks such that Santander, Reisebank and RBC were using ripple network in order to gain momentum in global financial transactions (Li and et.al., 2018). According to Zwanenburg (2018), San-Francisco based Blockchain enterprise announced plans to set-up a new office in Singapore to gain competitive advantage in the crypto currency world. Jani (2018) differentiated between Ripple and Bitcoin on the basis of certain selected parameters. Client maintenance, lesser transaction time (less than 4 seconds), minimal transaction cost, security and ownership were the main factors that segregated both the decentralized technologies. Mathieu (2018) tried to compare between the existing card payment model and GRAFT a blockchain based business model. Researchers explored how the card processing companies like Visa and Mastercard were charging high processing fees. Further various scholars examined that by using GRAFT, enterprises and customers could reduce transaction fees. The difference between the traditional and the decentralized model could be understood as follows:



Figure 2: Transaction fees charged by firms

(Source: Mathieu, 2018)

The above figure defines different parties involved in the transaction and the fees charged by them. Furthermore, Mathieu (2018) explored how blockchain technology could reduce processing fees and enhance security & transparency features in every transaction that it makes in an appropriate manner.



Figure 3: GRAFT Blockchain business model

(Source: Mathieu, 2018)

It is clear from the above that by using pay-in-broker platforms, customers could pay using crypto currencies (Bitcoin). Furthermore, GRAFT tokens converted crypto-currencies to the pay-out currency of the merchant's choice (in USD). GRAFT charged an approx. 1.5 percent of the transaction value as the processing fee which was almost half the transaction fees charged by other card processing firms on every transaction. By using the decentralized technology, merchants were able to reduce the transaction fee by up to 50% on processing \$1,000,000 in crypto-currency transactions annually (Mathieu, 2018).

Due to the potentially higher sums of money involved in blockchain and crypto-currency, Card provider giants like Mastercard and Visa were also emphasizing on incorporating blockchain services into their list of operations (Fein and Reijntjes, 2018). Competing with other business rivals, grasp business opportunities, makes secure verification of payments and instant payments to merchants were the main causes that motivated firms to adopt the decentralized technology. According to Mintdice report (2018), Mastercard has filled 30 patents relating to linking cryptocurrency with a fiat account, track anonymous transactions, identity verification etc. In order to open the doors of business opportunities, enterprises developed an API to support both account-based and blockchain-based payments by June, 2017. The main purpose of adopting blockchain in the payment sector was to overcome the credit card fraud which affected on an average of around 17.6 million people annually (Theodorou and Sklavos, 2019). Just like MasterCard's blockchain solution, Visa had developed its own blockchain based API, "Visa B2B connect" in order to process secured business transaction at the global level and provide hassle free payment ecosystem between clients and vendors (Mintdice report 2018).

Research gap

Though there are various studies conducted on card processing systems and different levels of fees charged by card provider companies like Mastercard and Visa, it was found that the new system would be better in term of reducing processing fees, transparent transaction processing and offer better value to customers and merchants. But while introducing the blockchain technology in the payment industry, security, economic, political and identity verification that should have been the determinants were not considered. Future researches could be conducted

to understand the effect of implementation of blockchain in the financial sector in a more detailed manner.

Research Methodology

Keeping in view the objectives of the study, secondary data collection method and qualitative approach was very well suited for the current case. In the study, secondary data was collected from different published sources. Qualitative research has been undertaken to understand the existing ecosystem used by card processing firms like Mastercard and Visa. In addition, various published articles, websites, journals and books helped researchers to explore challenges faced by the card payment industry. Lack of awareness and a little idea about the real time implementation of blockchain created problems in the primary data collection and quantitative data analysis. It was found that the new system would be better in terms of reducing processing fees, process transactions transparently and offer better value to the customers and merchants.

Findings

The study tried to critically compare the existing payment ecosystems and the new ubiquitous decentralized payment system that was missing in many of the earlier studies. The researcher tried to collaborate different views of companies and authors related to blockchain and its usage in a real time scenario. In order to understand the imperative need of blockchain in the payment industry, various cases of blockchain platforms used by Ripple, GRAFT, Visa and Mastercard and their impact on the payment processes have been taken. On the basis of the critical comparison between the existing payment ecosystem and the blockchain based model, it could be said that there was an imperative need of blockchain over the existing payment facilitation network. Encrypted distributed ledgers, low-cost global payment processing services, secure and low cost real transaction were the crucial factors motivating firms and start-ups to use the new payment ecosystem. In the existing system, various parties were involved in the transactions and an approximate 3% fees was charged by them. On the other hand, lesser parties' involvement and reduced total fees of approximately 1.5% were the major effects that could be seen between the existing and the new decentralized system. Other positive impacts of the distributed technology could be seen in the form of reduced processing fees, transparent processing of transactions and offering of better value to customers and merchants. However, along with the above benefits the challenges like technology failure, regulatory barriers, institutional hurdles and political opponents could pose a problem while adopting and implementing Blockchain in the financial industry. From the present case, it is clear that there are lot of changes happening in the blockchain industry and the implementation of a decentralized technology in the financial sector could still being explored. The major impact of adoption of decentralized technology could be seen in the form of enhance transparency, security and developed trust among each participant in the network. The researchers explored that access permission, trust in the new technology, scalability and limited memory capacity were the main weaknesses of this decentralize technology. However, these kinds of challenges

