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The Phenomenon of Cryptocurrency and its Implementation into Businesses

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What potential benefits does the implementation of cryptocurrency have for businesses?

by

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Abstract

While the popularity of cryptocurrencies has seen a dramatic uptick as of late, the general phenomenon still carries with it a high level of novelty. The inception of cryptocurrencies began with Bitcoin in late 2008, making its first appearance on a cryptographic community forum, posted by a yet to be identified entity carrying the pseudonym Satoshi Nakomoto. The phenomenon has since grown tremendously in its exposure to the public, notably due to the tremendous financial gains seen from early adopters, while spurring the creation of numerous other cryptocurrencies with varying purposes and designs. Cryptocurrency can be defined as a purely digital form of currency built upon cryptographic proofing mechanisms and blockchain technology. First and foremost, blockchain technology is seen as being capable of providing businesses with increased functionality and efficiency. One such advantage is the possibility to transact through decentralized autonomous networks, capable of automatically and cryptographically, validate and facilitate transactions. The decentralized technology could reduce the economic dependency on third parties by getting rid of traditional financial institutions when operating a business.

In spite of the widespread recognition of cryptocurrencies, we found there to be a gap in both the literature and public perception of the potential benefits for business adoption. Throughout the thesis, cryptocurrency literature research is combined with the implications of Tesla Inc. and Sharge&Charge Foundation's implementations of cryptocurrency. These companies were found to have the potential to achieve certain benefits related to their cryptocurrency implementation. Their implementations saw them use cryptocurrency for both investment and operational purposes. For Share&Charge it is argued that implementing cryptocurrency and blockchain technology lead to reduced transaction costs and agency dependency. Tesla was found to have the potential for reduced transaction costs related to their payment method, as well as using cryptocurrencies to combat foreign exchange risk. Furthermore, the thesis ended up answering the research question. The literature, theory, and findings from the cases, gave the insight necessary to draw the conclusion that cryptocurrency implementation for businesses presents the potential benefits of reducing transaction and agency cost in a number of different ways.

Key Words: Bitcoin, Stablecoin, Cryptocurrency, Blockchain, Smart contract, Decentralization, Foreign Exchange, International Businesses, Strategic Management, Transaction costs, Agency theory

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Table of Contents

List of Figures

1 Introduction

The globalization tendencies of modern nations have increased the firm's ability to reach foreign consumers while being able to harness the production capabilities of an enlarged pool of available market resources. While trade and business have stretched far beyond the confines of domestic borders due to globally homogeneous consumer tastes and preferences, the methods by which they transact have not. The vast majority of nation-states are still seen to utilize individual currencies as the foundations of their local economies, issued by their respective central banks or governments. This forces multinational corporations to incur the inevitable costs of traditional cross-border currency conversion for foreign transactions, while also being exposed to the risks associated with harmful economic policy affecting currency's value.

Were there to be a globally accepted currency, trusted, valuable, and most importantly capable of being a fundamentally perceived source of value for businesses to transact in a global economy. Doing so could reduce the costs associated with the conversion, transfer, and settlement of funds, currently facilitated by mediating financial institutions and central banks, approaching a competitively fairer global economy.

It is important to note that this paper by no means intends to suggest the abolishment of national financially controlled forms of currency, nor advocates for the adoption of a single global currency. However, the recent rise in popularity of cryptocurrencies and their claim to solve many of the global economies' problems with slow, costly, and centralized forms of transacting, provides a particular point of interest for multinational corporations. Despite the apparent interest, it is in the authors' opinion that there is limited common knowledge on the subject of cryptocurrencies, in particular the technology on which it is built. Similarly, media and academic publications are observed to primarily focus on cryptocurrency as a substitute for fiat currency and not the practical implications the technology might have.

Therefore, our paper aims to map particular cryptocurrency implementations currently seen in business, combined with supporting literature, in an attempt to demonstrate the seen potential for businesses and their competitiveness. In addition, the paper will provide a thorough overview of cryptocurrencies, their functions, as well as any supporting technologies and concepts. Furthermore, the concept of competitive advantage will be explained to provide a meaningful discussion of a business' motivation for implementing cryptocurrencies based on their potential benefits.

1.1 Cryptocurrencies

1.1.1 Cryptocurrency, Blockchain, and Decentralization

"Human civilization flourished in times and places where sound money was widely adopted, while unsound money all too frequently coincided with civilizational decline and societal collapse" (Ammous, 2018, p.31). For many, the unconscious prevalence of

government-issued fiat has grown to encompass the methods by which we transact, exchange and store our value unquestionably. This, however, can hardly be said for those impoverished by hyperinflationary actions of economically irresponsible and short-sighted governments and central banks.

Being intrinsically useless pieces of paper, the value of fiat money is derived from the simple assumption that it is a necessity when conducting transactions in a particular environment (Hayashi & Matsui, 1994). Its necessity, however, has in certain cases been imposed through force; as seen by the US government's 1933 confiscation of its people's gold, an intrinsically valuable rare-earth metal, cherished and used for barter throughout most of human civilization (Kemmerer, 1944). In essence, modern economies' deviation from the *'International Classical Gold Standard'*, 1873-1914 (Kemmerer, 1944), labeled the currencies of the then world powers intrinsically valueless; upheld only by the people's perception and trust to redefine and translate its true value.

The value of government-issued fiat, maintained through trust, requires its people to simultaneously believe in the immortality of the economy and government of which it is pegged; as the demise of either will render the currency useless, as proven repeatedly throughout history (Dowd, Hutchinson, & Kerr, 2015). The quest for sound money has, therefore, been a resurging topic mainly in the aftermath of financial crises where monetary institutions are to blame. One such case led Topan and Păun (2011) to propose their definition of sound money. For money to be sound its characteristics must include utility and value, portability, indestructibility, homogeneity, divisibility, stability, and cognisability (Topan & Păun, 2011). Unlike fiat, the authors categorized gold as fulfilling all characteristics of sound money.

However, it could be argued that the use of physical gold in the modern, digital, and globally interconnected economy is all but impractical. Whereas pegging government currencies to gold would in large solve the impracticalities of physical gold while maintaining its benefits as sound money, the days of gold standards seem an unforeseeable option for monetary institutions (Dowd, Hutchinson, & Kerr, 2015). Largely in response to the concerning prevalence and failures of unsound money controlled by centralized entities, a new take on money, adept to the accelerating digital world, was established with a focus on decentralization and combining the properties of gold.

The world came to know cryptocurrencies as it was first introduced in late 2008 by the launch of Bitcoin, a fully decentralized peer-to-peer electronic cash system challenging the need for financial institutions (Nakamoto, 2008). As highlighted by Nagy (2005), before the invention of Bitcoin, the pursuit to establish a digital form of payment system was well underway. He expressed his opinion on prior suggestions for digital payments, arguing that they lacked five key characteristics of physical cash, which without them, any form of digital payment system would be rendered economically unfeasible. The five key cash-like characteristics presented by Nagy (2005, p.1) can be seen depicted below:

1. “Money doesn’t smell.” Cash payments are – potentially – anonymous and untraceable by third parties (including the issuer).
2. Cash payments are final. After the fact, the paying party has no means to reverse the payment. We call this property of cash transactions irreversibility.
3. Cash payments are peer-to-peer. There is no distinction between merchants and customers; anyone can pay anyone. In particular, anybody can receive cash payments without contracts with third parties.
4. Cash allows for “acts of faith” or naïve transactions. Those who are not familiar with all the antiforgery measures of a particular banknote or do not have the necessary equipment to verify them, can still transact with cash relying on the fact that what they do not verify is nonetheless verifiable in principle.
5. The amount of cash issued by the issuing authority is public information that can be verified through an auditing process.

It was not until the creation of Bitcoin that the protocol suggestions and means of implementing a truly digital cash-like payment system, highlighted by Nagy (2005), became a reality. The creator of Bitcoin, an entity carrying the pseudonym Satoshi Nakamoto in publications, correspondence, and emails (Bearman, 2017), created a digital cash-like payment system seemingly achieving Nagy’s above-mentioned benefits of physical cash by developing a trustless, peer to peer, decentralized digital currency. The currency’s network was secured by an effective incentive mechanism allowing participating members to secure and facilitate transactions on the network, utilizing their personal processing power to solve cryptographic hashing algorithms, in return for a network fee (Nakamoto, 2008). Hence, the combination of a digital cash-like currency and its use of fundamental cryptographic algorithms, derived the now commonly known term cryptocurrency to describe this form of digital payment system.

The motivation for creating Bitcoin stemmed from Nakamoto’s (2008) claim of having witnessed the weaknesses of internet commerce and its reliance on financial institutions to act as trusted third parties to process electronic transactions. They deemed their influence inherent, due to the trust-based model of inter-bank transactions and their required mediation of disputes, in effect making non-reversible transactions inconceivable. Nakamoto saw the process of mediation as an unavoidable transaction cost, limiting the minimum practical transaction size as well as allowing for the broader implications and the possibility of reversible payments for non-reversible services. The proposition for having a payment system based on cryptographic proof instead of trust would allow parties to directly, and willingly, transact with one another without the need for a trusted third party (Nakamoto, 2008).

1.1.2 Smart Contracts

A smart contract is an automated contract that works without the interference or involvement of either participating party. The fully automated process prevents interpretational disputes and the need for trust between members of a contract (Brown & Whittle, 2020). Thereby, the

contract becomes unambiguous as the terms are willingly predefined and automatically enforced (Brown & Whittle, 2020). The creation of smart contracts eliminates the need for middlemen, namely banks to act as trusted agents, supplying transacting members with drafts to act as promissory notes (McGowan & Olson, 2021). The lack of a middleman would, thereby, also infer a reduction in transaction costs with the elimination of mediation costs. In addition to cost reductions, smart contracts offer risk aversion for the parties involved as neither governs the terms of the contract, diffusing a potential power imbalance when interpreting the contract (Brown & Whittle, 2020).

1.1.3 Stablecoin

Cryptocurrencies are commonly perceived as being price volatile, negatively impacting businesses and users' willingness to adopt the technology (Bullmann, Klemm, & Pinna, 2019). The issue of volatility is not easily solved in the short term as ordinary cryptocurrencies are contemporary assets, whose users' demand and supply determine their price (Dell'Erba, 2019). According to Dell'Erba (2019), the response to volatility saw the creation of stablecoins which aimed at being a more stable cryptocurrency alternative in relation to fiat. The author claims that a stablecoin's worth can be directly pegged to a government-backed fiat currency or other assets, creating a cryptocurrency whose worth is stable relative to the ordinary speculative cryptocurrency markets. Furthermore, he states that the volatility reduction is achieved by backing the stablecoin with fiat currency as collateral, precious metals, or by algorithmic mechanisms balancing the supply and demand of the asset circulation. The supply of collateral-backed stablecoins is controlled with the purpose of incentivizing trade of the stablecoin to only be conducted for a specific price (Dell'Erba, 2019).

1.2 Strategic Management

The effects of globalization have caused an increase in competitive uncertainty and lowered a firm's ability to visibly predict changes in a market's competitive landscape (Bang & Markeset, 2017). On the other hand, according to Bang & Markeset (2017), globalization has given companies the ability to expand their locational boundaries, gaining the opportunity of utilizing offshore production and outsourcing as methods of reaching new markets. For these reasons, the authors argued that the pressure for the strategic management of firms has tilted towards focusing on innovation in an attempt to gain a competitive advantage in an increasingly competitive landscape.

According to Grant (2016), there are two main directions a business may pursue in order to gain competitive advantage, i.e. differentiation and low-cost strategies. A low-cost strategy can be described as the pursuit of economies of scale and is usually oriented towards standardized products and services. Meanwhile, differentiation strategies aim to provide consumers with unique/superior product offerings for which they are willing to pay extra. The implementation of cryptocurrencies could indicate that an organization is pursuing a differentiation strategy by possibly attempting to capitalize on the first-mover advantage of being an early adopter. However, as this paper aims to discuss, cryptocurrency

implementations could also aid a firm's ability to achieve a low-cost strategy. This could be achieved by increasing a firm's overall efficiency, as it could serve to translate into a reduction in the general costs of production. The efficiency issues cryptocurrencies intend to combat are those related to a firm's interaction with independent agents and its transaction-making process. Were these costs to be reduced, one could objectively argue for the increase in efficiency to create a competitive advantage by enabling a firm to increase profits and use their profitability as leverage to stay competitive.

