

A Work Project, presented as part of the requirements for the Award of a Masters Degree in International Management from the *Faculdade de Economia da Universidade Nova de Lisboa*

THE EFFECT OF CRYPTOCURRENCIES ON THE GERMAN PAYMENTS ECOSYSTEM:
A CRITICAL ANALYSIS OF ITS FUTURE DISRUPTION POTENTIAL

Joel Tecle (33382)

A project carried out in the Master in International Management Program,
with the supervision of Professor Vasco Santos

04-01-2020

Abstract

Purpose and Methodology We examine the disruption potential of cryptocurrencies on Germany's payments ecosystem. A literature review is performed to characterize the novel technology as well as the German payments ecosystem. A consumer survey and expert interviews are also performed in order to gauge the views of potential users as well as those of the industry.

Findings Cryptocurrencies are showed not to be a passing phenomenon in Germany. Rather, they will eventually disrupt the payments ecosystem. However, cryptocurrencies are not yet at a stage that would allow them to become a widely used payment means. The hindering issues underlying this conclusion are pinpointed.

Keywords Blockchain, Cryptocurrency, Disruption, German Payment Ecosystem

Acknowledgments

I would like to express my deepest appreciation to my advisor Professor Vasco Santos. Despite the difficult times in which we find ourselves in, he showed tremendous enthusiasm and outstanding support during the process. In the numerous discussions, he encouraged me to question the status quo and thus significantly contributed to the development of the thesis. Consequently, without his advice and help, the thesis would not have been possible.

Last but not least, I would like to thank my family who actively supported and has always believed in me.

This work used infrastructure and resources funded by Fundação para a Ciência e a Tecnologia (UID/ECO/00124/2013, UID/ECO/00124/2019 and Social Sciences DataLab, Project 22209), POR Lisboa (LISBOA-01-0145-FEDER-007722 and Social Sciences DataLab, Project 22209) and POR Norte (Social Sciences DataLab, Project 22209).

Table of Contents

- 1 | Introduction 1**
- 2 | Blockchain Technology: Purpose..... 2**
- 3 | Blockchain Technology at a Glance..... 3**
 - 3.1 | The Example of Bitcoin..... 3**
 - 3.2 | Challenges of the Blockchain Technology 5**
- 4 | The Rise of Cryptocurrencies 6**
 - 4.1 | Cryptocurrencies Landscape: Status Quo 6**
 - 4.2 | Cryptocurrencies Challenges 8**
- 5 | Cryptocurrencies: A Future Payments’ Method? 9**
- 6 | The Payments Ecosystem in Germany 10**
 - 6.1 | Market Overview 11**
 - 6.2 | Usage of Cryptocurrencies 12**
 - 6.3 | Legal Environment 13**
- 7 | Methodology 13**
- 8 | Analysis and Findings 15**
 - 8.1 | Consumers Survey 15**
 - 8.2 | Experts Interviews 20**
- 9 | Conclusion..... 24**
- References 26
- Appendices 30

List of Abbreviations

BaFin	Bundesanstalt für Finanzdienstleistungsaufsicht
BTC	Bitcoin
E.G.	Exempli Gratia
ETH	Ethereum
EU	European Union

List of Tables

TABLE 1: Average daily number of payment transactions	7
---	---

List of Figures

FIGURE 1: The Blockchain	5
FIGURE 2: Cryptocurrency market capitalization.....	7

1 | Introduction

DEVELOPED ECONOMIES are evolving towards a cashless payments system: fewer and fewer transactions are settled in cash. Contactless debit and credit cards are examples of technologies underlying this trend.

Cryptocurrencies are a novel addition to this trend; one may argue that they are on the rise. However, the general public's enthusiasm for cryptocurrencies ebbs and flows. Publicized stories in the Media involving their use for criminal purposes create ill feeling, as do stories of fraud (Yermack, 2013). Monetary authorities are concerned about the loss of control once cryptocurrencies become widely used (Schultze, 2019). One thus wonders whether the blockchain technology underlying cryptocurrencies will become a significant part of a cashless payment ecosystem.

Opinions on this question *are* divided. Some studies expect a future without cash while arguing that cryptocurrencies will not play a major role in it. One argument to this effect is that the daily exchange rate fluctuations of cryptocurrencies *vis-à-vis* traditional currencies make them a faulty store of value, entailing too much (exchange rate) risk. Others argue, on the other hand, that their decentralized architecture in relation to reserve currencies (notably, the dollar) or a country's domestic currency can propel cryptocurrencies to success.¹

This leads to our research questions: (i) *Are cryptocurrencies able to gain a significant market share in the payments market in Germany?* (ii) *Or, to the contrary, are cryptocurrencies merely a hyped but ultimately niche phenomenon in Germany?*

We wish to determine whether German citizens are open towards new payment methods, in general, and cryptocurrencies in particular. Will Germans increasingly adopt

¹ The fact that cryptocurrencies are not controlled by a central authority—for instance, a central bank—was a key objective underlying the creation of the blockchain technology and remains a highly-prized feature (Joo et al., 2019).

cryptocurrencies as means of payment, or will they insist on holding and paying with cash (or other, more traditional payment instruments)?

We limit the scope of this study to Germany for several reasons: (i) the topic is intensely discussed there; (ii) the federal government has recently published a regulatory framework for cryptocurrencies, which makes it clear that authorities forecast their enhanced importance.

Methodologically, we will try to gauge the public's predisposition to use cryptocurrencies by conducting a survey. In addition, interviews will be conducted with experts that are working with cryptocurrencies in order to gauge how suppliers of goods and services rate the prospects of this new technology. This will allow us to assess the prospects of cryptocurrencies in Germany from both sides of prospective transactions.

2 | Blockchain Technology: Purpose

The blockchain concept was devised in 2008 with the purpose of creating “A Peer-to-Peer Electronic Cash System” by an individual under the pseudonym Satoshi Nakamoto. The identity of this person has remained unknown to the present day (Farell, 2015). According to Nakamoto (2008), doing business on the internet implies relying on financial intermediaries that process payments. The key role they play is based *inter alia* on the trust placed on them by the transacting parties. Despite the trust-based system performing well, inherent deficiencies remain. For example, transaction costs make small transactions uneconomic. In addition, intermediaries used to collect as much information as possible to control transaction costs (Nakamoto, 2008). Thus, by replacing trust with cryptographical proof, Nakamoto strived to build a system that renders third parties redundant. The new system would result in low transaction costs, high transaction speed, and pseudo-anonymity (Farell, 2015).² Nakamoto was not the first to pursue the creation of digital money: there were predecessors

² Pseudo-anonymity occurs when a transaction is ascribed (and is thus traceable) to an account address, though not (or not immediately) to an individual's identity. However, once the individual's identity is uncovered and revealed, all transactions can be retraced (Singh, Heulot, and Ben Hamida, 2018).

that had failed before. However, Nakamoto was the only one who managed to eliminate the danger of double-spending (Andersen, 2016).³

3 | Blockchain Technology at a Glance

3.1 | The Example of Bitcoin

Blockchain is primarily known as the technology underlying Bitcoin (henceforth BTC), consisting of a public ledger that makes all transactions visible (Swan, 2015). The blockchain contains the payment history of all transactions done with BTC (Lemieux, 2016). The database is distributed across thousands of computers, henceforth called nodes, dispersed worldwide and is publicly available (The Economist, 2015). To showcase the functionalities of a blockchain, our analysis is divided into three parts: verification of sender, transaction validation and updating of the public ledger.

In order to verify the identity of a sender, blockchain makes use of digital signatures, which are a type of asymmetric cryptography. Each user is provided with a pair of keys, also known as digital signatures, namely a private and a public one, to authenticate transactions (Lemieux, 2016). The public key is comparable to a bank account number, whereas a private key is akin to the password of a bank account (PWC, 2018). Importantly for what follows, they are inextricably linked.

To initiate a payment, the sender secures the transaction with a digital signature that uses its private key and sends its public key to the receiver (Sabry, Kaittan, and Majeed, 2019). The receiver uses the public key of the sender to decrypt the digital signature in order to verify the identity of the sender. A decryption is only possible as long as the public and private keys do indeed form a pair. Through this method, the sender can be verified to be the legitimate owner of the transferred amount. (Crosby, 2016).⁴

³ Double-spending, consisting of the idea of spending money twice, is a main issue of digital currencies which can easily be copied unless properly functioning security systems prevent it (Pérez-Solà et al., 2019).

⁴ See Appendix 1.