could be overcome after a lot of research and the technology becoming mature over a period of time.

Conclusion and implications

From the above it is clear that the adoption of new technologies is often slow due to sensitive financial issues. However, a lot of attention to start-ups and fintech companies are shifting towards the use of applications of cryptocurrency and blockchain in the financial sector. By using decentralized technology, firms would be able to overcome transactional fees, incidental fees, and scheduled fees while executing card transactions. On the basis of the critical comparison between the existing payment ecosystems and the new ubiquitous payment system, it could be said that Blockchain technology could be beneficial for firms and customers. By adopting Blockchain, companies could gain various advantages such that faster business processes execution, reduced transaction cost & infrastructure costs and overcome chances of cyber-attacks. However, the complexity and less familiarity with what is going on in the background and aren't used widely could also scare the retailers to adopt this technology in their day to day business processes. Besides this, the current case explores the regulatory barriers, technology failures and institutional hurdles which are also creating challenges for the firms to adopt and implement Blockchain in the payments sector. Enhanced transparency, security and reduced cross border transaction costs and time are the major factors that have forced several banks and large corporations to incorporate blockchain services into their list of operations. After comparing between various pros and cons of blockchain, the present case concluded that Block-chain payment platform could be more beneficial for cross border transactions in developing nations in the absence of technology up-gradation, lack of good quality payments infrastructure and inability to handle real-time settlement in an appropriate manner. Majority of the data collected were from secondary sources to understand the comparison between the existing payment ecosystem and the new ubiquitous payment system. The current case could help companies and researchers to understand blockchain based technology used by various fintech firms while adopting and implementing blockchain in their day to day internal and cross border transactions. Future research could be conducted to understand the government stands and other challenges affecting the implementation of blockchain in the card payments sector.

Teaching notes

Learning objectives

The present case talks about the issues card payments industry currently faces and explores how Blockchain can help to overcome those hurdles while implementing this decentralized technology in their daily processes. The researcher concludes with a brief note on the imperative needs of blockchain over the existing payment facilitation network.

Target Audience

Fintech firms, E-commerce companies, Consultants, Teachers and students.

Suggested Questions

1. Identify the major reasons that forced companies to rely on blockchain as a powerful business tool.
2. How could Blockchain help firms and merchants to improve the existing payment ecosystem and implement the new ubiquitous payment system while entering into financial transactions?

References

- Williamson, S., 2018. How Blockchain Technology Is Transforming Traditional Payment Methods. [Online]. Available through: < <https://www.nasdaq.com/article/how-blockchain-technology-is-transforming-traditional-payment-methods-cm1012647> >. Accessed on: [12th Jan'2019].
- Zwanenburg, 2018. Invest in Blockchain. Available through: <<https://www.investinblockchain.com/what-is-ripple/>>. Accessed on: [10th Jan'2019].
- Faden, M., 2017. Coming in 2017: Live Blockchain Deployments promise to accelerate Payment processing services and Trade Finance. Available through: <<https://www.americanexpress.com/us/foreign-exchange/articles/blockchain-to-accelerate-payment-processing-services/>>. Accessed on: [11th Jan'2019].
- Medici, 2018. Blockchain –Overview, Tech, Application Areas and Use cases. Available through:<<https://gomedici.com/an-overview-of-blockchain-technology/>>. Accessed on: [15th Jan'2019].
- Canellis, D., 2018. Deutsche Bank, HSBC, and IBM are testing Blockchain-powered bank transfers. Available through: <https://thenextweb.com/hardfork/2018/07/03/blockchain-bank-ibm/> Accessed on: [12th Dec'2018].
- Mulle, M., 2017. *CIO Insights Reflections: Cryptocurrencies and Blockchain-their importance in feature.* Available through: :<<https://www.finextra.com/finextra->