1.3 Research Problem

Our thesis targets the subject of cryptocurrency. At the time of this study, spring 2022, cryptocurrency is still a new phenomenon that has significantly increased its overall presence during recent years. The phenomenon is becoming more popular not only amongst individuals and economic systems challenged by harsh conditions but has also made its way into the business environment. Nevertheless, the gap in knowledge regarding the technology and use of cryptocurrencies persists to this day. The subject requires some level of technical knowledge to understand its functionality. There is currently a limited amount of international businesses with cryptocurrency implementations due to the low density of information surrounding the topic. This lack of knowledge leads to businesses not understanding the approach to implementation. Since there is not enough information or thoroughly examined papers on cryptocurrency business implementations and their outcomes, businesses cannot necessarily pursue an implementation based on precedent. Therefore, the lack of a clear guide and evidence for it being beneficial creates a low level of business intrigue in opting for a cryptocurrency implementation.

In this paper, we describe what cryptocurrencies are and how the technology behind them works to address the knowledge void for the subject matter. In addition, there is a further gap in expertise regarding the implementation of cryptocurrency at a business level. The technology behind them can be beneficial to lots of organizations even if they target distinct business areas, thus, displaying the multifaceted use of cryptocurrency. Still, only a selected few have chosen to implement it, one we attribute to the uncharted environment and steep learning curve. Therefore, we decided to address this gap by presenting a comprehensive introduction of cryptocurrencies, their functions, and potential benefits for businesses implementing them.

1.4 Aim and Objectives

In spite of its name suggesting it is just a digital take on currency, cryptocurrencies and their technology have the potential for a much larger application than typical currencies. Cryptocurrencies are mainly discussed in media and literature publications as a contrast to traditional fiat currencies or financial assets, however, fail to account for the applicability of the technology in business and what these effects might have on international business. Consequently, the aim of this thesis is to inform readers of the concept of cryptocurrency

from a business perspective and address the potential transactionary cost benefits from its implementation.

In order to achieve the aims of this thesis, we will present a thorough literature review of cryptocurrency, focusing on the characteristics that are applicable to businesses. To further support the information gathered from the literature, two real-life examples of businesses having implemented cryptocurrency will be presented and analyzed together with the literature. While conducting the research and analysis, two theories applicable to transactionary costs will be used, *Transaction Cost Theory* and *Agency Theory*. The combination of theories, literature, and real-life cases will give the possibility to reach a conclusion that will address the above stated aims and objectives of this paper.

1.5 Research Purpose

The thesis is based on prior literature as well as real-life examples of businesses having implemented cryptocurrency, leading to a thorough analysis and discussion of how cryptocurrency implementation can benefit businesses from a transactionary cost perspective. Cryptocurrency is a relatively new concept not widely familiar, hence, literature is yet to cover all its aspects. Currently, cryptocurrency literature seems concentrated on comparing the attributes of cryptocurrency as it relates to its fiat counterpart, treating the two as substitutes. However, we view the literature as lacking in exploring the potential for businesses in implementing the technological aspects of cryptocurrencies and potentially gaining an advantage from it, hence, our choice for exploring the subject further. Therefore, the purpose of this thesis is to present the phenomenon of cryptocurrency and its implementation in businesses. Paving the way for future subject research would assist in closing the gap in literature targeting cryptocurrency implementation for businesses. To fulfill our purpose, the thesis will address the following research question:

What potential benefits does the implementation of cryptocurrency have for businesses?

1.6 Limitations

This section targets the initially found limitations that would further narrow down the scope of research of the thesis. Firstly, there are a limited number of recognized international businesses that currently have cryptocurrency implemented, especially those who are public and thoroughly disclose the effects they have seen. Therefore, the possibility to obtain first-hand data is very limited.

Secondly, as the possibility of obtaining first-hand data is very low, the thesis will have to rely on secondary data to provide the necessary information to conclude the research question. This results in the thesis being heavily reliant on prior literature, significant as theory does not always correspond with real-world implementation but can provide the necessary information to draw a conclusion that induces future research into the area.

Thirdly, the thesis is limited to the extent that it investigates potential benefits for businesses implementing cryptocurrency. The thesis has limited the scope to only target the potential transactionary cost benefits of implementing cryptocurrency, specifically in response to this thesis's aims and motives, along with the claims that these are the foundational intentions behind cryptocurrencies.

Lastly, our explanation of cryptocurrency is limited only to what is found relevant in gaining a more comprehensive understanding of potential business implementations. These limitations are important to be aware of before reading the thesis, as they are the limitations that lead to the formulation of our thesis and the choice of the research method.

1.7 Outline of the Thesis

The previous **Chapter 1** delivered the thorough and necessary background knowledge on cryptocurrency, enabling readers to better understand the concepts discussed later in the thesis. **Chapter 2** looks at the theoretical perspectives of Agency Theory and Transaction Cost theory in conjunction with a review of the necessary literature for a comprehensive analysis. **Chapter 3** presents the methodology section of the paper, where the reasoning behind the choice of method is conducted. The concept of qualitative research and abductive approach is presented to provide our reasoning for the research approach. **Chapter 4** presents the paper's Empirical Observations. In this section, secondary sources are being used to present information on two businesses that have implemented cryptocurrency. **Chapter 5** presents the Analysis section of the paper, where all information gathered through Literature Review, Theory Review, and Empirical Observations will be analyzed and discussed thoroughly. **Chapter 6** presents the conclusion of the thesis, while also reaching an answer to the research question. Furthermore, this chapter will also contain a discussion regarding future research into the area of cryptocurrency and its application to businesses.

2 Literature and Theoretical Perspectives

The section is split into three subsections: Gap of information, Theory Review, and Literature review. Presenting the gap in information will demonstrate the relevance and need for this thesis, while the Theory and Literature review will focus on providing the necessary information to address the found gap.

2.1 Gap in Prior Literature

According to Ante (2020), prior research into the subject of cryptocurrency has a predominant focus on market economics and its efficiency, as approximately 36% of all publications concerning cryptocurrency or blockchain focus on these aspects. On the other hand, approximately 12% of publications target the applications of blockchain and cryptocurrencies (Ante, 2020). These claims seem to be valid when conducting our own investigation and research of the literature, encountering numerous pieces dedicated to

discussing cryptocurrency as a substitute for fiat currency, and as a substitute for other forms of investment.

The first evidence of this can be found in Claeys, Demertzis, and Efstathiou (2018), where the pros and cons of cryptocurrency are explained thoroughly, but solely from the perspective of them being used as a widespread substitute for fiat money. Even if the authors present a number of pros and cons of cryptocurrency, they fail to mention the possible impact on international business or the firm-level impact. The authors end up with the conclusion that cryptocurrency fails to be a reasonable substitute for fiat money as it lacks the important requirements for being used as a substitute currency, such as being reliable and non-volatile in value.

In addition to this, Pestunov's (2020) research article "Cryptocurrencies and Blockchain: Potential applications in Government and Business", suggests research into the application of cryptocurrency in business. In the article, the author discusses the different issues of cryptocurrency, for example, it being unstable both in value and number of active users. Furthermore, the author presents the history of cryptocurrency and some of the blockchain possibilities. However, the article still fails in providing a comprehensive discussion and conclusion on specific business implementations and their outcome.

Prior research seems to end up in the conclusion that cryptocurrency implementations are not feasible due to the scalability of certain blockchains and the size of the user base. However, that might not be an issue for businesses as they do not necessarily need their customers to adopt this new form of payment, but rather it could be used in less frequent B2B interactions. Prior research has also been seen targeting the investment possibility for cryptocurrency, comparing it to the stock market and other securities. While investment and private equity firms surely would find this useful, the lack of research on the applicability of cryptocurrencies on an operational level for general business purposes remains. Therefore, a thorough investigation into applications and its outcome is needed.

2.2 Theory Review

2.2.1 Transaction Cost Theory

Oliver Williamson (1985) defined a transaction as the transfer of a good or service across a technologically separable interface. It was, however, Coase (1937) before him who challenged the framework of modeling a firm's production costs without acknowledging the impact of organizational systems and the effects of transaction costs. Transaction costs, he defined, as the costs associated with using the price mechanism, that being the market interactions related to price discovery and contract negotiations (Coase, 1937). In this definition, the price mechanism refers to the establishment of a competitive price equilibrium for a particular commodity, regulated proportionally by the rate of change in demand and supply in a pure exchange market (Saari & Simon, 1978).

When interacting with the exchange market, transaction costs occur as it is "necessary to discover who it is that one wishes to deal with, to inform people that one wishes to deal and on what terms, to conduct negotiations leading up to a bargain, to draw up the contract, to undertake the inspection needed to make sure that the terms of the contract are being observed, and so on." (Coase, 2013, p.850). The costs of conducting transactional operations ensure that despite the price mechanism greenlighting seemingly profitable transactions, the associated transaction costs can halt the transition of factors of production be it that the costs of setting up the transaction are higher than the potential profit for fulfilling it (Coase, 2013).

Williamson (1985) furthered the definition of transaction costs by adding the ex-ante costs of measures taken to safeguard an agreement to avoid opportunistic behavior (Makabenta-Ikeda, 2006). Williamson was, however, primarily concerned with contractual issues and the costs involved in their enforcement. Nevertheless, his take on the ex-post costs associated with an organization's governance structures, provided a framework for the expected transaction-related costs based on the institutional makeup of the firm.

Clearing and settlement costs are a crucial component to factor into the overall transaction costs of exchange, typically involving financial or cash flow transactions (Makabenta-Ikeda, 2006). As this paper looks specifically at the adoption of a new form of financial asset, with the possibility of it being used in peer-to-peer exchanges or transactions, the overall associated costs tied to the financial payment systems would have to be taken into account. The fees typically associated with the traditional forms of interbank payment systems are attributed to network fees, used to support the processing and settlement systems required for them to operate (Carlton & Frankel 2005).

2.2.2 Agency Theory

Agents are individuals who act on behalf of the business principal (Grant, 2016). An agency relationship constitutes a business relationship between a principal and an agent, where the principal delegates some kind of work that needs to be done by the agent (Shapiro, 2005). Agency problems occur when the goals of the agent do not align with the goals of the principal, incurring an inevitable cost to the interaction (Shapiro, 2005). Furthermore, Shapiro (2005) elaborates on how agency problems often result from the principal not having enough information about the agent or available agents to conclude the best fit in the alignment of goals. Furthermore, principals would need to provide efficient guidance and communication of the goals they expect to achieve throughout the process of interacting with an agent in order to avoid further misalignment (Mitnick, 2015).

When discussing agency cost it is important to note that it does not necessarily have to be a financial one, but rather refers to the cost of inefficiency or degradation of the outcome. According to Mitnick (2015), one important aspect of agency theory is the claim that every action taken in an agency relationship incurs a cost, either real or perceived. The author claims that these costs often arise from the potential corrections needed to cover the misalignment of goals and actions taken by the agent and the principal. The author states that

the decision to implement changes throughout the principle-agent interaction needs to be based on the costs of doing so. If the costs of enforcing corrections are greater than the potential benefit of the corrections there is no incentive to conduct it.

As discussed earlier, agency costs arise from misunderstandings of goals and objectives, however, according to Panda and Leepsa (2017), there are more specific reasons why agency costs arise. Those reasons are: "the separation of ownership from control, different risk preferences, information asymmetry, and moral hazard" (Panda & Leepsa, 2017, pp.74).

2.3 Literature Review

2.3.1 Cryptocurrency and Blockchain Characteristics

The embedded cryptographic proofing mechanisms, securing a cryptocurrency's code and transaction data, are paramount in order to avoid needing a mediating third party. To achieve this, cryptocurrencies at large use a ledger composed of a "peer-to-peer distributed timestamp server to generate computational proof of the chronological order of transactions." (Nakamoto, 2008, p.1), while eliminating the possibility of double-spending. The ledger promotes security and transparency amongst individuals utilizing the network, seeing that all transactions can be viewed and thereby verified (cryptographically in the case of cryptocurrencies). Therefore, new transactions can only be finalized once verified by the majority of timestamp servers on the network (Nakamoto, 2008). Once validated, transactions are added to the general consensus network in blocks, a technology otherwise referred to as the blockchain (Nakamoto, 2008).