Nakamoto's primary goal is the validation of transactions without reliance on third parties. How is this goal put into practice? The decentralized transmission of data is processed via a peer-to-peer network. A peer-to-peer network is characterized by a heterogeneous constellation of nodes that share their resources, such as processing power or storage capacity to provide a service offered by the network without the need for a central authority (Schollmeier, 2002). The main issue is that nodes do not trust each other. As such, they must verify information on their own. To solve this issue, each node keeps a duplicate of the blockchain. This procedure permits the validation of the transaction without nodes trusting each other (Tapsell, Akram, and Markantonakis, 2018). To be specific, each transaction is broadcast to the network of nodes (Sabry, Kaittan, and Majeed, 2019). The nodes then collect the broadcasts of the transactions in a chain of blocks,⁵ which receive a timestamp and hash value (Lemieux, 2016).⁶ According to Nakamoto (2008) a timestamp is necessary to authenticate the occurrence of the transaction at the given time and to prevent double-spending. Each timestamp is connected to the timestamp of a previous transaction in its hash, which leads to a chronological sequence, the blockchain (Nakamoto, 2008). The concatenation of the individual blocks makes it very difficult for a potential hacker to manipulate a past block. The hacker would also have to change all following blocks since the hash values would then be inconsistent, which would require an enormous amount of computing power and is thus an unappealing operation (Yermack, 2017).⁷ Figure 1 depicts how a blockchain operates.

⁵ A block contains all transaction details as illustrated in Figure 1.

⁶ A hash is a function that turns an input of numbers and letters into an encoded output with a fixed length. The output is called hash value. (Frankenfield, 2020).

⁷ See Appendix 2.

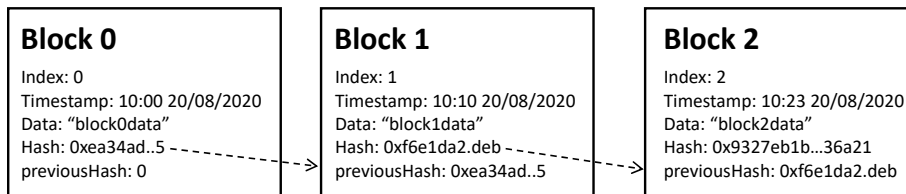


FIGURE 1: The Blockchain

Source: own illustration based on Ashok (2018).

However, there is still a challenge to be met. In theory, nodes could propose unverified transactions as a subsequent block in the chain. To decide which block to include next, the nodes must solve a mathematical problem, also known as proof-of-work. Nodes need to invest sufficient computing resources in order to provide a solution to the problem. The first node with the solution sends this result to the network, whereupon it is reviewed. Once the network has agreed on the result, the block is attached to the chain and the node receives an incentive in the form of a BTC amount (Crosby, 2016). False claims will thus be costly to submit (since they involve computing a solution to a problem), while ultimately they will be rejected, entailing a net loss.

3.2 | Challenges of the Blockchain Technology

Although the blockchain technology entails several benefits, it also faces several challenges.

The nature of the technology and its rising popularity create a scalability problem. The technology can handle about seven transactions per second, which is far from matching the pace at which transactions take place in the real world. Furthermore, low-volume transactions (entailing low fees) are processed more slowly as nodes prioritize transactions involving high volume (since these entail higher fees). This leads to decreased speed since high-volume transactions require more computing work. Thus, these issues make scaling up a difficult task (Wang et al., 2018).

Another challenge arises from high energy consumption. A real-time ledger requires significant consumption of power to ensure full functionality (Golosova and Romanovs, 2018). According to the Cambridge Bitcoin Electricity Consumption Index (2020), the

ecosystem requires 66.39 terawatt-hours per annum, which exceeds the total consumption of, for instance, Switzerland, Greece or Israel. The high energy consumption is caused by nodes needing to solve mathematical problems in order to validate transactions (Golosova and Romanovs, 2018).

Anonymity is a paramount goal of the blockchain system. However, as discussed earlier, the anonymity protection offered by the blockchain is limited. Besides the fact that transactions can be retraced to public keys, Juhász et al. (2018) have developed a mathematical model to map public keys to IP addresses. To sum up, the blockchain technology is facing significant challenges for which solutions must be found.

4 | The Rise of Cryptocurrencies

4.1 | Cryptocurrencies Landscape: Status Quo

The global economy is heavily dependent on the US dollar. By allowing transactions to be carried out without dependence on the US dollar, cryptocurrencies may change the balance of power in international trade, foreign relations and diplomacy (Katalyse.io, 2018). Currently, several hundred cryptocurrencies exist with significant market shares, and several thousand cryptocurrencies have existed at some point. Most cryptocurrencies are similar to BTC in terms of their characteristics, involving minor adaptations (e.g. currency supply, block time). These cryptocurrencies are also known as “altcoins” (Hileman and Rauchs, 2017).

The market capitalization shown in Figure 2 is an estimator of the size of the cryptocurrency industry. The market capitalization was not far from US\$ 350 billion in August 2020. By the end of 2017, the industry had reached its peak with a market capitalization of US\$ 800 billion. This peak was induced by the so-called “crypto-mania” (Huber and Sornette, 2020). This boom was followed by a decline in market capitalization. Figure 2 further demonstrates the dominance of BTC, which holds more than half of the market capitalization throughout the years.

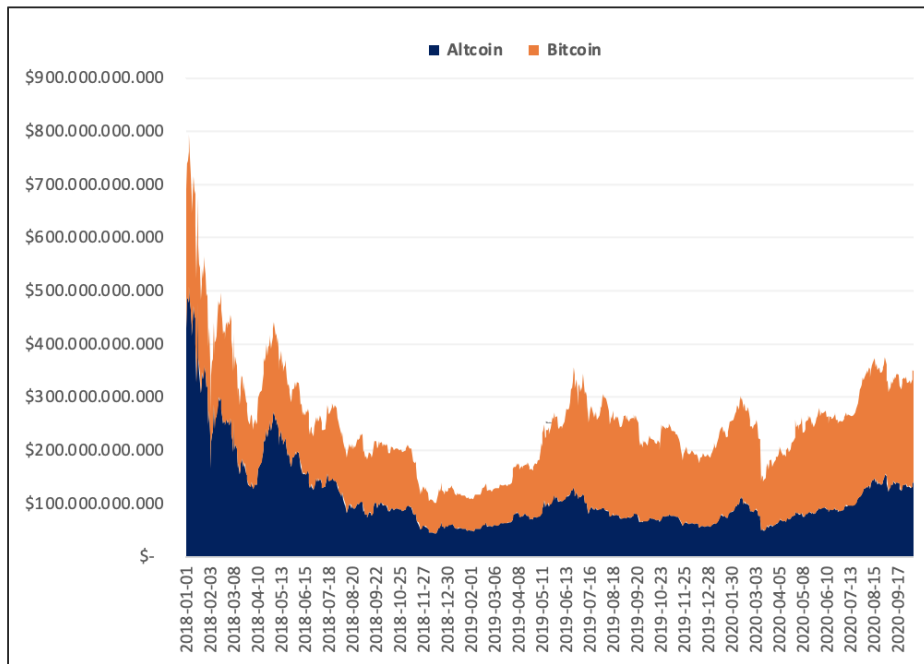


FIGURE 2: Cryptocurrency market capitalization

Source: own illustration sourced from Coin Dance (2020).

However, other cryptocurrencies increasingly challenge BTC’s historical dominance, such as ETH (Hileman and Rauchs, 2017), which has become the second-largest cryptocurrency in recent years with a market capitalization of US\$ 42 billion, followed by Tether and Ripple. A look at the average number of daily transactions (Table 1) depicts a different scenario. Ripple registers on average over one million daily transactions, followed by ETH and, at a large distance, BTC and Tether.

	Ripple	Ethereum	Bitcoin	Tether
Q4 2019	1591825	598660	284993	17485
Q1 2020	1010555	662945	310449	11491
Q2 2020	940782	874031	299790	9411
Q3 2020	1089001	1149174	327010	6186

TABLE 1: Average daily number of payment transactions

Source: own illustration sourced from CoinMetrics (2020).

Despite the rising popularity of other cryptocurrencies, BTC is used by the vast majority of wallets, payment service providers and exchanges (Hileman and Rauchs, 2017).

4.2 | Cryptocurrencies Challenges

A number of challenges need to be overcome to enhance the adoption of cryptocurrencies as a method of payment. Many of these challenges are linked, as already discussed, to the underlying technology. However, there are also legal, economic and social factors that affect the adoption of cryptocurrencies. We discuss three of them next.

Regulation Provisions have a vital role in balancing informational asymmetries and critical externalities. When the market is prone to potential deficiencies, regulation can help to improve acceptability (Gurguc and Knottenbelt, 2018). Furthermore, cryptocurrencies cannot develop into an alternative, widely used payment method as long as the regulatory framework does not allow it (Laboure and Reid, 2020). Germany has already started to develop such a framework, which is discussed in section 6.3 in more detail.

Payment Ecosystem As of now, cryptocurrencies are barely adopted by merchants. To accelerate the adoption process and emerge as a globally relevant payment method, partnerships with key mobile payment apps, card providers and retailers need to be established (Laboure and Reid, 2020). The first step in this direction has recently been taken with the integration of cryptocurrencies into PayPal's ecosystem. With the attempt "to increase consumer understanding and adoption of cryptocurrency" PayPal offers the opportunity to buy, hold and sell selected cryptocurrencies (PayPal, 2020).