- downloads/newsdocs/cio_insights_reflections_-_cryptocurrencies_and_blockchains_-_emea_-_client_ready.pdf> Accessed on: [8th Jan'2019].
- Nikhilesh, D., 2017. Deutsche Bank: Blockchain opportunities are huge. Available through: <https://www.coindesk.com/ford-lg-to-pilot-ibm-blockchain-in-fight-against-child-labor> Accessed on: [14th Jan'2018].
- Detrixhe, J., 2018. Big tech companies prefer the Federal Reserve over Blockchain. Available through :< <https://qz.com/1499400/tech-giants-like-google-and-paypal-look-to-the-federal-reserve-for-faster-payments/>>. Accessed on: [16th Jan'2019].
- Ebrahimi, A., 2018. The Complete Guide to Credit Card Processing Rates & Fees. [Online]. Available through: < <https://www.merchantmaverick.com/the-complete-guide-to-credit-card-processing-rates>>. Accessed on: [16th Jan'2019].
- Mathieu, 2018. GRAFT is providing an alternative to Credit Card Networks via Real-time Authorizations and Service Provider Ecosystem on a Private Blockchain. [Online]. Available through :< <https://ethereumworldnews.com/graft-is-providing-an-alternative-to-credit-card-networks-via-real-time-authorizations-and-service-provider-eco-system-on-a-private-blockchain/>>. Accessed on: [12th Jan'2019].
- Mintdice report, 2018. Mastercard vs. Visa blockchain projects. [Online]. Available through :< <https://www.mintdice.com/blog/Mastercard-vs-visa-blockchain-projects>>. Accessed on: [10th Jan'2019].
- Jani, S., 2018. An overview of Ripple Technology & its comparison with Bitcoin. Available through :<https://www.researchgate.net/publication/322436263_An_Overview_of_Ripple_Technology_its_Comparison_with_Bitcoin_Technology>. Accessed on: [18th Jan'2019].
- Buchanan, B. and Naqvi, N., 2018. Building the Future of EU: Moving forward with International Collaboration on Blockchain. *The JBBA*, 1(1), p.3579.
- Ølnes, S. and Jansen, A., 2018. Blockchain technology as infrastructure in public sector: an analytical framework. In *Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age* (p. 77). ACM.
- Casey, M., and et.al., 2018. The Impact of Blockchain Technology on Finance: A Catalyst for Change. *Geneva Report on the World Economy*, (21).
- Sheetal, M. and Venkatesh, K.A., 2018. Necessary requirements for Blockchain Technology and its Applications.
- Li, Y., and et.al., 2018. Blockchain technology in business organizations: A scoping review.
- Fein, J. and Reijntjes, R., 2018. The Blockchain Revolution: Addressing the rise of blockchain-based applications and their impact on emerging country market development.
- Lavazova, O., Dehling, T. and Sunyaev, A., 2019, January. From Hype to Reality: A Taxonomy of Blockchain Applications. In *Proceedings of the 52nd Hawaii International Conference on System Sciences (HICSS 2019)*.
- Theodorou, S. and Sklavos, N., 2019. Blockchain-Based Security and Privacy in Smart Cities. In *Smart Cities Cybersecurity and Privacy* (pp. 21-37). Elsevier.

Fees charged by card provider companies.

Table 1: Incidental Fees

(Source: Ebrahimi, 2018)

Categories	Types of Fees charge
Processing Integrity Fees	Varies by companies
Application/Setup Fees	\$50-\$100
Early Termination Fee (ETF)	\$300-\$1000
Account Closure Fee	\$20-\$75
Address Verification Service (AVS)	\$0.05-\$0.25
Voice Authorization Fee	\$0.25-\$4
Retrieval Request Fee	\$10-\$15
Chargeback Fee	\$10-\$30
Batch Fee	\$0.05-\$0.30
Non-Sufficient Funds Fee (NSF)	\$20-\$25
PCI Non-Compliance Fee	\$20-\$40

Table 2: Scheduled Card Payment Fees

(Source: Ebrahimi, 2018)

Categories	Types of Fees charge
Fixed Acquirer Network Fee (FANF)	Varies and published by Visa
Mastercard Merchant Location Fee	\$15/yr or \$3/yr
PIN Debit Network Fee	\$50-\$62/yr
Monthly Fee	\$10-\$99/mo
Annual Fee	\$0-\$300/yr
Statement Fee	\$5-\$10/mo
Online Reporting Fee	\$5-\$15/mo
Monthly Minimum Fee	\$10-\$25/mo

Terminal/Equipment Fee	\$5-\$60/mo
POS Software Fee	\$25-\$100/mo
Payment Gateway Fee	\$5-25/mo (+ trans. fee)
PCI Compliance Fee	\$60-\$120/yr
IRS Reporting Fee	\$25/yr