Blockchain technology is critical as its peer-to-peer network functionality allows for transactions to be recorded and added to a ledger in predetermined-sized blocks of transaction data. These blocks give validation from several different time-stamp servers that operate within the peer-to-peer network (Brown & Whittle, 2020). According to Brown & Whittle (2020), the validation itself is realized through the process of *'hashing'*, the use of cryptographic algorithms to compress new block data, including all previous block data, into a simplified string of bits (either a 0 or 1) to reduce package size. Furthermore, the authors state that once validation has occurred, the next block in the chain is branded with a new hash that is visible to everyone within the network as seen in *Figure 1*. They claim that all data contained in the next block is not susceptible to change, except if all preceding blocks in the chain were to change in accordance with a majority of the network computational power actively seeking to do so. Furthermore, they explain that utilizing the technology of blockchain allows for a new way of doing business through decentralized autonomous networks, capable of automatically conducting the process of cryptographically validating and facilitating transactions.

In the case of Bitcoin, the consensus mechanism used for validating new blocks is known as proof of work, where members, known as *'miners'*, can contribute their computational power to create and verify new blocks by hashing the SHA-256 algorithm (Nakamoto, 2008). In

exchange for their work in securing the network and facilitating the creation of new blocks, miners are rewarded with the fees for transacting on the network, creating an incentive mechanism for miners to compete with one another by adding more computational power to the network, symbiotically bolstering network defense (Nakamoto, 2008). For the most prominent cryptocurrencies i.e. Bitcoin & Ethereum, the fees for transacting on their networks have been immensely volatile as seen in *Figure 2* and *Figure 3*. It is, however, important to note the total transaction fee is automatically determined by the protocol (Nakamoto, 2008). Therefore, in times of increased transaction volume or drop in mining processing power validating new blocks of transaction data, the fee for transacting on the network automatically rises to incentivize more miners to join the validation process as well as disincentivizing users to transact during the time in which the network cannot keep up with validating transactions in a timely manner (Nakamoto, 2008).

It is said that a Bitcoin transaction could take anywhere between 10 to 60 minutes to settle depending on network activity. This is due to the specific block size on the blockchain, causing transactions to be postponed to later blocks to verify in case the current block is full (Baqer, Huang, McCoy, & Weaver, 2016).

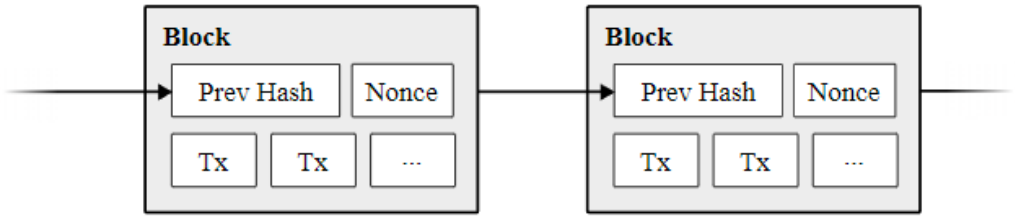

Figure 1, The validation of one block brands the next block with a new hash (Nakamoto, 2008)

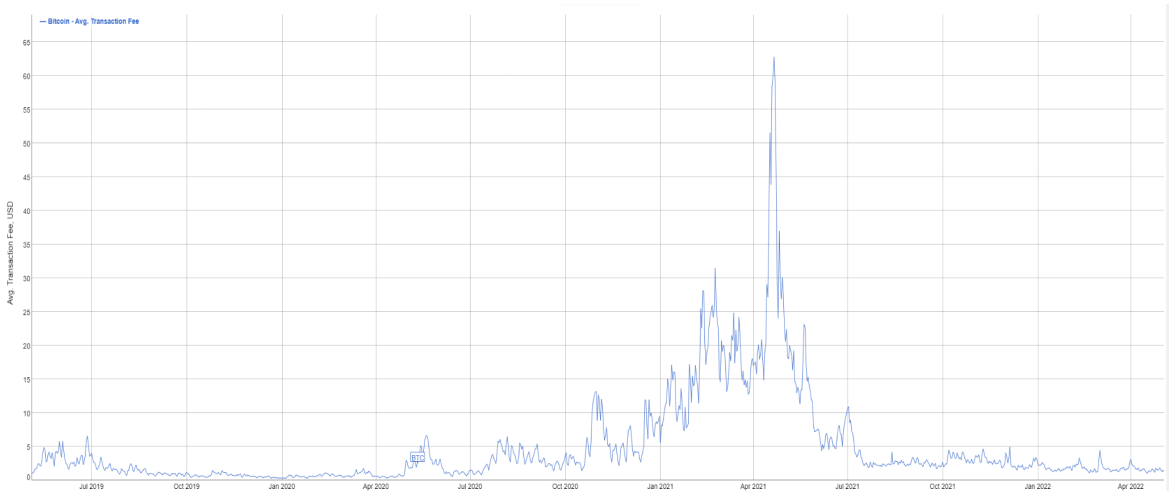

Figure 2, Bitcoin Avg. Transaction Fee historical chart (BitInfoCharts, n.d.a)

Figure 3, Ethereum Avg. Transaction Fee historical chart (BitInfoCharts, n.d.b)

A fundamental aspect of cryptocurrencies is their reliance and advocacy of decentralization. According to Crane (2018), the underlying decentralized nature of cryptocurrencies offers the possibility of a currency not being controlled by institutions but by users of the network. He continues by explaining how all network transactions need to be authenticated by a distributed network of individuals, of which the sheer volume of users and contributors increases the security and preventability of any one person or entity to manipulate the process. Furthermore, he argues that in addition to preventing a minority attack and manipulation of the process, transparency is key in preventing manipulation from bad actors, as all network activity is conducted in plain view.

2.3.2 Stablecoins

It could be said that the interpreted value of cryptocurrencies is still in its infancy. Therefore, their price relative to government-issued fiat is predictably volatile. According to Dell'Erba (2019), cryptocurrency's volatility dissuades its general adoption by consumers wishing to store value in a sound form of money, with the intent of using it for everyday transactions. Of the two forms of stablecoins, those backed by collateral and those by algorithmic mechanisms, those backed by collateral seem to be the most feasible option as a substitute for fiat money as it offers stability and trust, characteristics important for consumers (Dell'Erba, 2019).

The most prominent stablecoins can be seen built on various pre-existing blockchains as transactional tokens (or coins) (Dell'Erba, 2019). Furthermore, there are currently a number of prominent stablecoins in circulation, all of which try to address the issue of volatility, such as Tether (USDT) and DAI, both pegged to the US dollar (USD) (Bullman, Klemm, & Pinna 2019). *Figure 4, 5, and 6* show the daily closing market prices of USDT, DAI, and Bitcoin. The price of the USDT and DAI (*Figure 4 and Figure 5*) are seen fluctuating less while successfully achieving a price close to 1 USD with fluctuations less than 10%. Bitcoin (*Figure 6*), on the other hand, can be seen as being far more volatile, not prone to seeing fluctuations of more than 10% in a day. This is understandable as Bitcoin is not backed by

collateral nor intended to exude price stability through algorithmic mechanisms.

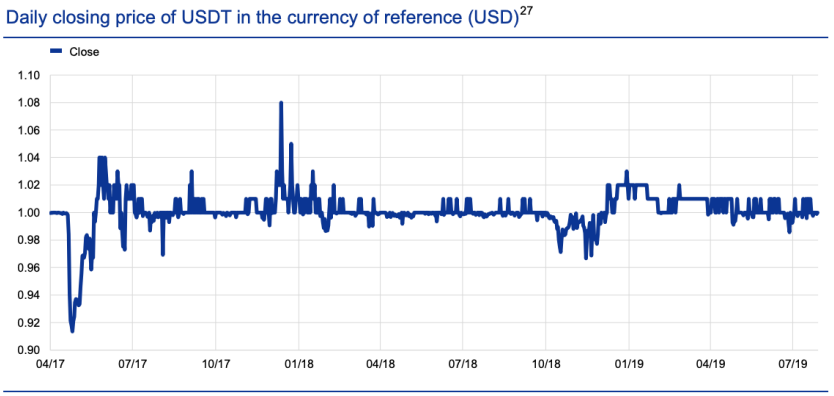

Figure 4, The daily closing price of USDT (Bullman, Klemm, & Pinna, 2019)

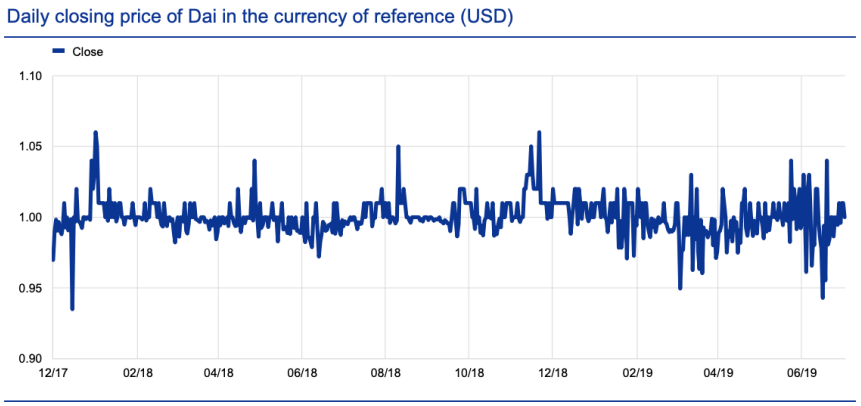

Figure 5, The daily closing price of DAI (Bullman, Klemm, & Pinna, 2019)

Figure 6, The daily closing price of Bitcoin (Yahoo! Finance, n.d.)

2.3.3 Foreign Exchange Related Risks

Fitzroy & Hulbert (2005) characterize company risks into business risk and financial risk.

Business risk is mostly short-term oriented and is concerned with an organization's operating cash flow, impacted by its competitive environment (Fitzroy & Hulbert, 2005). Financial risk is focused on a company's capacity to repay its debt, necessary in order to avoid insolvency and deprioritizing equity shareholders (Fitzroy & Hulbert, 2005). This, in turn, could negatively impact and accelerate the overall speed at which business risk unfolds for companies facing financial strains (Fitzroy & Hulbert, 2005).

A considerable risk that companies operating at the international level encounter are foreign exchange risk. Jankensgård, Alviniussen, and Oxelheim (2020) define exchange rate as units of home currency in relation to a unit of foreign currency, where currency appreciation reflects a more favorable rate at which the currency can be exchanged. Furthermore, Jankensgård, Alviniussen, and Oxelheim (2020) discuss how state governments can impact their nation's trade and economy by manipulating the value of their currency, thus shedding light on the impact magnitude at the company level caused by stakeholders outside of it. The authors explain that company competitiveness is directly impacted by exchange rates as companies, whose home currency appreciates, find it more challenging to compete in the global market due to their goods becoming more expensive for foreign buyers. In competitive market circumstances, it is enough for slight distortions in the exchange rate to enable competitors to occupy a critical position in the market (Jankensgård, Alviniussen, & Oxelheim, 2020).

Companies dealing internationally are faced with transaction exposure when conducting deals internationally. This is mainly due to the third-party involvement of banks acting as mediators, whose systems of communication and settlement take days to process (Gowda & Chakravorty, 2021). Traditional financial institutions such as banks have for the most part been used as the primary method for businesses to transfer funds internationally. The process requires interbank communication and settlement methods, including potential currency conversions, in order for the funds to be transferred (Gowda & Chakravorty, 2021). These processes, in effect, add large fees to the act of transferring money abroad, as communication and settlement services provided by each intermediary need to be compensated (Gowda & Chakravorty, 2021).

The international inter-bank communication system most widely used is The Society for Worldwide Interbank Financial Telecommunication (SWIFT) system, a standardized transaction messaging system for banks to understand and, thereby, process and settle payments (Qiu, Zhang & Gao, 2019). According to Qiu, Zhang and Gao (2019) SWIFT payments typically have to go through five parties before eventually arriving at the beneficiary's account, this causes SWIFT settlements to take between 3 to 5 banking days to complete. The authors claim that these additional steps cause fees to be opaquely defined, where the cost of an entire transaction includes the fee of utilizing the SWIFT system itself, along with the corresponding bank fees and exchange rate fees. For businesses transacting with foreign buyers and suppliers, this will result in increased lead time while waiting for a transaction to be settled. In effect, the prolonged settlement times also mean that changes in the exchange rate from one day to another could negatively affect businesses' ability to

predetermine the entire cost of the transaction prior to its settling (Jankensgård, Alviniussen, & Oxelheim, 2020).

Furthermore, foreign exchange-affected transaction costs can lead to a direct impact on a company's competitiveness by impacting the business' operating cash flow. Jankensgård, Alviniussen, and Oxelheim (2020) explain this phenomenon through the following equation:

CF = Q(P) * P(XR) * XR.