Volatility Price instability can also be a major limitation to cryptocurrencies becoming a widely accepted payment method. Using a cryptocurrency as a means of payment also implies holding it, at least for a while. Insofar as this is the case, a cryptocurrency also becomes a store of value. The high volatility of cryptocurrencies negatively affects a cryptocurrency's performance as a store of value, thus limiting its use as a payment means. The creation of

“stablecoins” is currently addressing the volatility problem. Stablecoins, such as Tether, are backed by reserve assets to ensure constant value (Gurguc and Knottenbelt, 2018).

5 | Cryptocurrencies: A Future Payments Method?

The question of whether cryptocurrencies represent a suitable payment method of the future remains open and must be discussed. We narrow the discussion down to BTC.

The technology behind BTC, namely the blockchain, bypasses relevant transaction hurdles associated with traditional payment systems, which potentially increases savings for merchants and consumers (Leal, 2014). Given the intense criticisms regarding credit and debit cards, that charge high fees, BTC presents an inexpensive alternative that fuels price competition with those more traditional payment methods (Anderson, 2012). The example of Coinbase highlights significant price differences compared to traditional payment providers.⁸ Incoming payments up to US\$ 1 million per merchant per annum are charged 0%, and 1% if this limit is exceeded (Böhme et al., 2015). Currently, the merchant discount rate charged by traditional payment providers ranges from 2% to 3% (Leal, 2014). This results in a significant competitive advantage for BTC that could accelerate its adoption. Also, according to Leal (2014), savings up to US\$ 150 billion in retail point of sale and US\$ 12 billion in e-commerce fees per annum can be potentially realized.⁹

However, focusing solely on fees is misleading as further costs can arise at different stages in the process. For instance, one has to consider conversion costs of 1% for merchants who wish to convert BTC into fiat currency. The estimated savings may decrease over time as potential regulatory and other operational costs arise and are forwarded to merchants. Beyond the potential increase in costs, BTC faces the challenge of achieving critical mass: merchants

⁸ Coinbase is a digital trading platform for buying, selling, transferring and storing cryptocurrencies (Coinbase, 2020).

⁹ See Appendix 3.

will not accept BTC unless a sufficient mass of consumers demands to use it when effecting transactions.

To answer the question of the potential of BTC as a suitable payment method, the consumers' perspective must also be taken into consideration. Today, consumers pay a money transfer fee amounting to 10% of the total amount transferred (on average). These fees cover network access, agent commission and FX conversion fees. By bypassing traditional payment providers, BTC can reduce these fees to 1%. Based on the World Bank's estimate of global money transfers, US\$ 43 billion can potentially be saved by consumers (Leal, 2014). A further important factor is transaction speed: payments via a BTC network are still too slow for in-person retail payments (Böhme et al., 2015).

To put it in a nutshell, the greatest challenge for BTC will be whether the cost advantage will be maintained. The traditional payment providers will most likely respond to competition by reducing profit margins (Leal, 2014). Nevertheless, BTC has established itself as a relevant competitor in the payments market, which creates a new dynamic and sets new standards.

6 | The Payments Ecosystem in Germany

6.1 | Market Overview

Germany is particularly known for its strong preference for cash. In 2017, cash accounted for 74% of all transactions. Regular payments, such as those at restaurants, bars and cafes, are mostly done in cash. Yet, there is also a rising use of debit cards. Debit cards currently account for 19% of transactions, entailing an increase of four percentage points from 2014. 57% of all cardholders use their card more than once a week, also entailing a significant increase over 2014. Above 1% of overall turnover was recorded for contactless card payments. Institutions feel the need to issue contactless *Girocards* as their use continues to gain momentum (Deutsche Bundesbank, 2018). According to this study, over 88% of the German population values the opportunity to pay in cash and wants to retain it in the future,

which shows a high level of satisfaction with traditional payment means. Nevertheless, the high growth rates recorded by innovative payment methods such as contactless cards suggest a coming change, which may also extend to cryptocurrencies. The young in particular are open to new payment methods. 15% of the respondents are willing to hold their account with internet providers (for instance N26), rather than using traditional banks. In summary, it can be ascertained that Germans still prefer cash, but are becoming increasingly open to alternatives.

Did COVID-19 change the payments behavior in Germany? The long-term impact of the pandemic on payments is not yet clear. Payment service providers state that customers use debit cards more frequently compared to March '20. On the other hand, strict regulations lead to store closures, which in turn led to decreased use of card payments. While non-food businesses had to close in March '20, food businesses were allowed to remain open. Multiple studies indicate that between 25% and 50% of Germans are using cards more often than cash since March '20 in order to reduce the infection risk. This trend is observed across all ages, being particularly observed in the middle aged.

Perhaps unsurprisingly, contactless payments gained ground during the pandemic. Contactless payments accounted for 50% of debit card payments by the end of March '20, an increase of 15% over December 2019. In sum, the pandemic further marginalized cash as a payment means. The development of contactless payments has been accelerated by the pandemic. However, its growth rate is expected to slow down once the health crisis is over (Mai, 2020).

6.2 | Usage of Cryptocurrencies

The use of cryptocurrencies in Germany is hard to determine since no central authority controls or monitors this payment method. According to Bitcoin Deutschland AG approximately 0.5 million up to 1 million German citizens use cryptocurrencies as a payment

method, for investing or for some other purpose. Of those who use cryptocurrencies, the majority opt for BTC, which illustrates the importance of this particular cryptocurrency: estimates indicate that 50% of the amount allocated to cryptocurrencies by Germans involves BTC, while the remaining applications are divided among a multiplicity of other cryptocurrencies. Nevertheless, a rising interest in other types of cryptocurrencies, namely altcoins, can be observed among Germans. Yet, their high volatility and low market capitalization (see Figure 2) remain a challenge.

Regarding the use of cryptocurrencies as a means of payment in Germany, the available data on transactions is as follows: 25% of German users of a cryptocurrency utilize it as a means of payment (Deutscher Bundestag, 2018). According to Hungerland et al. (2017), the usage of cryptocurrencies as a means of payment is proving to be difficult in Germany because BTC is hardly accepted by merchants. Although the city of Berlin is well known for being the “Bitcoin capital” of Europe, only 44 stores accept BTC, followed by Hamburg (13 stores) (as of April 24, 2017). In addition, all the stores involved supply niche products, making it impossible to meet everyday needs by paying with BTC. The infrastructure necessary for widespread adoption is therefore not yet in place.

6.3 | Legal Environment

Germany is a leader in the EU regarding the regulation of cryptocurrencies. Early on, in 2013, BaFin legally classified BTC in the German Banking Act.¹⁰ It defined BTC as a unit of account and thus classified it as a financial instrument. Furthermore, it allowed the use of BTC for conducting barter transactions. Nevertheless, from BaFin’s viewpoint, BTC is not a legal tender and neither is it regarded as e-money, since no issuer or central authority manages the currency. This legal classification applies to all cryptocurrencies regardless of the underlying software or encryption technology (BaFin, 2020).

¹⁰ BaFin is the regulator charged with supervising the German financial system.

To deal with the increasing relevance of the blockchain and its applications, such as cryptocurrencies, the German government has issued a national blockchain strategy in September 2019. Among other things, the strategy describes how crypto assets and stable coins can be regulated in the future. It thus seeks to provide legal certainty, which in turn aims to create dynamics in the blockchain area for startups, investors, industrial companies, and the public sector. The strategy asserts, for instance, that “traditional” crypto assets—such as BTC and ETH—are allowed and legitimate for institutional trades, whereas private stable coins like Libra will most likely be prohibited. The German government’s strategy seems to be based on the objective of hindering developments that can potentially develop into a serious alternative to the euro. According to the German government, this could be the case of private stable coins, such as Libra, which are therefore not incentivized (Sandner and Groß, 2019). At the end of 2019, the first measures of the national blockchain strategy were enshrined into law.

To sum up, one can conclude that Germany welcomes cryptocurrencies and the underlying technology by making efforts to create a solid legal framework. However, if cryptocurrencies become a relevant alternative to the euro, the German federal government could change its position, as its attitude regarding, for instance, Libra makes plain.

7 | Methodology

The empirical analysis relies on a consumer survey as well as on expert interviews. The consumer survey encompasses 26 questions and was offered through Qualtrics.¹¹ LinkedIn and Instagram were used to advertise the survey. In addition, acquaintances and relatives were informed of its existence via direct messages. 318 responses were recorded, of which 259 are complete. Since the research question is focused on Germany, the pool of participants was further reduced to 195 German respondents.

¹¹ See Appendix 7.

The sample is biased in terms of gender and age. Males represent 67% of the final sample, a ratio that differs significantly from the German population's gender partition.¹² Moreover, most respondents are young: 59% are 18 to 25 years old and 31% are 26 to 35 years old. On the other hand, the overrepresentation of younger generations has the advantage of better capturing the viewpoint of those that are most likely to be affected by the expanding use of cryptocurrencies.

Approximately 57% of respondents earn less than EUR 19.999. 48% have a bachelor's degree, followed by 28% who earned a master's degree. The experts' interviews consisted of multiple questions divided in 7 clusters.¹³ They were conducted and recorded in German and translated into English afterwards. In total three different interviews were scheduled with experts who have in-depth knowledge of cryptocurrencies and the blockchain technology. The first interviewee is a business development manager who is working for a payment provider. This company is focused on providing solutions for micropayments resulting from transactions carried out on the internet. He further runs a blog dedicated to sharing knowledge about cryptocurrencies. The second interviewee works for a railway company. He is manager and spokesperson on all topics related to blockchain. The German company is a large competitor in the railway industry focused on passenger and freight transportation. In light of the increasing relevance of the blockchain technology, the railways operator is continuously seeking application opportunities within the firm. The third interview partner is Ralph Bärligea, a business advisor at a consulting firm that leads blockchain projects. His firm specializes in advising banks on IT topics. Ralph Bärligea is further involved in different workgroups related to the subject at hand, and also shares his knowledge with the German parliament. The first two interviewees were anonymized for confidentiality reasons.

¹² The German population is composed of 50% females and 50% males (Statista, 2020).

¹³ See Appendix 4.

8 | Analysis and Findings

8.1 | Consumers Survey

The overwhelming majority of the surveyed (96%) has heard of cryptocurrencies or BTC at least once. There is not a notable difference between the two genders regarding this aspect. One can therefore comfortably assume that both have a similar degree of exposure to cryptocurrencies.

Although most respondents have heard of cryptocurrencies, 84% of them feel unfamiliar with the subject. Only 3% feel familiar with the topic, while 13% feel neither familiar nor unfamiliar. The reasons for these observations might be lack of knowledge or, alternatively, rare use of cryptocurrencies, or even both with the former causing the latter. The conclusion is nevertheless clear: cryptocurrencies are known to exist but are not well understood.

Regarding the currently preferred means-of-payment method, the majority selected the debit card (57%), followed by cash and credit card, both attaining almost 20%. Germany is known for its strong preference for cash payments, a fact already discussed in Chapter 6.1. However, Mai (2020) points out that the Covid-19 pandemic may have attenuated this preference for paying cash. If this change in preferences proves permanent—a fact that we cannot yet gauge since the pandemic is still ongoing at the time of writing—cryptocurrencies might benefit from it since they are digitally implemented and used, thus eschewing physical contact between transacting parties. Interestingly enough, the preference for payment methods differs across gender. While 71% of female respondents opt for debit cards, only 50% of male respondents do. The implications of this discrepancy for the success of cryptocurrencies as a means of payment in Germany are not immediately apparent.

Almost 77% of respondents do not use cryptocurrencies for payment purposes and will not do so in future. Three reasons stand out for this: lack of knowledge (35%), preference for familiar payment methods (18%), and low acceptance by merchants (14%). This suggests that

further information regarding cryptocurrencies and their use, as well as increased merchant acceptance are required for cryptocurrencies to become increasingly used. In plain words, an ecosystem does not yet exist.

14% of respondents do not use cryptocurrencies but are willing to do so in future. The reasons given for being willing to try them in future are diverse: out of curiosity (34%), fast transaction processing (21%), identity protection (21%). We infer that these characteristics of cryptocurrencies are valued by (at the time of asking) a minority of Germans, and for varied reasons. The minority (6%) who used cryptocurrencies as a means of payment in the past is particularly driven by curiosity and low transaction fees. All this suggests that cryptocurrencies are still little known and fairly ill understood by a minority who are somehow interested (or at least alert) to their use.

The majority of respondents do not own cryptocurrencies (63%). The main reason for this is once again lack of knowledge (38%) and lack of need for them (19%). Particular important in this respect is also the volatile and risky character of cryptocurrencies. Indeed, public opinion in Germany is quite alert to the wide fluctuations observed in their value in the past.

However, 23% of our respondents who do not own cryptocurrencies, nevertheless plan to buy them in future. They regard cryptocurrencies as an investment asset or would like to own them out of curiosity. Very few want to buy commodities with them (8%). Those who currently own cryptocurrencies (15%), do so mainly because they regard them as an investment asset (35%), or as a store of value (30%). This is quite remarkable since cryptocurrencies are perceived as being volatile. Moreover, this finding is corroborated by two respondents who, when queried about the reason for their ownership of cryptocurrencies, offered the following answer: “*Speculation*”.

The answers described up to now suggest that the use of cryptocurrencies as a payment method do not figure prominently in German respondents’ minds. However, another

perspective arises out of the remaining responses. Almost 63% of respondents characterize cryptocurrencies as a suitable means of payment, with female and male respondents expressing exactly the same viewpoint (63% for both genders). Opinions are even more explicit when it comes to digital money and volatility. The vast majority sees cryptocurrencies as digital money (97%) with an unstable value (94%).

51% of respondents regard cryptocurrencies as a useful asset to invest in. A minority (7%), however, already perceives them as an improvement over currently available means of payment. Interestingly, males hold this view (8%) much more than females (4%).

25% of respondents hold the view that the future of cryptocurrencies will be driven by their importance as an investment vehicle. Interestingly, 26% of respondents expect cryptocurrencies to face stronger regulation in the future. The blockchain strategy recently published by the German government may have reinforced this impression, with stricter regulations having been proposed. 27% of respondents view cryptocurrencies as becoming an important means of payment. This result is particularly interesting since (in question 4 of the survey) the vast majority does not plan to make payments with cryptocurrencies in the foreseeable future. The factors that hinder their use as means of payment, therefore, gather an added acuity.

Trust is a critical success factor when it comes to paying for transactions. According to 90% of respondents, a large network of merchants with acceptance points would strengthen trust in cryptocurrencies. Furthermore, according to 84% of respondents, less volatility is needed to gain the trust of users.

Somewhat surprisingly, respondents believe that the confidence of users would increase significantly if the operators were to be publicly known. While Satoshi Nakamoto, the inventor of BTC, remains anonymous until today, the company and inventor behind ETH,

Vitalik Buterin, is publicly known. This suggests that full disclosure of operators is not always ensured, an issue that regulation may easily address.

Somewhat surprisingly, stronger regulation is not an overly strong enhancer of trust. Though 55% of respondents think so, 45% do not hold this view. Regulation is therefore not a particularly effective trust-building measure.

The COVID-19 outbreak has little impact on respondents' perceptions of cryptocurrencies, as stated by 93% of respondents. Some interesting evidence arose from those respondents whose perception has changed: *"They become more relevant as my trust for paying with cards/online banking/the governments decreases"*, *"Privacy has become more important"*, *"Covid did not affect the cryptocurrencies as drastically as real currencies"*, *"Unstable value of the currency"*. The answers indicate decreased trust in fiat currencies as a result of the pandemic, a fact that favors cryptocurrencies. In fact, BTC did not suffer any loss of value during the pandemic. On the contrary, BTC has even reached its all-time high of approximately US\$ 34,500 according to CoinMarketCap (2020).

The main reasons advanced by respondents for not using cryptocurrencies themselves as a means of payment is lack of knowledge (25%), followed by low acceptance by merchants (20%), and high volatility (17%). The least important factor is the presence of a robust regulatory stance (10%). When questioned about her or his perception of which factors might induce the German population as a whole to refrain from using cryptocurrencies as a means of payment, similar results were obtained. Our respondents believe that the main hindering factors are once again lack of knowledge (21%), followed by security concerns (19%), and low acceptance by merchants (16%). All this strengthens the conclusion that specific measures addressing these issues must be taken in order to accelerate the adoption of cryptocurrencies.

Finally, respondents were queried about whether they would accept to use cryptocurrencies for several types of transactions. 63% would pay for online transactions with cryptocurrencies. 15% of respondents would willingly receive the proceeds from the sale of a commodity in cryptocurrencies. However, hardly any respondent (1%) would want to have her or his salary paid in cryptocurrencies.

To sum up, the overwhelming majority of German citizens are currently critical regarding the use of cryptocurrencies and do not want to use them as a means of payment. Reasons for this are mainly their volatility, the low number of merchants that accept it, and especially the lack of knowledge about the technology. COVID-19 and the accompanying upswing of digital payments have not dramatically altered this perspective. So far, German perceive cryptocurrencies mostly as an investment opportunity. On the other hand, the survey shows that cryptocurrencies are considered as a suitable payment method. Most respondents deem cryptocurrencies an important payment method in the future, with only a few believing that cryptocurrencies are but a hyped novelty.