The price is accounted for as a function of the exchange rate (XR) which the authors say directly impacts the price of a product and ultimately its demanded quantity (Q) will decrease based on the price (P) increase. Hence, the companies competing in the global market can be affected by foreign exchange volatility to the point that it leads to structural issues. According to Petit (2007), cash flow volatility is one of the aspects that can further cause issues in financing strategic investments needed to cover for cash deficit. To minimize the chance of running these risks, companies have to employ risk management alternatives which can also be quite costly (Petit, 2007; Jankensgård, Alviniussen, & Oxelheim, 2020).

2.3.4 Crypto Benefits as a Functional Medium of Exchange

As mentioned in the background section of this thesis, the rise of cryptocurrencies in large due to their proclaimed ability to reduce transaction costs, has rarely been the subject of focus for researchers. However, Levulytė and Šapkauskienė's (2021) paper on 'Cryptocurrency in context of fiat money functions', provided the necessary research on cryptocurrencies in comparison to the functions of fiat. They argue that one of the three main functions of currency is to provide users with a medium of exchange (Levulytė & Šapkauskienė, 2021). To verify cryptocurrencies' potential as a functional currency, a study was devised to test whether cryptocurrencies were a more efficient, less costly, medium of exchange, used as an intermediary between the conversion of a base currency to a target currency. To compare, the same test was devised on the foreign exchange market (FX) where a base fiat was converted to a targeted fiat. The authors' reasoning for devising the study as such was due to the practically limited knowledge of how many companies currently accept cryptocurrencies, and whether or not such a sample size would be sufficient (Levulytė & Šapkauskienė, 2021).

Therefore, the aforementioned study allows one to assess whether cross-currency transactions benefit from using cryptocurrency as a mediator in an attempt to acquire more target currency, as opposed to directly converting the currency on the foreign exchange market. This is only possible due to the nature and existence of cryptocurrency exchanges, which much like the foreign exchange market, serve as a marketplace for trading currencies, including fiat, for one another (Stylianou & Carter, 2020). Much like the foreign exchange market, every trade on cryptocurrency exchanges is subject to fees (Binance.us, n.d.; Coinbase, n.d.; FTX US Support, n.d.). These have to be taken into account when calculating the net benefit in order to establish which method of conversion achieves the largest net target currency (Levulytė & Šapkauskienė, 2021).

In their calculations, Levulytė and Šapkauskienė (2021) applied a fee of 0.5%, including conversion and other costs, for using cryptocurrency as a mediator, a fair assessed value for a typical cryptocurrency exchange (Binance.us, n.d.; Coinbase, n.d.; FTX US Support, n.d.). Thereby, Levulytė and Šapkauskienė (2021) finalized their equation with the "aim to find and evaluate the possible gain in exchanging base currency (euro) to cryptocurrency and then to a target currency, thus proving the value of cryptocurrency as a medium of exchange" (Levulytė & Šapkauskienė, 2021, p.47). Their constructed equation can be seen expressed below.

$$\text{Benefit} = \frac{\text{Base currency units using crypto} \cdot 0,995 - \text{Base currency units using FX}}{\text{Base currency units using FX}}$$

Figure 7, Equation for calculating cryptocurrency net benefit as a mediator for currency exchange. (Levulytė & Šapkauskienė, 2021).

The cryptocurrencies chosen for the study were, at the time, the top three by market capitalization, namely Bitcoin, Ethereum, and Ripple respectively. Their results are represented in *Figure 8* below. Firstly, when looking at Table 1, highlighting the results for Bitcoin, it is clear that even after the included 0.5% fee, there are benefits seen for using Bitcoin as an FX transaction mediator. Levulytė and Šapkauskienė (2021) state that the most relevant value that depicts the benefit of Bitcoin is the trimmed average. This value is generated by eliminating the 10% highest and lowest values, showing "a slightly more accurate value of the benefit, with the benefit declining slightly in most cases, but increasing for the Australian dollar, the Chinese yuan, and the Russian ruble" (Levulytė & Šapkauskienė, 2021, p.47).

The results show no clear trends between developed and developing nations, still, ARS, CHF, and CNY stand out as being the highest benefiting currencies. As seen in Table 2, Ethereum sees on average lower trimmed averages compared to Bitcoin, going so far as to be -1.14% worse off when exchanging to the Japanese Yen. It should be noted that both the Swiss franc (CHF) and Argentine Peso (ARS) were not measured due to there not being any available exchanges capable of exchanging Ethereum for those particular fiat currencies (Levulytė & Šapkauskienė, 2021). The author's suggested the less benefitting Ethereum as being the result of its lesser value in comparison to Bitcoin, thereby, limiting the ability to take advantage of arbitration (Levulytė & Šapkauskienė, 2021).

Despite the selling point of being a fast and low-cost-focused cryptocurrency (Ripple, n.d.), Table 3 shows Ripple to be the least beneficial FX transaction mediator, however, with a significantly lower standard deviation than Bitcoin and Ethereum. All in all, the study concluded Bitcoin and Ethereum achieved the greatest tangible monetary benefit, with Ripple still showing benefits as a transaction mediator for the Russian ruble (Levulytė & Šapkauskienė, 2021). Although the absolute values of the percentage benefit fall in general below 1%, this can still prove hugely beneficial when transferring large sums of money. The benefits and study as a whole, thereby, prove cryptocurrencies' utility as mediums of

exchange and display an advantage over the traditional foreign exchange market for all currencies used in the study.

Table 1
Benefit using Bitcoin as an FX transaction mediator.

	Benefit using BTC as transaction mediator											
	Result without taxes						Result with 0,5% tax					
Currency	Average with standard deviation	Trimmed average	MIN benefit	MAX benefit	Median	MAD	Average with standard deviation	Trimmed average	MIN benefit	MAX benefit	Median	MAD
USD	0,85%±1,52%	0,69%	-1,35%	6,93%	0,51%	1,17%	0,35%±1,51%	0,18%	-1,84%	6,40%	0,01%	0,67%
AUD	0,1%±0,78%	0,11%	-1,82%	2,01%	0,10%	0,63%	-0,4%±0,77%	-0,39%	-2,31%	1,50%	-0,40%	0,63%
JPY	-0,14%±0,84%	-0,12%	-4,52%	2,11%	-0,17%	0,63%	-0,64%±0,84%	-0,62%	-5,00%	1,60%	-0,67%	0,62%
CHF	7,66%±6,12%	7,34%	-4,77%	20,73%	4,60%	5,38%	7,12%±6,09%	6,80%	-5,25%	20,13%	4,08%	5,36%
SEK	0,78%±1,74%	0,58%	-1,81%	7,71%	0,31%	1,31%	0,27%±1,73%	0,07%	-2,30%	7,18%	-0,19%	1,30%
MXN	0,69%±1,85%	0,55%	-2,73%	7,67%	0,20%	1,47%	0,19%1,84%	0,05%	-3,22%	7,13%	-0,30%	1,46%
RUB	0,49%±2,58%	0,54%	-6,87%	10,34%	0,73%	2,01%	-0,02%±2,57%	0,04%	-7,34%	9,79%	0,23%	2,00%
CNY	2%±0,86%	2,06%	-0,21%	3,46%	1,91%	1,79%	1,49%±0,86%	1,55%	-0,71%	2,95%	1,40%	1,36%
ARS	12,97%±10,18%	12,85%	-6,35%	41,77%	15,06%	10,56%	12,41%±10,13%	12,29%	-6,82%	41,06%	14,48%	10,29%
ZAR	0,7%±2,19%	0,56%	-3,83%	7,73%	0,34%	1,73%	0,2%±2,18%	0,06%	-4,31%	7,19%	-0,16%	1,72%

Table 2
Benefit using Ethereum as an FX transaction mediator.

	Benefit using ETH as transaction mediator											
	Result without taxes						Result with 0,5% tax					
Currency	Average with standard deviation	Trimmed average	MIN benefit	MAX benefit	Median	MAD	Average with standard deviation	Trimmed average	MIN benefit	MAX benefit	Median	MAD
USD	0,91%±1,53%	0,74%	-1,25%	7,03%	0,58%	1,23%	0,41%±1,52%	0,23%	-1,74%	6,49%	0,07%	0,73%
AUD	-0,43%±1,62%	-0,60%	-7,84%	10,15%	-0,32%	1,11%	-0,93%±1,61%	-0,87%	-8,30%	9,59%	-0,82%	1,10%
JPY	-2,01%±5,52%	-0,91%	-34,20%	7,39%	-0,40%	3,20%	-2,5%±5,49%	-1,41%	-34,53%	6,85%	-0,90%	3,18%
SEK	0,98%±1,67%	0,78%	-1,49%	7,96%	0,55%	1,22%	0,47%±1,66%	0,27%	-1,98%	7,42%	0,04%	1,22%
MXN	0,89%±1,78%	0,75%	-3,17%	7,86%	0,57%	1,37%	0,39%±1,77%	0,25%	-3,65%	7,33%	0,07%	1,36%
RUB	0,44%±2,57%	0,50%	-6,35%	10,03%	0,64%	1,99%	-0,06%±2,56%	0,00%	-6,82%	9,48%	0,14%	1,98%
CNY	0,01%±1,03%	-0,05%	-3,13%	4,96%	-0,09%	0,75%	-0,5%±1,02%	-0,55%	-3,61%	4,44%	-0,59%	0,75%

Table 3
Benefit of using Ripple as an FX transaction mediator.

	Benefit using XRP as transaction mediator											
	Result without taxes						Result with 0,5% tax					
Currency	Average with standard deviation	Trimmed average	MIN benefit	MAX benefit	Median	MAD	Average with standard deviation	Trimmed average	MIN benefit	MAX benefit	Median	MAD
USD	-0,09%±0,34%	-0,12%	-2,48%	2,21%	-0,13%	0,34%	-0,59%±0,84%	-0,62%	-2,97%	1,70%	-0,63%	-0,16%
AUD	-0,57%±0,98%	-0,09%	-3,00%	3,09%	-0,13%	0,74%	-0,56%±0,97%	-0,59%	-3,49%	2,58%	-0,63%	0,74%
JPY	-0,05%±0,92%	-0,05%	-4,46%	3,90%	-0,09%	0,68%	-0,55%±0,92%	-0,55%	-34,53%	6,85%	-0,90%	3,18%
CHF	1,14%±6,06%	1,14%	-29,06%	19,40%	1,17%	3,23%	0,63%±6,03%	0,63%	-29,42%	18,80%	0,66%	3,07%
SEK	-0,27%±0,96%	-0,10%	-3,10%	4,01%	-0,15%	0,71%	-0,53%±0,95%	-0,60%	-3,59%	3,49%	-0,65%	0,71%
MXN	-0,11%±1,37%	-0,16%	-3,79%	4,33%	-0,21%	1,07%	-0,61%±1,37	-0,66%	-4,27%	3,80%	-0,71%	1,06%
RUB	0,53%±2,58%	0,59%	-6,43%	10,35%	0,77%	1,98%	0,03%±2,57%	0,09%	-6,90%	9,80%	0,27%	1,97%
CNY	-0,05%±0,99%	-0,10%	-3,31%	3,36%	-0,19%	0,76%	-0,55%±0,99%	-0,60%	-3,79%	2,85%	-0,69%	0,76%
ZAR	-0,1%±1,77%	-0,15%	-4,41%	6,18%	-0,28%	1,37%	-0,6%±1,76%	-0,65%	-4,89%	5,65%	-0,78%	1,36%

Figure 8, Benefits of using Bitcoin, Ethereum, and Ripple as an FX transaction mediator (Levulytė & Šapkauskienė, 2021).

2.3.5 Smart Contracts

The use case for cryptocurrencies extends further than just the benefits of the decentralized nature of a blockchain-driven currency. According to Brown & Whittle (2020), a smart contract is an automated contract that works without the interference or involvement of either participating party. The authors describe the ability of smart contracts to be added onto the blockchain of a supporting network similar to that of transactions, as it is simply stored as data within each block. They go on to explain how the initial block carrying the smart contract, and each subsequent block thereafter, contains the instructions for inputs and outputs of the contract, along with the necessary triggers that activate them. In practice, this allows for a party fulfilling the terms of their contract, to have the outcome of the contract subsequently released as a network transaction upon triggering the necessary terms of the contract. This fully automated process prevents either party's need for trust and individual

interpretations of the contract. Thereby, the contract becomes unambiguous as the terms are willingly predefined and automatically enforced (Brown & Whittle, 2020).