8.2 | Experts Interviews

Expert interviews were conducted on specific topics of cryptocurrencies.¹⁴ Not only are these valuable in their own right, but they can also be compared with the public's view gathered from the consumers' survey.

Money Character According to the business advisor Ralph Bärligea, cryptocurrencies theoretically fulfill all the main characteristics of money, but “*empirically, however, not yet*”. For instance, the store of value property is not yet present, but it might potentially be achieved in the long run if volatility is eliminated. Another expert, a business development manager, states that cryptocurrencies meet all characteristics of money, but not all to the same extent. He justifies this viewpoint by stating that “*money is established over a long period of time*

¹⁴ See Appendix 6.

and not in a short time". According to another expert, a portfolio manager, all three attributes of money are fulfilled by cryptocurrencies. He states that "*You can calculate with it, use it as store of value and exchange it*". The public also tends to agree with the experts' opinion. 94% of respondents perceive cryptocurrencies as digital money, which suggests that they attribute the characteristics of conventional money to cryptocurrencies. One thus concludes that, at least notionally, Germans take cryptocurrencies as fulfilling the functions of money.

Sustainability No consistent opinion among the experts is discernable regarding this topic. The business advisor expects that the technology underlying cryptocurrencies, i.e., the concept of blockchain, will be well established in the future. He comments that "*The technology will almost certainly become a fundamental part of the financial system (...)*". Regarding the future of cryptocurrencies as a payment method, however, he is noncommittal since he holds the view that competition will ultimately determine the answer to this question. The business development manager has a clear position: he states that cryptocurrencies "*will definitely not fade away*". Nevertheless, he further holds a nuanced opinion. He forecasts a successful implementation of cryptocurrencies for large transactions but is unsure if they will take root as a primary means of payment. A contrary opinion is held by the portfolio manager, who considers the use of cryptocurrencies as a means of payment as a "*hyped novelty since there is no difference between paying with credit card or with cryptocurrencies*". All things considered, one must conclude that it is unclear whether cryptocurrencies will endure as a payment method.

Customers' Acceptance According to the business advisor, cryptocurrencies will reach critical mass as a means of payment within the next five years, as long as the underlying technology is deemed legal and thus operates on a par with other, more established payment technologies. This opinion is shared by the business development manager, who predicts a quick establishment of cryptocurrencies in cross-border payments. He points out that the

“stable coin market capitalization is already exploding due to cross-border payments”. Nevertheless, he remains doubtful regarding the acceptance of cryptocurrencies as point-of-sale payment systems. The portfolio manager also believes that cryptocurrencies will soon become an established means of payment. According to him, PayPal’s announcement that it will integrate cryptocurrencies into its ecosystem will accelerate customers’ acceptance. In summary, experts confidently share the same opinion: they expect widespread customers’ acceptance of cryptocurrencies within the next five years. This is somewhat surprising, in view of their response to the previous issue, namely their doubts regarding the public’s acceptance of cryptocurrencies as a means of payment.

Adoption Push According to the business advisor, news that induce a signaling effect, such as banks offering custody services and broad network effects will increase trust in cryptocurrencies. The business development manager is in line with his opinion. He is convinced that news with a signaling effect create trust, which is exemplified by the *“purchase of Bitcoins by large companies such as MicroStrategy”*.¹⁵ He also believes that broad merchants’ acceptance is required. However, both experts agree that benefits must be mutual, i.e., merchants and shoppers must gain from the use of cryptocurrencies. The portfolio manager emphasizes the need for education and underscores the need for the reputation of cryptocurrencies to improve. Furthermore, he adds, banks should not be allowed to sell cryptocurrencies in order to prevent the public from equating cryptocurrencies with shares. To sum up, one can conclude that, in particular, news with a signaling effect create trust and accelerate the adoption of cryptocurrencies as a payment method.

Barriers to Adoption To fully understand what unleashes the adoption of cryptocurrencies as a means of payment, experts were asked about potential barriers. Here, all experts agreed

¹⁵ MicroStrategy is a business intelligence company that bought 21.454 BTC at a purchase price of US\$ 250 million as part of its capital allocation strategy (Business Wire, 2020).

when they identified lack of knowledge as a barrier to adoption. This is also supported by the results of the survey: the majority of respondents recognize it as such.

There is also unanimity among the experts in what concerns (uncertainty surrounding) regulation. The business advisor sees “*strong regulations*” as critical, while the business development manager views lack of “*regulation*” in general as a barrier. Finally, the portfolio manager also considers the uncertain legal situation to be an obstacle to adoption.

Contrasting views arise with regard to the role of (poor) reputation. The business advisor sees bad reputation as a barrier to adoption, which he illustrates with the example of Mt. Gox.¹⁶ He nevertheless adds that “*bad reputation is mostly unfounded, because in this case the fault lies with the operators, not with the technology*”. The other experts, however, do not consider bad reputation as a significant factor limiting the uptake of cryptocurrencies as a means of payment by the general population. To sum up, it is clear that lack of knowledge prevents adoption, while the uncertain legal situation and lack of regulatory protections are likely to prevent adoption. In this regard, the experts also view low network effects and the inconsistent positioning of the ECB as hindering adoption.

Technology Usability Here we wish to understand whether technological conditions exist to successfully use cryptocurrencies as a means of payment. According to the business advisor, the conditions are already in place as “*several wallet providers exist that everyone can use*”, and “*there are stock exchange places (for instance Bison), in which one can buy cryptocurrencies*”. However, he regards the private keys as a security issue, because in case of loss, the deposit is also lost. This opinion is also supported by the business development manager. According to his perspective, the requirements for using wallets or making payments via QR codes are already in place, which help solve the technological issue.

¹⁶ Mt. Gox was an online trading platform for cryptocurrencies, which went bankrupt. Customer deposits worth millions of dollars in BTC disappeared (Goldstein and Tabuchi, 2014).

Interestingly, he also points out that the handling of private keys needs to be optimized, thus fully agreeing with the business advisor. A contrary position is held by the portfolio manager, who does not think that the technological requirements are already fully in place. He considers keys, wallets, and stock exchanges as vulnerable to potential hacking attempts and highlights that *“differently than with a bank, if the money disappears, there are no possibilities to undo it since there is no governance structure”*.¹⁷ In trying to summarize these viewpoints, one can conclude that technological requirements for the use of cryptocurrencies are currently already met in Germany, though with the proviso that work must be done to deal with private keys’ shortcomings and the possibility of losses arising from mishandled payment orders.

Legal Environment The business advisor was personally involved in shaping the German law and (perhaps unsurprisingly) views the current state of affairs as very positive. He describes the legal situation in Germany as *“leading in Europe”*. As examples, he quotes *“the licensing process for providing custody service is clearly regulated”* and *“it is also officially regulated that assets can be launched on a blockchain in tokenized form”*. Moreover, he does not see the need for further regulation. The business development manager agrees with this viewpoint, adding that the German government is *not* hostile to cryptocurrencies. In fact, he adds that *“good laws are on the way in the area of security tokens and crypto custody”*. He also does not identify any *“pain points”* that would necessitate further regulation. A not entirely similar opinion is held by the portfolio manager. He feels that the current legal situation is weak, *“as there is no clear line from the government”* adding that *“the German government has tried to formulate a blockchain strategy, but it has not yet been implemented”*. He further states that clear regulation is needed because cryptocurrencies are

¹⁷ This obviously is an undesirable consequence of the decentralized nature inbuilt by design on the blockchain technology.

perceived as speculative objects. At the same time, overregulation is not recommendable to avoid encumbering the innovation drive. One may conclude that the experts' viewpoint is that the legal environment is friendly towards cryptocurrencies and largely supportive, though some perhaps minor issues may need addressing.

Experts believe that cryptocurrencies will be accepted as a means of payment by the general public within the next few years. Concerning the sustainability of this novel instrument, however, positions remain divided. It therefore remains to be seen whether cryptocurrencies can prove their worth as a means of payment in the long term. According to the experts, the technological and legal framework conditions are by large in place for a successful development of cryptocurrencies as a means of payment in Germany. To encourage adoption, news with signaling effects are crucial in order to build customer trust. A broad network of merchants that accept cryptocurrencies as a payment method is also of the essence. Simultaneously, there is a need to invest in education and knowledge as these are also adoption barriers.

9 | Conclusion

Are cryptocurrencies able to gain a significant market share in the payments market? Or, to the contrary, are cryptocurrencies merely a hyped but ultimately niche phenomenon in Germany? These are the two questions that this paper addresses. The latter has a clear and sharp answer: No! Neither the German public, whose opinion was gauged by means of a consumer survey, nor the three experts interviewed expect so. We are thus sure that cryptocurrencies based on the blockchain technology are *not* a passing phenomenon in Germany.