Smart contracts get rid of the need for middlemen to act as trusted agents (McGowan & Olson, 2021). With no middleman present in the transaction, a reduction in transaction costs through the elimination of mediation costs would occur (McGowan & Olson, 2021). According to Brown & Whittle (2020), in addition to reducing the costs, a risk aversion also occurs from the implementation of smart contracts as neither party in the transaction governs the terms of the contract, eliminating the power imbalance of an interpretational dispute. Furthermore, the authors claim that the risk of incomplete contracts such as interpretation disputes over ambiguous predefined terms disappears along with the risk of not getting paid. The disappearance of risk is stated to occur due to a combination of logical and distinct requirements allowing a payee's locked-in payments to automatically transfer once the seller's requirements are fulfilled. Moreover, they claim smart contracts' lack of an intermediary and digital nature, simplifies a company's ability to create and replicate them regardless of transaction size.

According to Alharby, Aldweesh, and van Moorsel (2018), the scientific interest in smart contracts has increased in recent years by the number of relevant articles on the subject. They found that 62% of articles relevant to smart contracts concern their application. The authors claim this to be due to the applications for smart contracts becoming more interesting to businesses. The reasons for implementing smart contracts are due to their potential to impact transaction and agency costs (Shermin, 2017). According to Shermin (2017), smart contracts create the possibility to circumvent the transaction costs for businesses as they would be able to conduct direct contracts and payments, excluding any middleman and their fees.

While there is applicability for smart contracts, the limited real-life examples bring us to question and look for any potential barriers to their implementation. According to Mandloi & Bansal (2020), the greatest barriers to smart contract implementation are a result of the technology still carrying a high degree of novelty. In addition to this, the authors insist on the scalability and versatility of smart contracts, predominantly determined by which blockchain it is deployed upon, as being a cause for slow adoption. Similarly, the authors argue for the difficulty in recreating perfect contracts and tying them into a method of achieving the correct real-world triggers to resolve them, continues to be challenging when translating into auto enforceable code.

2.4 Chapter Summary

This part addressed essential information for our thesis research from two different angles. In the theory review transaction cost and agency theories were examined in order to identify key bottlenecks businesses are dealing with in terms of these two theories' applications. In transaction cost theory some of the identified common causes which lead to an increase in transaction costs are associated with: foreign exchange risk and fees, governance structures along with the clearing and settlement processes of financial institutions. In combination with

transaction costs, compatible elements of agency theory such as principal-agency issues where the consequences of the interests of both the agent and principal not being aligned can result as well in cost increases.

The literature review looks at the technological functionality of cryptocurrencies as well as stablecoins and smart contracts as complementary technological derivations. In addition, current risks encountered in the foreign exchange media were examined and combined with a research of areas where cryptocurrencies could provide businesses with potential benefits if used as a medium of exchange. Hence, it became apparent how a cryptographic proofing mechanism combined with advantages derived from the blockchain technology can become an automated exchange medium without requiring the involvement of third parties. Foreign exchange and investment, payment method, and smart contract were identified as the three key areas of cryptocurrency-related technological applications into businesses.

These findings of key areas of cryptocurrency implementation to businesses lead to the creation of *Figure 9*, an exhibit providing the necessary information and key points to analyze a business implementation of cryptocurrency. The exhibit presents the important key points of what a cryptocurrency is, in combination with the findings of implementation possibilities that creates the basis for how to move forward with implementation. Which leads to the next section of the exhibit, focusing on the potential benefits offered for a business depending on the choice of cryptocurrency implementation, and how to apply it. All of the different potential benefits found for the three types of implementation lead to the conclusion that they are all related to transaction- and agency costs, meaning that all three types of cryptocurrency implementation provide for potential benefits on businesses' transactionary costs.

Figure 9. Our own exhibit summarizing the key points from the literature and theory review.

3 Methodology

The thesis has taken an abductive methodological approach which, in the following section, will be discussed and assessed as it relates to answering our research question. The research design section will focus on explaining why a comparative study was deemed appropriate and how this will be enforced throughout the thesis. Furthermore, the data collection method is divided into two parts, i.e. case selection and data collection, which are thoroughly addressed. Finally, the validity and reliability of the information used as well as the limitations of the study will be discussed, in terms of how it was found and vetted.

3.1 Research Limitations

The study is part of a bachelor thesis that was conducted over a period of approximately ten weeks as per Lund's University requirements. Based on the novelty of the subject matter and the time constraints it was not possible to conduct a data collection process in order to obtain primary data. As there are only a few companies that have implemented cryptocurrencies, it was not possible to gain access to direct information from them due to our restricted resources and our time constraints. Furthermore, we are only using two cases to compare and exemplify the potential implications of cryptocurrency adoption in certain areas of the business. Therefore, the number of the selected cases paired with a limited number of selected applicable theories and the fact that businesses widely differ in their approaches and models, cannot allow for the study's drawn inferences to be widely generalized. Hence, the research study seeks to investigate the phenomenon of cryptocurrency in terms of its use at the firm level and display what are some possibilities with the intention of spurring interest for further research in the area. Moreover, the business adoption of cryptocurrencies is also in its incipient stages due to the novelty of the phenomenon and thus it is yet not possible to evaluate or predict either precisely how or the extent to which their impact on organizations will unfold.

3.2 Research Approach

Since the subject of cryptocurrencies is still relatively new and the available peer-reviewed literature on their implementation into businesses is relatively limited, we deemed an abductive approach to be most suitable for our research topic. Because cryptocurrency is such a recent phenomenon, both within academia but also in the broader sense, we seek to first understand its foundations and the way in which companies have found it useful rather than establishing the course of direction for both its business utility and the research method from the beginning. For this reason, a deductive approach where theory and hypothesis are clearly known at the beginning of the research process was not fit for our research question nor was it an inductive approach where theory is derived from a collection of data (Saunders, Lewis, & Thornhill, 2009; Bryman & Bell, 2011). The study is thus intended to objectively review the research topic in order to recognize the key elements and theories associated with their adoption at a business level and to potentially identify pivotal emerging themes which could prove to be patterns in the long term. Hence, an abductive approach will allow for an extent

of flexibility by removing the rigidity of conducting research limited by theories based on initial presumptions.

Dubois and Gadde (2002) describe abductive reasoning as a matching process free of biases that are not intended to fit specific patterns. The authors argue that the interdependence and embeddedness between different variables could lead to various directions that a study can take because it is oriented towards discovering new details. In this case, the matching process was conducted based on our information in the literature review and our company-specific collected data. Therefore the direction of our thesis could not be predicted by matching essential details of cryptocurrency functionality with relevant theories for their application at the firm level alone. Only when real company information was added did the thesis obtain a clearer sense of direction.

An abductive research approach can, therefore, be conducted by employing qualitative research. Although not with a direct focus on an abductive approach, Bryman and Bell (2011) also emphasize that qualitative analysis can be conducted using theory as a foundation. This is also applicable to our paper in the sense that we are using transaction cost and agency theories as background information to better understand the issue at hand that businesses could be dealing with. Our study is conducted through the lenses of a pragmatic view hence we are intending to adopt a practical investigation into the phenomenon of cryptocurrency (Patton, 2015). Furthemore, Bryman and Bell (2011) point out that choosing a paradigm is important and plays a role in how the research design will then be predetermined as well as how the methods for the data collection will be selected. Therefore we seek to capture the essence of the practical use of employing cryptocurrency technology at the company level.

3.3 Research Design

Due to time constraints for the investigation of our research question, secondary data has been used to be able to meet the requirements. Overall, a comparative design is applicable and will be used to thread our research design. This type of research design is suitable for studying real cases of cryptocurrency implementation because it does not bear with it the necessity for presumptions nor does it require a rigid structure of assessment. Therefore, we can focus on conducting a free of expectation investigation to reap undirected results.

Comparative design is defined by Bryman and Bell (2011) as a type of study which compares contrasting cases that look at the same phenomena. The authors argue that the purpose of such a study is to better grasp social phenomena. Markey (1926) defines social phenomena as all the behavior which influences or is influenced by others. Although Markey's (1926) investigation of the nature of social phenomena was directed toward the sociology field, the core idea of his inquiry is that it is not merely enough to assess the directly visible elements of behavior and their interaction but that there are also several non-visible elements which play a role and can be unknowingly exposed for analysis. Therefore, the author argues that comparative sociology should be used to achieve deeper learning of certain phenomena. The

implementation of cryptocurrency can be seen as a complex social phenomenon because there are a multitude of elements, including people's behavior, impacting the outcome.

Furthermore, the study is designed to investigate how organizations react to the phenomena of blockchain and cryptocurrencies which is reflected in their different forms of implementation and use cases. Since the organizations are different, they respond differently to the cryptocurrency phenomena. In addition, the way companies react to the phenomena is highly dependent on their strategy which comprises both internal and external aspects which could be matched to a person's individual and collectively induced behavior (Markey, 1926). Just as people might not always be aware of the source of their behavior's derivation and even action (Markey, 1926), the companies may also encounter elements in their decision-making structure that may not be directly traced to a line of reason or whose outcome is not thoroughly assessed.

Comparative designs require the use of at least two cases to facilitate the obtainment of contrasting views (Bryman & Bell, 2011). The aim is to see if any emerging patterns can be identified after the investigation of two companies implementing cryptocurrencies. A comparative design can often be used for qualitative studies such as cross-cultural research at the business level which is rooted in cultural distinctions left unaccounted for in organizational management (Bryman & Bell, 2011). For the data collection, Bryman and Bell (2011) pinpoint that a cross-sectional design format can be commonly used. However, one of the main conditions described by the authors for using cross-sectional design in data collection is using information from a single point in time. This is not possible to secure when using secondary data because the data has already been collected and originates from multiple independent sources, making it difficult to find data on the same isolated point in time for both of our cases (Bryman & Bell, 2011).

3.4 Data Collection Methods

Our thesis targets the area of cryptocurrency as a general phenomenon and its usage in business. This is a fairly new subject that has not been thoroughly investigated by previous literature and studies, hence, there is not any statistical data available for cryptocurrency implementation in businesses. The lack of data in combination with our second focus on cryptocurrency as a phenomenon means that a qualitative study was deemed suitable for our thesis.

3.4.1 Case Selection Process

Our initial goal for the data collection process was to collect primary data obtained directly from the companies which we would then use to assess the implications of the business' implementation. To make a realistic goal for obtaining the data within the scope of our paper, we first planned to select two local companies in an attempt to make data gathering easier. These companies were IKEA and Webhallen. Our reasoning around IKEA was not only its highly intricate global supply chain system that would make a good case for studying

transaction costs impact and cryptocurrencies applications but also because the company has been somewhat explorative with the blockchain technology in certain markets and testing out the smart contracts on the Nordic market (Palmer, 2019). Webhallen on the other hand was specifically identified because they implemented cryptocurrency payments on several occasions. Hence, we thought Webhallen possessed good learning material for understanding cryptocurrency's limitations and drawbacks in the company's decision of the adoption process.

However, since primary qualitative data can be challenging to gather and make use of, especially due to the currently limited focus of businesses on cryptocurrencies and our time and resources constraints, we decided to instead orient ourselves towards other company cases that are more grounded and transparent with their cryptocurrency implementation process and reasons. For these reasons, we initially chose Tesla, Microstrategy, and Share&Charge for their varying organizational approaches and use cases of cryptocurrency implementation at the firm-level. Share&Charge was chosen due to its implementation of cryptocurrencies as a direct form of payment for customers (Share&Charge, n.d.b). Microstrategy has been highly focused on using cryptocurrencies as a form of investment, making it their predominant treasury asset (MicroStrategy, 2022). Tesla, on the other hand, has been using cryptocurrency as a form of payment but also as part of its financial investment (Tesla, 2022). However, the paper puts the transaction cost and agency theories at the center of the study for which MicroStrategy's case did not fulfill the requirements. To be able to build a comprehensive overview of cryptocurrency business adoption only Tesla and Share&Charge were left as the most suitable cases to meet the research purpose given the limitations.

3.4.2 Data Collection

For conducting our inquiry we gather qualitative data from peer-reviewed literature and present it in the literature and theory section. Additional data is also gathered from secondary sources and presented in the empirical data section of the thesis. To be able to investigate our research problem within the available time frame secondary data collection was used. The process we applied for our data collection was to acquire as much knowledge as possible based on thoroughly overviewing both publicly available information as well as academic literature. First, we identified and collected the necessary literature for building our own and the readers' understanding of the phenomenon of cryptocurrency. The predominant data collected at this phase was mainly related to the technical functionality of the phenomenon as well as an investigation of its practical uses. After that, additional data was collected from various published documents and articles in books and journals which brought the necessity of moving into a sorting stage. At this stage, we focused on sorting our data based on its relevance and applicability to the researched problem. This was mostly performed for the part where we selected the preliminary theories and models suitable for analyzing our company data.

The type of secondary data gathered in the empirical data phase is compiled data, meaning that the information available has undergone a sorting process and has been summarized and compressed to fit the reporting purposes of use required by the specific actors (Saunders, Lewis, & Thornhill, 2009). In our case, the data has been collected from the reporting organizations, i.e. Tesla and Share&Charge, whose intended users are multiple stakeholders with varying interests. Saunders, Lewis, and Thornhill (2009) divide the secondary data into three different types depending on their type and source. These are survey-based data, documentary data, and multiple source data. Both documentary secondary data and multiple source data have been collected for this study. For the company data gathering, documentary secondary data was predominantly used. Our most widely used sources which are included in this data type are reports to shareholders, administrative and public records, newspapers, as well as other published materials by the companies (Saunders, Lewis, & Thornhill, 2009). For the second part of the theory and literature review, we have collected multiple-source secondary data in the form of books, journals, and government publications.

3.5 Reliability and Validity

It is common practice to consider the credibility of a research study. In addition, we have conducted a qualitative study where secondary data has been collected through various channels from multiple sources hence we must ensure that concerns regarding the reliability and validity of our findings are addressed.

Saunders, Lewis, and Thornhill (2009) characterize reliability as the extent to which persistent findings are reached based on the data collected. Since our findings rely on companies' self-reported statements on their implementations and investments of cryptocurrency solutions, their bias, opinions, and perhaps even personal stake within the cryptocurrency world, could harm mapping the true implications of cryptocurrencies in business. To circumvent these potential limitations, we chose to look predominantly at statements officially made by the companies or regulatory bodies. Therefore, certain company information such as financial statements is subject to SEC and IFRS financial reporting regulations, according to which misleading investors through providing false financial statements is punishable (SEC, n.d; IFRS, 2022b).

Bryman and Bell (2011) highlight that it is fundamental to consider the source's credibility and their varying interests. Saunders, Lewis, and Thornhill (2009) highlight that looking at causal relationships is one way to assess validity. In other words, understand who are the different stakeholders and what are their different intended outcomes. We are using secondary data which has been collected from the information published by the case companies themselves. Nonetheless, a lot of the information collected comes from the annual reports which have previously been audited. One of our use case companies has the USA as its home country and is reporting its financial data according to the GAAP standard (Tesla, 2022). However, there may be certain biases along the process of the primary data collection point until its publishing phase that cannot be directly traced back. Furthermore, the choice of two organizations operating in the electrical vehicles industry was not purposefully made as

elaborated in the case selection process. Hence, any potential technological inclinations and preferences based on similarities in the business models were included in this paper.

3.6 Chapter Summary

In Methodology we first described the research problem for the thesis with all its ramifications after which we proceeded to all the details of how this study is to be conducted. For the research approach, an abductive model was chosen and the reasons for it were explained, as well as described how it will be applied. The design selected is a comparative design that was deemed appropriate due to its adaptable nature which allows for more flexibility in terms of the data collected. For this investigation, secondary data was collected in the form of academic literature, books, and company data. Based on these data types and the research approach we elaborated on what are the potential reliability and validity limitations of these methods.

4 Empirical Data

This section constitutes the empirical data that we obtained from secondary sources, in the form of Tesla Inc. and Share&Charge Foundation. The data and information are mostly taken straight from the businesses' websites and financial reports, presenting data as close to a first-hand source as possible. The data presented below present the real-life data and case of potential benefits from businesses' adoption of cryptocurrencies, that in combination with the previous section of the literature review presents the information necessary to conclude this thesis.

4.1. Tesla Inc.

Although known for being an electric vehicle manufacturer and sometimes also a tech company (Grant, 2016), Tesla currently divides its business segments into automotive and energy generation and storage (Tesla, 2022). Apart from innovating and creating their core product, electric cars, from scratch, the company has opted for a different way of distributing its products as well. The company's approach to servicing and distributing cars greatly varies from the traditional franchise dealership model dominant in the automotive industry. The business has chosen to not distribute its electric vehicles through third-party intermediaries and focused on selling directly to consumers instead (Tesla, 2012). One explanation for diverging from the franchise dealership sales channel was to be more agile in reaching customers before they reach out to a car dealer. Furthermore, the company also argued that by using franchise dealerships it would find itself at a disadvantage compared to the fuel-powered car due to the dealership's conflict of interest driven by their incentive system (Tesla, 2012).

At the beginning of 2021, Tesla took a big leap and started to allow for some cryptocurrency implementation in different forms (Tesla, 2022). First, the company purchased $1.5 billion worth of Bitcoin after which it also decided to accept payments in cryptocurrency only for

certain products and where allowed by jurisdictions (Tesla, 2021). While Tesla's exact method of payment implementation has not been publicly confirmed, the consensus points toward their use of the free and open-source BTCPay software, based on the statements made by both the BTCPay team and Tesla's CEO (BTCPay Server, 2021; Musk, 2021). BTCPay is a direct payment gateway that would allow Tesla to accept Bitcoin directly and without a third party payment provider (BTCPay Server, n.d.)

In January 2021 Tesla had to change its investment policy to be able to remove the operating liquidity requirements which made it possible to invest in other assets such as cryptocurrencies (Tesla, 2021; Tesla, 2022). The firm has motivated its request by being able to minimize its operating liquidity, which was approved by the Audit Committee, thus intending to maximize its return on the operating cash (Tesla, 2021). Moreover, they announced their intention of being able to diversify their portfolio by investing a portion of their operating cash in alternative reserve assets such as cryptocurrencies, gold-based assets, and others. The International Monetary Fund Committee on Balance of Payments Statistics (2015) defines reserve assets as those types of assets which can directly be used for the balance of payments because they are easily convertible and recognized by monetary authorities. Further, they explain that these asset types are used for tackling issues that can occur in the balance of payments process due to negative impacts caused by changes in the exchange markets.

Tesla has initially declared that they intend to hold their digital investments for the long-term but that they value the fact that the assets can easily be liquidated, relevant in Tesla's case as they have criteria for operating liquidity (Tesla, 2021). However, cryptocurrencies are categorized as indefinite intangible assets by the accounting rules (IFRS, 2022a). This means that any changes in the price of these currencies will be reported and incurred as a loss by the company, thus also increasing the occurrence at which the company reports losses based on the market volatility for cryptocurrencies. They state that they are willing to invest in cryptocurrencies at the expense of risking worsening their financial position and even potentially exposing themselves to regulatory changes in the political and financial environments (Tesla, 2021). Tesla seemingly compared the risks associated with the cryptocurrency implementation to the risks related to the foreign currency risks accompanying their international transactions, especially revenue, cost of revenue, operating expenses, and foreign currency-denominated debt (Tesla, 2021). Hence, they have conflicting sources of revenue, and therefore changes in the dollar value as a currency impact their other revenue sources, the reason for which the company is taking hedging action to protect itself from risks associated with its activities involving foreign exchange.

In May 2021 Tesla ceased to accept Bitcoin as a form of payment, pinpointing environmental and sustainability issues related to the Bitcoin protocol. However, Tesla retains its stance on cryptocurrency's future potential and that they consider it a suitable alternative to cash in terms of liquidity (Tesla, 2022). Nonetheless, for the financial year which ended December 31, 2021, the company appears to have realized more gains than losses in bitcoin with $101 million registered in impairment losses and $128 million in gains from selling the asset

(Tesla, 2022). At the beginning of 2022, Tesla decided once again to accept cryptocurrencies as payment but this time it was applied specifically to Dogecoin which could now be used for their charging stations (Tesla, n.d.).

Tesla's production chain sees numerous parts shipped from all over the globe to their production facilities (Tesla, 2022). This requires not only a great deal of planning, both financial and operational, but it also contributes to the necessity of risk management. In addition, Tesla's operations, like those of many others, have become more aware of the effects of supply chain disruptions and changes in global trade in the past two years (Tesla, 2022). Therefore, the company acknowledges that certain supplier relations as well as stakeholders, acting in any parts related to their relationship, may lead to them not being able to control their manufacturing costs due to the impact some of these suppliers can have on their supply chain. Similarly, the firm argues that such interruptions would do even more harm since they are in a growth phase while operating in an already highly competitive market with increasing competition (Tesla, 2022). The company points to unexpected changes in the market and business conditions, trade policies, and labor issues as reasons for extensive supplier-side distortions (Tesla, 2022). Other general risks such as changes in political landscapes, as well as in legal and regulatory conditions are also acknowledged by the company as highly relevant.

4.2 Share&Charge Foundation

The next company that has implemented cryptocurrency into its business is the Share&Charge Foundation. Share&Charge is a non-profit committed to "the development, implementation, and promotion of open protocols and applications for sustainable and future-oriented mobility based on internet-based technologies and decentralized software architectures" (Share&Charge, n.d.b).

The business strives to achieve more possibilities for open innovations targeting a better charging experience for electric vehicles through the implementation of Open Charging Networks (Share&Charge, n.d.b). The Share&Charge Foundation is an organization, but also a community for innovation regarding open charging networks for electric vehicles (Share&Charge, n.d.b). The organization offers other companies and organizations within the electric vehicle charging industry technology working groups, innovation and research projects, and exclusive content regarding electric vehicle charging if they join the community (Share&Charge, n.d.b). These offerings are one of Share&Charge's methods to reach its goal of developing, implementing, and promoting open charging networks and their importance for the future (Share&Charge, n.d.b). The second method used is their innovation projects where they implement open charging networks. These projects happen all around the world depending on the interested partnering companies (Share&Charge, n.d.b). It is within these innovation projects that Share&Charge have implemented cryptocurrency into their business, both as a payment method and smart contracts, two examples of such innovation projects are the "E-MOBILITY WALLET" and "SWISS PILOT" (Share&Charge, n.d.b).

The E-mobility Wallet is a project conducted in Germany cryptocurrency act as a payment method for using their electric vehicle charging network (Share&Charge, n.d.c). The project lets electric vehicle owners pay their charging fee at the charging station with the cryptocurrency DAI instead of simply using ordinary currencies via credit/debit cards (Share&Charge, n.d.c). DAI is a stablecoin that is based on the Ethereum blockchain, targeting 1 USD (MakerDAO, n.d.). DAI can be used by any company and individual and allows everyone to pay with cryptocurrency without the value volatility that many other cryptocurrencies are affected by (MakerDAO, n.d.).

The Swiss Pilot is a project conducted by Share&Charge together with their partners in Switzerland (Share&Charge, n.d.d). The project aims to implement blockchain technology in services for charging electric vehicles to reduce transaction costs for businesses, leading to reduced costs for consumers (Share&Charge, n.d.d). When you charge your electric vehicle at a charging station you most likely have to pay a roaming fee to use the product or get a subscription at that specific station (Share&Charge, n.d.d). Roaming fees occur due to the exchange rate and transfer fees charged to businesses when charging outside of one's home network (Share&Charge, n.d.d).

The E-Mobility wallet, needed to pay for Share&Charge's charging network, uses the Energy Web Chain (EW Chain) and its native token EWT to facilitate its transactions (Share&Charge, n.d.b). Unlike Ethereum, the EW Chain provides significantly lower transaction fees and an average block time of around 5 seconds (Energy Web, n.d.). "To date the upper boundary of transaction fees on the EW Chain is approximately 0.00015 EWT and the vast majority of fees range from ten-thousandths to millionths of one EWT..." (Energy Web, 2020, p.7). With the value of EWT at the time of writing hovering around $3, the total cost for a transaction is but a fraction of a cent and settles in roughly 5 seconds.

Had Share&Charge not used cryptocurrency as their payment method, they perhaps would have opted for the more typical and expensive credit/debit card payment solution. In the US, the weighted average merchant processing fee "for all Visa and MasterCard credit cards was 2.17% in 2013, while the same average for debit cards was almost a third, or 0.76%." (Merchant, 2016, p.328). These fees can be viewed as having a direct and proportionate impact on a firm's revenue and would, therefore, altogether be more costly than the use of the EW Chain described above.

4.3 Chapter Summary

Our empirical data is secondary data collected mostly from the two selected real-life cases, Tesla and Share&Charge, to conduct a comparative study. For the implementation of blockchain technology into their business, the companies have taken some similar approaches to their implementation, however, significantly differencing for the most part. Both Tesla and Share&Charge have adopted cryptocurrencies as a form of payment, however the specific currencies, as well as the extent to which they are used largely differs. Tesla has started with

accepting Bitcoin for their electric vehicles to reduce it to accepting Dogecoin instead, only for their charging stations. Share&Charge, on the other hand, chose to implement stablecoins instead, choosing to protect themselves from the price volatility of cryptocurrencies. Furthermore, Share&Charge also opted for the implementation of smart contracts in their operations to be able to increase their efficiency, whereas Tesla is holding some of their cryptocurrencies as invested part of their operating cash flow. All in all, our study gathers the relevant data which helps us understand why the companies have implemented cryptocurrencies in the first place, how they use it, as well as what is their long term intention with it.