Regarding the former question, the answer is more nuanced. *As things stand*, cryptocurrencies will not gain a significant market share in the German payments market. The majority of survey respondents have a somewhat critical (though not close-minded or

rejectionist) opinion of cryptocurrencies. Although experts believe that cryptocurrencies will achieve acceptance as a means of payment, they point out several aspects that may hinder (or even prevent) such a desideratum from occurring: the public's lack of knowledge, (need for further) regulation, security aspects as yet unresolved, and lack of point-of-sale acceptance by merchants are the major issues underlying this conclusion. Furthermore, the current development of the German central bank's digital currency may also make it harder for cryptocurrencies to gain market share as a means of payment.¹⁸ Finally, cryptocurrencies are currently perceived by the majority of our survey's respondents as an investment opportunity rather than as a means of payment, which again detracts from their popularity as a means of payment.

Our results are subject to limitations implied by the limited research resources available to us. The survey is not based on a perfect cross-section of the German population, a fact particularly evident in the age distribution. Limitations are also visible as far as the expert interviews are concerned. The number of experts interviewed is small. One may thus question whether the answers obtained reflect the opinion of the cryptocurrency industry in Germany.

Despite these caveats, nevertheless, our findings raise one crucial issue that, to our mind, future research (as well as those involved in exploiting the potential market opportunities offered by cryptocurrencies) *must* address: who should be made responsible for overcoming the deficiencies pointed out above? The central bank, the banking system, merchants or regulators?

¹⁸ “We define a central bank digital currency simply as an electronic, fiat liability of a central bank that can be used to settle payments or as a store of value. It is in essence electronic central bank, or ‘narrow’, money.” (Meaning et al., 2018).

References

Journal Articles

- Anderson, Ross.** 2012. “Risk and Privacy Implications of Consumer Payment Innovation in the Connected Age.” *Consumer Payment Innovation*, 99.
- Böhme, Rainer, Nicolas Christin, Benjamin Edelman and Tyler Moore.** 2015. “Bitcoin: Economics, Technology, and Governance.” *Journal of Economic Perspectives*, 29 (2): 213–238.
- Crosby, Michael.** 2016. “Blockchain Technology: Beyond Bitcoin.” *Applied Innovation Review*, 1(2): 8–18.
- Farell, Ryan.** 2015. “An Analysis of the Cryptocurrency Industry.” *Wharton Research Scholars*.
- Huber, Tobias and Didier Sornette.** 2020. “Boom, Bust, and Bitcoin: Bitcoin-Bubbles As Innovation Accelerators.” *Swiss Finance Institute Research Paper*, (20–41).
- Hileman, Garrick and Michel Rauchs.** 2017. "Global cryptocurrency benchmarking study." *Cambridge Centre for Alternative Finance*.
- Joo, Hashemi Mohammad, Yuka Nishikawa and Krishnan Dandapani.** 2019. “Cryptocurrency, a successful application of blockchain technology.” *Managerial Finance*, 46 (6), 715–733.
- Juhász, Péter L., József Stéger, Dániel Kondor, and Gábor Vattay.** 2018. “A Bayesian Approach to Identify Bitcoin Users.” *PLOS ONE*, 13 (12): 1–21.
- Laboure, Marion and Jim Reid.** 2020. ”The Future of Payments. Part III. Digital Currencies: the ultimate Hard Power Tool”. *Deutsche Bank Research*.
- Leal, Roman.** 2014. “Is Bitcoin the future of payments?” *Goldman Sachs Global Macro Research*. (21): 18–19.
- Lemieux, Victoria Louise.** 2016. “Trusting Records: Is Blockchain Technology the Answer?” *Records Management Journal*, 26 (2): 110–39.
- Mai, Heike.** 2020. “Paying in times of crisis – Coronavirus, cards, and cash”. *Deutsche Bank Research*.
- Nakamoto, Satoshi.** 2008. “Bitcoin: A Peer-to-Peer Electronic Cash System.”
- Pérez-Solà, Cristina, Sergi Delgado-Segura, Guillermo Navarro-Arribas, and Jordi Herrera-Joancomartí.** 2019. “Double-Spending Prevention for Bitcoin Zero-Confirmation Transactions.” *International Journal of Information Security*, 18 (4): 451–63.

Sabry, Sana Sabah, Nada Mahdi Kaittan, and Israa Majeed. 2019. “The Road to the Blockchain Technology: Concept and Types.” *Periodicals of Engineering and Natural Sciences*, 7 (4): 1821–32.

Sandner, Philipp and Jonas Groß. 2019. “Blockchain-Strategie: Ein wichtiger Schritt.“ *Wirtschaftsdienst*, 99 (11): 744–745.

Wang, Huaimin, Zibin Zheng, Shaoan Xie, Hong-Ning Dai and Xiangping Chen. 2018. “Blockchain challenges and opportunities: a survey.” *International Journal of Web and Grid Services*, 14 (4): 352–375.

Yermack, David. 2017. “Corporate Governance and Blockchains.” *Review of Finance*, 21(1): 7–31.

Working Papers/Conference Paper

Golosova, Julija, and Andrejs Romanovs. 2018 “The Advantages and Disadvantages of the Blockchain Technology.” *Electroning and Electrical Engineering (AIEEE)*, 1–6.

Meaning, Jack, Ben Dyson, James Barker and Emil Clayton. 2018. “Broadening narrow money: monetary policy with a central bank digital currency.” Staff Working Paper Bank of England, 724.

Singh, Kalpana, Nicolas Heulot, and Elyes Ben Hamida. 2018. “Towards Anonymous, Unlinkable, and Confidential Transactions in Blockchain.” *IEEE Confs on Internet of Things, Green Computing and Communications, Cyber, Physical and Social Computing, Smart Data, Blockchain, Computer and Information Technology, Congress on Cybermatics*, 1642–1649.

Schollmeier, Rüdiger. 2002. “A Definition of Peer-to-Peer Networking for the Classification of Peer-to-Peer Architectures and Applications.” *Proceedings of the First International Conference on Peer-to-Peer Computing*, 101–102.

Tapsell, James, Raja Naeem Akram, and Konstantinos Markantonakis. 2018. “An evaluation of the security of the Bitcoin Peer-to-Peer Network.” *IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data*, 1057–1062.

Yermack, David. 2013. “Is Bitcoin a Real Currency? An Economic Appraisal.” *National Bureau of Economic Research* (19747).

Books

Swan, Melanie. 2015. *Blockchain – Blueprint for a new economy*. Sebastopol: O’Reilly.

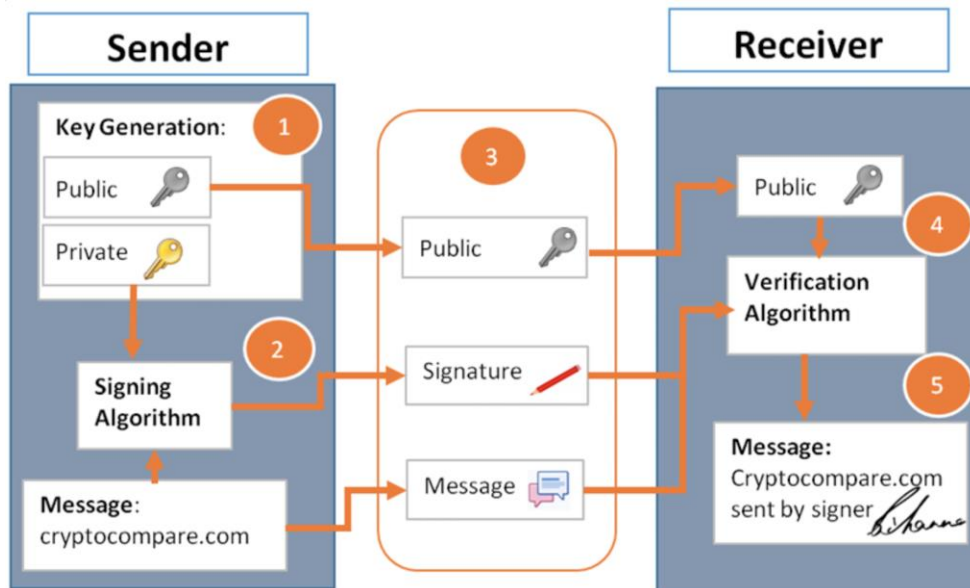
Internet Sources

- Andersen, Nicolai.** 2016. “Vorstellung der Blockchain-Technologie “Hallo, Welt!” *Deloitte*. <https://www2.deloitte.com/content/dam/Deloitte/de/Documents/Innovation/Vorstellung%20Oder%20Blockchain-Technologie.pdf> [accessed August 10, 2020].
- Ashok, Vishnu.** 2018. “Building a simple Blockchain using python.” *Medium*, January 01. <https://medium.com/@vishnuashok123/building-a-simple-blockchain-using-python-90d27ee50214> [accessed August 22, 2020].
- BaFin.** 2020. “Virtual Currency.” September 18. https://www.bafin.de/DE/Aufsicht/FinTech/VirtualCurrency/virtual_currency_node.html [accessed November 17, 2020].
- Business Wire.** 2020. “MicroStrategy Adopts Bitcoin as Primary Treasury Reserve Asset.” August 11. <https://www.businesswire.com/news/home/20200811005331/en/> [accessed December 10, 2020].
- Cambridge Bitcoin Electricity Consumption Index.** 2020. “Bitcoin network power.” <https://www.cbeci.org/> [accessed September 26, 2020].
- Coinbase.** 2020. “What is Coinbase?” <https://help.coinbase.com/en/coinbase/getting-started/general-crypto-education/what-is-coinbase> [accessed November 8, 2020].
- Coin Dance.** 2020. “Cryptocurrencies by Market Cap (historical) Summary.” <https://coin.dance/stats/marketcap/historical> [accessed October 10, 2020].
- CoinMarketCap.** 2020. “Bitcoin.” <https://coinmarketcap.com/currencies/bitcoin/> [accessed January 03, 2021].
- Coin Metrics.** 2020. “Network Charts.” <https://network-charts.coinmetrics.io/> [accessed October 10, 2020].
- CryptoCompare.** 2015. “How do digital signatures in Bitcoin work?” February, 12. <https://www.cryptocompare.com/wallets/guides/how-do-digital-signatures-in-bitcoin-work/> [accessed December 1, 2020].
- Deutsche Bundesbank.** 2018. “Payment behaviour in Germany in 2017.” February 2. <https://www.bundesbank.de/en/publications/reports/studies/payment-behaviour-in-germany-in-2017-737278> [accessed November 29, 2020].
- Deutscher Bundestag.** 2018. “Einzelfragen zur Regulierung und zur Nutzung von Kryptowährungen.” February 2. <https://www.bundestag.de/resource/blob/547154/f316613869fff44f54cd6eaaa053f1b7/wd-4-021-18-pdf-data.pdf> [accessed November 10, 2020].
- Elizabeth Schultze.** 2019. “Cryptocurrencies are ‘clearly shaking the system,’ IMF’s Lagarde says.” CNBC, 10. April. <https://www.cnbc.com/2019/04/11/cryptocurrencies-fintech-clearly-shaking-the-system-imfs-lagarde.html> [accessed November 3, 2020].

- Frankenfield, Jake.** 2020. “Hash.” *Investopedia*, June 30. <https://www.investopedia.com/terms/h/hash.asp#:~:text=A%20hash%20is%20a%20function,to%20blockchain%20management%20in%20cryptocurrency> [accessed August 21, 2020].
- Goldstein, Rachel Abrams Matthew Goldstein and Hiroko Tabuchi.** 2014. “Erosion of Faith Was Death Knell for Mt. Gox.” *New York Times*, February 28. <https://dealbook.nytimes.com/2014/02/28/mt-gox-files-for-bankruptcy/> [accessed December 29, 2020].
- Gurguc, Zeynep and William Knottenbelt.** 2018. “Cryptocurrencies: Overcoming barriers to trust and adoption.” *Imperial College London Consultant*, June 8. <https://www.imperial.ac.uk/media/imperial-college/research-centres-and-groups/ic3re/CRYPTOCURRENCIES--OVERCOMING-BARRIERS-TO-TRUST-AND-ADOPTION.pdf> [accessed October 29, 2020].
- Hungerland, Fabian, Dr. Jörn Quitzau, Jens Rotterdam, Hendrik Hüning, Prof. Dr. Henning Vöpel and Dr. Andre Wolf.** 2017. “Die Zukunft des Geldes – Das Geld der Zukunft.” *Berenberg and HWWI*. https://www.hwwi.org/fileadmin/hwwi/Publikationen/Partnerpublikationen/Berenberg/2017-06-02-Die_Zukunft_des_Geldes-Ansicht-Internet.pdf [accessed November 12, 2020].
- Katalyse.io.** 2018. “How Cryptocurrency is Disrupting the Global Economy.” *Medium*, January 10. <https://medium.com/the-mission/how-cryptocurrency-is-disrupting-the-global-economy-89347581aa93> [accessed October 10, 2020].
- Paypal.** 2020. “PayPal Launches New Service Enabling Users to Buy, Hold and Sell Cryptocurrency.” October 21. <https://newsroom.paypal-corp.com/2020-10-21-PayPal-Launches-New-Service-Enabling-Users-to-Buy-Hold-and-Sell-Cryptocurrency> [accessed October 31, 2020].
- PWC.** 2018. “Blockchain, a catalyst for new approaches in insurance.” <https://www.pwc.com/gx/en/insurance/assets/blockchain-a-catalyst.pdf> [accessed August 10, 2020].
- Statista.** 2020. “Population of Germany from 1990 to 2019, by gender.” June. <https://www.statista.com/statistics/454338/population-by-gender-germany/> [accessed December 13, 2020].
- The Economist.** 2015. “Blockchains - The great chain of being sure about things.” October 31. https://www.economist.com/briefing/2015/10/31/the-great-chain-of-being-sure-about-things?utm_source=pinterest&utm_medium=social [accessed August 5, 2020].

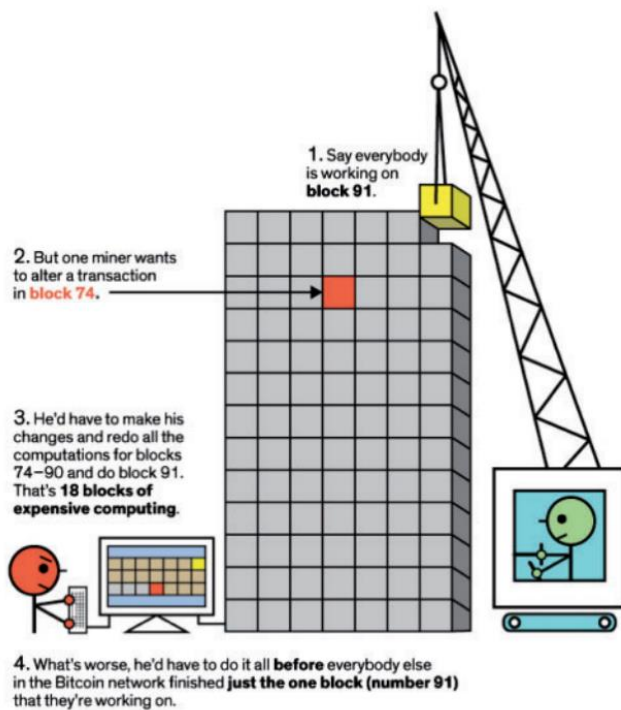
Appendices

Appendix 1: Bitcoin Transaction Process



Source: CryptoCompare (2015).

Appendix 2: Why You Can't Change a Blockchain



Source: Yermack (2017).

Appendix 3: Potential Annual Net Savings with Bitcoin based on 2013 Volumes

2013 Market Size (\$bn)	Retail	E-commerce	Remittances
Dollar volume by market	10,383	609	549
Prevailing average pricing	2.5%	2.9%	8.9%
Bitcoin pricing	1.0%	1.0%	1.0%
Prevailing transaction fees	259.6	17.8	48.9
Bitcoin transaction fees	103.8	6.1	5.5
Potential savings with Bitcoin (\$ bn)	155.7	11.8	43.4

Source: Leal (2014).

Appendix 4: Expert Interview Framework

EXPERT INTERVIEW FRAMEWORK: CRYPTOCURRENCIES AND THE GERMAN PAYMENTS ECOSYSTEM: SUCCESSFUL DISRUPTION OR HYPE?

Warm-Up

“Thank you for agreeing to talk to me today. I am conducting a research on cryptocurrencies and their effect on the German payment’s ecosystem. In what follows, there are no right or wrong answers and, of course, everything we talk about today is confidential. Do you mind if I record this interview? We’re going to cover different topics in the next 45 minutes. If you have any questions, please don’t hesitate to ask them at any time.”

Background Information

- Could you briefly introduce yourself and describe your responsibilities at [insert company name]?
- For how many years have you been dealing with the topic of cryptocurrencies?
- How does the emergence of cryptocurrencies affect your company?