5 Analysis & Discussion

This section contains our analysis of the findings of both the literature review and the empirical data. The analysis will be conducted through the use of our exhibit created in section 2.4, which presents the main key points of cryptocurrency implementation. By analyzing empirical data through the exhibit we will be able to reach the findings necessary to conclude our thesis in the following section. Furthermore, the analysis and discussion will be divided into three different concepts: Payment implementation, Foreign exchange risk, and Smart contracts.

5.1 Cryptocurrency implementation in Tesla

5.1.1 Tesla - Payment implementation

Through our data, we found Tesla to have implemented two forms of cryptocurrency payment methods. Firstly, Tesla was seen to have implemented Bitcoin as a payment alternative for their EVs, followed by the ability to use Dogecoin in combination with Tesla charging stations. Our exhibit created in *Figure 9* outlines the reduction in transaction costs as well as foreign exchange-related risks as expected benefits of implementing cryptocurrency as a payment method. Despite having ultimately dropped the use of Bitcoin due to environmental concerns regarding the Bitcoin protocol, we can still attempt to analyze the seen benefits from Tesla's limited implementation of Bitcoin.

When comparing the prior method of payment for a Tesla EV, credit cards, to the introduced Bitcoin payment alternative, we can first look at the inherent costs associated with the transaction's facilitation. As presented above, the average fee for merchants using credit cards is ~2%, whereas the average Bitcoin transaction fee since its inception has been 0.000071 BTC (~$2.08 in May 2022). When comparing the two payment methods, we see Bitcoin being less suited for low-price transactions due to the transaction fee being independent and not tied proportionately to the total transaction amount. Credit cards' 2% fee would, therefore, be more suited for low-price transactions due to the proportion-based fee structure. This, however, changes when dealing with larger transactions such as when purchasing a car, where the 2% credit card fee significantly outweighs the fee of the Bitcoin network. For these

reasons, Tesla would have subsequently seen higher returns on their vehicles for customers using the Bitcoin payment method.

Our literature review and observations also highlighted the long-drawn settlement time of international bank transfers. The time it takes for bank transfers to settle implies that Tesla is unable to use its funds. On the other hand, Bitcoin, as mentioned above, typically sees transactions settle between 10 to 20 minutes enabling Tesla to instantly take ownership and utilize the money. The reduced settlement time along with the irreversibility of Bitcoin transactions would enable Tesla to significantly improve its account receivable turnover, as payments made through cryptocurrency are final and do not present the risks of credit defaults.

5.1.2 Tesla - Foreign Exchange and Investment

In our exhibit, i.e. *Figure 9*, it is displayed how financial investments are considered beneficial in terms of both risk reduction and cost reduction. This explains why cryptocurrencies can be used as an extensive part of a companies' financial investments, by ultimately being used for hedging purposes and portfolio diversification. As a multinational company, Tesla is involved in various international markets that do not transact in US dollars. The company is therefore periodically constrained to convert their foreign currency into their home country's fiat currency. Tesla has chosen to implement cryptocurrencies to be used as payment methods, while simultaneously using it and viewing it as a financial investment. At the same time this implementation potentially offers Tesla possibility to reduce the impact of volatility in the exchange market occuring due to longer settlement times where prices might change before transactions are completed.

International companies are typically faced with having to involve third parties to facilitate its transactions, limiting control of the transaction-making process. Before the settlement procedure is fully completed, it is common for fees to be charged by the financial third parties responsible for enforcing the transactions. These differences are caused by changes in the currency price. All in all, the currency translation process is ineffective because it involves a multitude of external agents that act first in their own interest and is time consuming, thus resulting in higher costs and risks for international companies.

Tesla is handling both a complex supplier network providing its spare parts from all across the globe as well as selling its products in a large number of distinct markets. Hence, the company needs to deal in other currencies for purchasing their supplies, at the same time as consumers use and pay with their domestic currencies, which leads to a large number of currency conversions. This results in an extremely high number of transactions which the company has to deal with on a regular basis, especially for the business to customer part where the company chose to distribute its products without using car dealerships. Tesla is thus subjected to lots of transaction fees and currency conversions which would increase the business transactionary costs.

Consequences of such an international transactionary environment are that costs become remarkably difficult to predict and can turn out to be overwhelming enough to put a company's financial position at risk. To manage the risk of not being able to pay its short-term liabilities, Tesla has implemented cryptocurrencies as a versatile type of investment for diversification purposes. As portrayed in *Figure 9* it can be deducted that the company is using this form of investment for hedging purposes. To sum up, the overall intended outcome is to use cryptocurrencies primarily as a long-term investment asset while having the possibility to liquidate on a short-notice to cover for potential inconsistencies in liability variations such as the ones related to transaction costs and foreign exchange.

Additionally, Tesla favors investing a part of its operating cash flow in digital assets as opposed to holding them in fiat currency. As depicted in *Figure 9,* the investment in cryptocurrency entails lower transaction costs and it also brings with it the probability of increasing their value as an asset without liquidation limitations. Hence the company can capitalize using a part of its cash flow for investment purposes while incurring lower transaction costs when and if the need to liquidate comes. All things considered, by holding a part of their operating cash in cryptocurrencies, Tesla could potentially decrease the negative impact on its revenue costs associated with foreign exchange and third party transactions. The aforementioned can be achieved by owning assets with a chance of increasing their value over short periods of time and which are easy to liquidate.

On the other hand, Tesla also takes a risk by holding a part of what should be their operational cash flow in cryptocurrencies as a form of investment. Since this asset's price can highly fluctuate over a short period of time, it could have a negative impact on the company's financial position if need may be to liquidate the asset on a short-notice. Therefore, if Tesla would find itself in a challenging position because of transaction costs and unpredicted foreign exchanges rate and has to liquidate cryptocurrencies whose price dropped, it might not be able to pay its liabilities. Moreover, as emphasized in our literature review, not only may this affect the current financial position of the company but it may also halt its position in the market from a strategic competitiveness stand. In practice, this would mean that the company could miss out on other strategic investments that could enhance its growth and competitiveness as well as it would endanger its relationship trust by not being able to meet its obligations on time.

5.2 Cryptocurrency implementation in Share&Charge

5.2.1 Share&Charge - Payment implementation

At Share&Charge we see the implementation of the stablecoin, DAI, as the primary payment method for their international and open EV charging network, using their internally developed E-Mobility wallet and the EW chain to facilitate transactions. Viewing our exhibit displayed in *Figure 9*, we expected to see lower transaction costs as well as opportunities for risk reduction when implementing cryptocurrencies as payment methods.

Share&Charge's use of the EW chain allows for transactions to cost a fraction of a cent, whereas traditional credit card settlement fees are ~2% of the principle. The minimal costs of transacting using cryptocurrencies see them being more suitable for an industry such as an open charging network where individuals are perceived to transact and interact with the service multiple times a day. For these reasons, the need for reduced costs is paramount for high transaction volume services as traditional payment method fees would render these services more expensive and/or less profitable due to costs being passed on to consumers. The reduction in overall transaction fees could therefore be passed on as a general cost reduction to consumers.

As Share&Charge operates within various European markets with different native currencies from Share&Charge's home country, Germany, conversions are needed to transform their foreign revenue into Euros. Using traditional means of payment, customers would either have the opportunity to pay in their home currency, leaving Share&Charge with the need to convert, or have their bank convert their native currency into the target currency and pay the subsequent fee. Either way, conversion fees through the bank and foreign exchange would be unavoidable for both Share&Charge and their customers, negatively impacting the cost of the transaction, and translating into a roaming fee for the user. As presented in the literature review, the use of cryptocurrencies as an exchange mediator between two currencies could prove less costly than using the traditional foreign exchange. Customers' purchase of DAI using their native currency to pay for the charging service, only for Share&Charge to subsequently sell DAI for Euros, would, according to the presented research, potentially be cheaper than using the foreign exchange. The use of a universal currency across all markets could also be viewed as a risk-reducing act, seeing that the potential risk of arbitrage from holding various forms of foreign currency could subsequently hurt competitiveness and real revenue. The same applies to non-stablecoin cryptocurrencies, whose prices, as presented in the literature review can be extremely volatile.

Settlement times from the implementation of cryptocurrencies were also seen to be a major benefiting characteristic of the technology. While the literature explained how traditional cross-border transactions through the SWIFT system take 3 to 5 banking days to complete, transactions on the EW chain take only 5.3 seconds for blocks to settle. The faster settlement time is another form of reduced transaction costs for Share&Charge, seeing that they can utilize their DAI immediately to convert and invest as well as take advantage of potential USD vs EUR arbitrage. Similarly, the reduction in settlement time allows for stronger financial positioning as instant on-hand funds make it possible to pay creditors and suppliers on time.

5.2.2 Smart Contract Implications for Share&Charge

The exhibit created from the literature review section can easily be applied to the case of Share&Charge, in particular, due to their usage of smart contracts. In the empirical observations section, it was found that Share&Charge is creating an Open Charging Network heavily built upon the technology of blockchain, the technology that allows for the creation

of smart contracts. A smart contract is, as discussed earlier, a contract built on blockchain which allows for two parties to enter a contract without relying on a third party, creating a risk- and cost reduction for both parties. The purpose of Share&Charge's Open Charging Network is for everyone to be allowed to use and benefit from the same network when charging electric vehicles, as well as to reduce the costs of charging an electric vehicle, both for consumers and the business providing the service.

By implementing smart contracts, settlement times, as well as currency conversion fees, would be excluded, and a transaction cost reduction would occur. This coincides with the targets of Share&Charge to reduce transaction costs for charging electric vehicles, as the ability to conduct direct contracts and payments would reduce costs for the consumers and reduce settlement times for the business. Which provides evidence of smart contracts offering a potential transactionary cost benefit to businesses implementing cryptocurrency.

Furthermore, *Figure 9* concludes that smart contract implementation offers a risk reduction for businesses, through a reduction of agency costs. The implementation of smart contracts means that a business does not benefit from an agent to conduct business anymore as the smart contract itself offers a direct way of following and fulfilling an agreement or contract. The smart contract consists of pre-defined requirements and terms that have to be agreed upon beforehand and then fulfilled to receive the outcomes of the contract. Transacting members would, therefore, not risk interpretational disputes of agreements. Furthermore, the smart contract implementation offers an exclusion of the risk of not getting paid due to the auto-enforceable nature of the contracts. When applying this knowledge to the empirical data found from Share&Charge it is visible that the arguments presented in literature regarding a smart contract implementation coincide with the goals that Share&Charge has for their service and business as a whole. In addition to their purpose of reducing transaction costs for businesses and consumers, Share&Charge also opt for excluding all agents in their business transactions for efficiency purposes, an aim more easily achieved through the use of agentless smart contracts.

There could, however, also be possible downside or risk associated with the implementation of smart contracts, specifically related to the need for cryptocurrency to be the transactional token of the contract. As discussed earlier, cryptocurrency prices are extremely volatile. This would result in contracts pre-established to pay a certain amount of non-stablecoin cryptocurrency, to drastically change in value relative to its fiat counterpart during the span until the contract is fulfilled.

Moreover, Share&Charge does not specify an expected baseline transaction cost from not having implemented smart contracts, thereby, making it difficult to conclude through statistical means whether smart contracts truly reduced transaction costs. However, the

reasoning behind smart contract implementation, following its technical aspects, points toward real possible transaction- and agency cost reductions for a business. By relying on the literature claims together with Share&Charge's discussion and implementation of smart contracts, smart contracts should decrease transaction costs for a business implementing them.

5.6 Summary of Findings

	Payments	Foreign Exchange & Investment	Smart Contract
Potential Benefits	● Lower transaction costs than banking alternatives ● Significantly faster settlement times	● Increased company ownership control over transaction costs ● Limit external agents' impact on financial stability ● Lower cost from using some cryptocurrencies as foreign exchange mediator	● A cost reduction in the form of exclusion of fees from using a middleman ● Shorter settlement times ● Reduces potential disputes interpretations of terms of an agreement ● Reduces the risk of not getting paid
Potential Downsides	● Price volatility of non-stablecoin cryptocurrencies	● Increased insolvency risk ● Decreased company trust ● Competitiveness threat	● Price volatility of non-stablecoin cryptocurrencies ● Higher costs than expected ● Lower funds received than expected
Inconclusive	● General cost of implementation might not be feasible for small businesses	● DAI being a cheaper exchange mediator	● The cost of setting up smart contracts in comparison to setting up a traditional contract

Figure 10, Our findings from the analysis and discussion.

5.6.1 Payments

Our findings show that the implementation of cryptocurrencies as a payment solution can under certain circumstances be less costly for businesses than utilizing traditional banking and credit card services. For instance, Share&Charge's use of the EW ensures that fees for each individual transaction amount to less than a tenth of a cent, whereas credit card service providers typically charge merchants ~2%. These significantly lower fees provide businesses with a much cheaper solution for both high volume and high-value transactions. From our research, we can also deduce Tesla to have achieved lower transaction costs from their implementation of Bitcoin. Despite the Bitcoin network fee on average being significantly larger (~$2.08 in May 2022) than that of the EW Chain, this would still be a cheaper option than the ~2% credit card merchant fee on an ordinarily priced automobile.

Faster settlement times were also witnessed from having implemented cryptocurrencies. Share&Charge's use of the EW chain sees a settlement time of roughly 5 seconds, whereas Bitcoin transactions seen implemented by Tesla typically settle between 10-60 minutes. Comparing this to the typical 3 to 5 banking days of SWIFT payments, the significantly faster settlement time could aid in reducing businesses' opportunity costs of not having access to its funds. The fast settlement, combined with the irreversible nature of cryptocurrency protocols such as Bitcoin, was also highlighted to potentially aid firms in improving their account receivable turnover, as cryptocurrency payments do not present the risk of credit defaults and instead emulate the functions of debit.

On the other hand, our findings failed to account for the implementation and maintenance costs of creating proprietary wallets and payment gateways in order to allow customers to pay using cryptocurrencies. The costs of Share&Charge's E-mobility Wallet and Tesla's direct payment gateway were both not quantified in our study and are, therefore, difficult to definitively state as being cheaper alternatives or estimate a return on investment.

Lastly, our observations found that cryptocurrency poses a large volatility risk for non-stablecoin implementations. Tesla's implementation of Bitcoin has during its time on their balance sheet in February 2021 swung drastically from its all-time high of ~USD 69,000 to, at the time of writing, its price of ~USD 29,000. These fluctuations, as seen in *Figure 6*, could occur in as little time as it takes for a Bitcoin transaction to settle (10-60 minutes). Therefore, firms accepting Bitcoin would be subject to the risks of arbitrage which could leave them with less fiat value once the transaction has settled than when the transaction was first made. For these reasons, our study shows the usage of stablecoins as the option in which firms can achieve the benefits of implementing cryptocurrency as a payment method (displayed in *Figure 10*) while avoiding the downsides of volatility associated with non-stablecoin cryptocurrencies.

5.6.2 Foreign Exchange & Investment

Companies transacting at an international level are faced with a multitude of agency-impacted risks with one of the largest being foreign exchange risk. By eliminating the

use of financial intermediaries and switching from transacting in foreign currencies to transacting in cryptocurrencies, businesses could gain several benefits. Cryptocurrency implementers could potentially increase their level of control over the outcome of the transacting process by replacing the foreign exchange practice with a straightforward conversion of digital assets. In such a way businesses are not subjected to the foreign currency price volatility which can be affected by other stakeholders such as governments and central banks.

Moreover, cryptocurrencies have the potential to reduce the transaction cost risk associated with currency conversion by eliminating external agents' impact on the currency translation process. As a result, making it easier for companies to plan the impact of their transaction costs on their operations and in some cases financial investments. Similarly, cryptocurrency could allow businesses to systematically provide equal transaction costs and uniform treatment of their customers and suppliers across their entire intricate global supply chains. Hence, using cryptocurrencies as an exchange mediator could lower businesses' overall transaction costs.

Contrastingly, if the value of a firm's cryptocurrency investment shrinks, its ability to cover financial obligations might be hampered. In addition, such a scenario could affect the trust and credit score of the company. Suppliers may become wary of conducting business in fear of not getting paid, while financial stakeholders may downgrade their credit ranking and become cautious when funding. Consequently, this may weaken a business' position on a competitive market. Moreover, as explained in the literature review, cash flow volatility can hinder companies from financing strategic investments which could result in a negative effect on their market position and competitiveness. With certain investment opportunities being time-limited, companies might be more reluctant to go into certain investments when part of their cash flow is held in highly price volatile cryptocurrencies.

Lastly, although the speed of the settlement does play an important role for an exchange mediator to avoid arbitrage, it is not clear whether or not DAI would be able to act as a cheaper exchange mediator compared to using the foreign exchange. Despite other cryptocurrencies displaying the ability to act as cheaper exchange mediators as seen in *Figure 8*, our paper does not clearly show that specific stablecoins such as DAI are able to achieve similar beneficiary results. Therefore, it is merely an assumption that DAI could be a cheaper exchange mediator based on the similarities in characteristics with other cryptocurrencies which showed promising results.

5.6.3 Smart Contract

The implementation of smart contracts seems to present several potential benefits for businesses according to our analysis of the literature and the case of Share&Charge. As presented in *Figure 10*, our findings consist of five different potential benefits for a business deciding to implement cryptocurrency and using the functions of smart contracts. All the transactionary cost benefits found are related to the reduction in transaction costs and agency

costs, all of which are to some extent acquired due to the exclusion of a middleman. This exclusion can lead to either direct cost reductions, or to cost reduction in the form of time.

In addition to the potential benefits, *Figure 10* also presents the potential downsides of smart contract usage for businesses. This potential downside is the volatility of cryptocurrencies, something that could impact the payment amount for a deal using smart contracts. Since the funds received might be of less fiat value than initially established, or larger than expected. Another potential downside that our findings have found to be inconclusive is the cost of establishing a smart contract in comparison to the cost of establishing a traditional contract. This would be vital to fully assess and conclude the true cost of implementing smart contracts and whether they indeed are cheaper than the traditional alternatives.

6 Conclusion

6.1 Conclusion of Research Question

When developing this thesis we came up with and reached the purpose of presenting the phenomenon of cryptocurrency and its implementation in businesses. The thesis targeted to address the gap found in the research conducted by Ante (2020). The author found only 12% of cryptocurrency literature to address the applicability of blockchain and cryptocurrencies, a gap that led to the formation of our research question: *What potential benefits does the implementation of cryptocurrency have for businesses?*.

After a thorough investigation of cryptocurrency relevant literature and businesses' cryptocurrency implementation and its effects on transactionary costs, we have been able to conclude our research question. We found that the potential transactionary cost benefits are connected to transaction costs as well as agency costs. The adoption of cryptocurrency for a business would potentially reduce transaction costs as it excludes fees from middlemen, by offering the ability to conduct direct contracts and payments which reduces the costs connected to longer settlement times. The adoption of cryptocurrency for a business could potentially reduce agency costs by the exclusion of middlemen, reducing the risk of misalignment of goals between such parties. These cost reductions could be seen as potentially offering a business the ability to form a competitive advantage, pursuing a low-cost strategy that would see them out-compete competitors based on price.

6.2 Aim and Objectives

One essential aspect of this thesis was to investigate the functionalities of cryptocurrencies and their potential implementation into businesses. Therefore, this thesis narrowed down the general phenomena of cryptocurrencies and its potential functionality for businesses, namely cryptocurrencies impact on transactionary costs. The thesis achieved this by investigating key elements in the company's payment settlements and currency translation processes, as well as agency impact, particularly on the contractual settlements.

Furthermore, the role and use of cryptocurrencies, as well as how it can be achieved from a technological standpoint, was investigated. From here, an appreciation of the role of transaction costs and external agents in international businesses started to become outlined. Using the readers' initial preparation on the clues they need to look after for understanding cryptocurrencies' functionality and technology, the paper has, then, addressed the gap in technical knowledge of these cryptocurrencies.

The technology used by cryptocurrencies allows for instant transactions and it does not require any mediation party involvement. Similarly, cryptocurrency payments cannot be reversed, leaving no room for interpretation after transactions have been settled. Already after meeting the first goal of bringing forward knowledge about cryptocurrency technology and functionality, elements of the other goal, i.e. the business utility of cryptocurrencies, start to become apparent. A highly automated payment system such as cryptocurrencies would tremendously reduce the amount of intermediaries and hence the level of ambiguity that companies encounter when transacting. Finally, a lot of the agency issues are removed at the same time in which companies' transaction cost planning and preparedness becomes more effective.

To display the potential impact on the business level, two use cases have been selected from businesses having implemented cryptocurrency. Thereupon, we were able to carry out our aim of displaying how implementing cryptocurrencies could benefit companies' through for example payment settlements. By reducing the intermediaries and therefore the time and the amount charged in fees, payment settlements could be more efficiently conducted using cryptocurrencies. Furthermore, we have also seen there to be a potential advantage for businesses to use cryptocurrency investments for hedging against foreign exchange risks, however without clear guarantees.

In conclusion, the paper did achieve its objectives of shedding light on potential benefits of cryptocurrencies at the business level. Likewise, the thesis used archetype economic theories such as transaction cost theory and agency theory to show where in a business cryptocurrencies may be applied as well as exemplify how it can be done to the extent possible.

6.3 Practical Implications

The potential for businesses to adopt cryptocurrencies into their operations has throughout this thesis shown to provide businesses with the ability to reduce various forms of transactionary costs. Our thesis has explored the underlying functions and concepts of cryptocurrency while elaborating on the implications of seen implementations in businesses. The technological and foundational understandings of blockchain and cryptocurrency presented throughout this thesis were found to be vital to understanding the proposed benefits of their implementation. The thesis's in-depth cryptocurrency literature research could, therefore, aid in educating business decision-makers on cryptocurrency's technological

principles by providing a more holistic view than what could otherwise be obtained through legacy media.

In addition, the thesis has provided evidence for the implementation of cryptocurrency technology as being both a faster and cheaper method of transacting in comparison to traditional credit card and bank transfer options. This research could encourage a firm's strategic decision-makers to pursue and research the potential benefits of implementing cryptocurrency as a payment method, moreover, justifying a comparison between a firm's transaction costs and those presented by Share&Charge and their usage of the EW Chain.

Lastly, our thesis set out to achieve more practical findings more relevant to businesses as previous literature has emphasized the study of cryptocurrency as it relates to the functions of fiat currency, often neglecting the technology's specific use case and benefits for businesses. Our research focuses on the practical applicability of cryptocurrency, providing evidence that it reduces both transaction costs and agency costs. These findings are perceived to contribute to opposing the general stigma and often politicized cryptocurrency debate, often seen as a threat to local economies.

6.4 Future Research

The field of cryptocurrency would benefit from seeing our findings statistically and quantitatively researched to further examine this thesis' hinted benefits, based on the coverage of pre-existing literature and current business cases. Future research should continue to investigate businesses implementing cryptocurrency. Further insight into businesses' measurable reduction in transactionary costs, would in combination with the literature, create a more thorough conclusion of the expected implications of cryptocurrency implementation suggested in this thesis.

The area of safety and risk for particular cryptocurrency blockchains and networks are, unbeknown to the authors, of utmost importance when dealing with financial assets and securities. Further research on the safety and independent audits of particular stablecoins would be needed due to their reliance on users' trust in the centralized organizations managing the collateral backing of its tokens. Future research investigating the associated risk score based on company-like audits of the most prominent stablecoins would in effect provide businesses with safer alternatives to choose from in their cryptocurrency implementation. If a cryptocurrency network is deemed not to be safe or risk-reducing as it was intended, this could cause the potential benefits to be outweighed by the potential costs of its implementation.

Furthermore, future research into how businesses could use cryptocurrency as part of their strategy would be needed for the future of business. Businesses need to seek new ways of remaining competitive and creating a competitive advantage over the market participants. Future research might be able to answer if cryptocurrency can provide a competitive

advantage for a business, something that we can not conclude from our thesis due to the lack of real quantifiable results.

In addition, another topic of interest for future research is the fee charged to merchants of cryptocurrency payment providers. While this thesis only looked at the costs associated with traditional payment service providers of credit and debit cards, the implementation of third-party payment service providers for cryptocurrencies and their subsequent fees were not compared. These options in retrospect are also assumed to be the most logical and cheapest form of implementation for smaller businesses that do not have the resources or capabilities of setting up direct payment software such as Share&Charge and Tesla.

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