Specific Questions

- Money has three main characteristics: (i) unit of account, (ii) store of value, and (iii) medium of exchange. In your opinion do cryptocurrencies in general, and Bitcoin in particular, meet any or all of these criteria? [*Money Character*]
- Do you perceive cryptocurrencies in general, and Bitcoin in particular, as innovative payment methods or just as a hyped novelty that will fade away? [*Sustainability*]
- Do you think *Germans* perceive cryptocurrencies in general, and Bitcoin in particular, as innovative payment methods or just as a hyped novelty that will fade away? [*Sustainability*]
- Will cryptocurrencies establish themselves as a means of payment in Germany by achieving a significant market share of all transactions carried out in the country? If so, will this happen in the next 5 years? If not, what would be a better basis/time to start their implementation, if any? [*Customers’ acceptance*]
- What must be done to achieve broad acceptance of cryptocurrencies by German customers as a means of payment? [*Customers’ acceptance*]
- In particular, what actions would increase Germans’ trust in cryptocurrencies? [*Adoption Push*]
- Would broad merchants’ acceptance of cryptocurrencies be enough to induce acceptance of cryptocurrencies by Germans? [*Adoption Push*]
- Does lack of knowledge about cryptocurrencies significantly hinder their adoption in Germany? [*Adoption barriers*]
- Does a (possibly existing) bad reputation of cryptocurrencies prevent their rise as a means of payment in Germany? [*Adoption barriers*]
- In general, which other factors and issues may prevent the uptake of cryptocurrencies by Germans as an important means of payment? [*Adoption barriers*]
- Are technological conditions already in place for the easy use of cryptocurrencies as a means of payment in Germany? [*Technology usability*]
- Are there security issues (real or perceived) associated with the use of cryptocurrencies? If so, to what extent do those limit their usability as a means of payment? [*Technology usability*]
- How do you assess the current regulatory environment regarding cryptocurrencies in Germany? [*Legal environment*]
- Should the German government further regulate cryptocurrencies? If so, why? If not, why? [*Legal environment*]

Wrap-up

“This brings us to the end of our interview. I would like to thank you for your time. Thank you once again.”

Appendix 5: Interview Cluster Analysis

Cluster	Interview Experts			Public Opinon
	Business Advisor	Business Dev. Manager	Portfolio Manager	
Money Character	Fulfill all the main characteristics; Empirically, however, not yet	Meets all characteristics, but not to the same extent	Is matching all characteristics	94% perceive cryptocurrencies as digital money (Q6)
Sustainability	Competition will decide, if cryptocurrencies will be accepted; Germans increasingly perceive it as a good thing	Not sure if it will establish as a primary means of payment; More success with large transactions	Are a hyped novelty since there is no difference between paying with credit card or with cryptocurrencies	27% think that they will become an important means of payment; 5.72% states that cryptocurrencies are hyped and will eventually disappear (Q8)
Customers Acceptance	Will reach critical mass within 5 years; underlying technology must be legally equal to other technologies	Payments for cross border transactions will establish; Classical Point of Sale systems will not become accepted; Education, and user-friendliness is important	Yes, it will establish as a means of payment within the next 5 years. At the latest after the news with PayPal broke out; Understanding must be promoted	27% think that they will become an important means of payment (Q8)
Adoption Push	News having signalling effect such as PayPal's integration; banks offering custody services; networks effects so that one can pay everywhere	Purchase of Bitcoins by large companies have strong signalling effect; broad merchants acceptance	Educational work is necessary, reputation must be improved; preventing banks to sell cryptocurrencies	n.a
Adoption Barriers	Lack of knowledge, bad reputation, low network effects, strong regulations	Lack of knowledge, regulation, bad reputation has no effect	Lack of knowledge, regulatory uncertainties, inconsisting position of ECB; bad reputation only slightly hinder rise	25% lack of knowledge; 20% low acceptance by merchants; 17% high volatility (Q12)
Technology Usability	Conditions are given; Wallet providers exist, stock exchanges offers cryptocurrencies; the decisive security gap is the safekeeping of the private key	Infrastructure is settled, network is working properly; Use of wallets left room for improvement	Not really, occasionally restaurant & bars offers ATM's; Keys, wallets, stock exchanges can be hacked	63% perceive cryptocurrencies as a suitable means of payment (Q6)
Legal Environment	Very positive perhaps even leading in Europe; no further regulations are necessary; law must be neutral with regards to technology and competiton	German government is not hostile towards the topic; no pain point which makes further regulation necessary at present	Weak, no clear line from the government; clear regulation in times in which cryptocurrency is seen as speculation object is recommended	n.a

Legend:

Aligned

Neutral

Contrary

Appendix 6: Expert Interviews

Interview: Business Advisor – Ralph Bärligea

THE EFFECT OF CRYPTOCURRENCIES ON THE GERMAN PAYMENT ECOSYSTEM: A CRITICAL ANALYSIS OF ITS FUTURE DISRUPTION POTENTIAL

EXPERT INTERVIEW WITH RALPH BÄRLIGE A

Date: 05.11.2020, 05:00 PM

Warm-Up

“Thank you for agreeing to talk to me today. I am conducting a research on cryptocurrencies and their effect on the German payment’s ecosystem. In what follows, there are no right or wrong answers and, of course, everything we talk about today is confidential. Do you mind if I record this interview? We’re going to cover different topics in the next 45 minutes. If you have any questions, please don’t hesitate to ask them at any time.”

Background Information

- Could you briefly introduce yourself and describe your responsibilities at Bearing Point?
 - I am a Business Advisor at BearingPoint with a focus on technical topics (cryptocurrencies, blockchain & payment transactions). Furthermore, I deal with topics related to data protection and information security
 - In addition, I am also involved in working groups that deal with issues such as: "How can we introduce the digital euro?"
- For how many years have you been dealing with the topic of cryptocurrencies?
 - For the first time in 2011/2012 as a research assistant in the German Bundestag, I have dealt with the topic professionally. This was triggered by the financial crisis and the euro rescue, which has also been a major concern for politicians.
- How does the emergence of cryptocurrencies affect your company?
 - The emerge of cryptocurrencies brought us to think about the technology and to bring the associated advantages closer to our customers, whenever possible. For example, a public project is implemented with the KfW Bank.
 - Questions with what the company deals are for instance:
 - How can programmable money be used?
 - How can we use cryptocurrencies efficiently in the capital market?

Specific Questions

- Money has three main characteristics: (i) unit of account, (ii) store of value, and (iii) medium of exchange. In your opinion do cryptocurrencies in general, and Bitcoin in particular, meet any or all of these criteria? [*Money Character*]
 - The main mission is to establish the function as a medium of exchange. The characteristics of the unit of account and store of value then result as a consequence of this.
 - Technical properties must be fulfilled so that money can fulfill its economic role, such as homogeneity (counterexample: diamond), durability, scarcity and divisibility.
 - In theory, cryptocurrencies fulfill all the main characteristics. Empirically, however, not yet:
 - Medium of exchange: you cannot pay everywhere, because the market capitalization is too low
 - Store of value: in the long run yes, but the fluctuations are still too volatile
 - Unit of account: yes, but only on marketplaces where cryptocurrencies are traded

- Do *you* perceive cryptocurrencies in general, and Bitcoin in particular, as innovative payment methods or just as a hyped novelty that will fade away? [**Sustainability**]
 - Cryptocurrencies or rather the underlying technology is an innovation. The technology will almost certainly become a fundamental part of the financial system. The security against manipulation and fast transferability without an intermediary make the difference, because previously both principles represented a "trade-off", which can now be combined. Therefore, the technology is not hype, the basic principle will prevail.
 - Whether cryptocurrencies will become generally accepted, however, I cannot make a statement, the competition will decide.
- Do you think *Germans* perceive cryptocurrencies in general, and Bitcoin in particular, as innovative payment methods or just as a hyped novelty that will fade away? [**Sustainability**]
 - Perception increases that cryptocurrencies can be a good thing among the population. Compared to other countries, German customers are less open-minded, but in Germany it is also on the rise and acceptance is also increasing at the political level, which can be seen in the example of the released blockchain strategy.
- Will cryptocurrencies establish themselves as a means of payment in Germany by achieving a significant market share of all transactions carried out in the country? If so, will this happen in the next 5 years? If not, what would be a better basis/time to start their implementation, if any? [**Customers' acceptance**]
 - Cryptocurrencies will establish themselves from my view within the next 5 years and reach a critical mass. The more people use it, the more valuable it becomes, it is also called a "network good". So far cryptocurrencies are used by 0,1% and 1% of the people, which are already inspired.
 - The advantages for the national economy are significant so that politicians have now also recognized that within the next 5 years at least a critical mass of 10% will be reached
- What must be done to achieve broad acceptance of cryptocurrencies by German customers as a means of payment? [**Customers' acceptance**]
 - The underlying technology must be legally equal to other technologies, i.e., there must be neither positive nor negative discrimination. Then the only thing that counts is whether the technology is convincing or not.
- In particular, what actions would increase Germans' trust in cryptocurrencies? [**Adoption Push**]
 - News having a signaling effect such as PayPal's integration of cryptocurrencies strengthen the confidence in the population
 - Trust is also strengthened when banks or other services offer custody services
 - Further, network effects strengthen the confidence, so that one can pay everywhere with cryptocurrencies
 - User-friendliness must be convincing and creates trust
- Would broad merchants' acceptance of cryptocurrencies be enough to induce acceptance of cryptocurrencies by Germans? [**Adoption Push**]
 - It would promote it, but it is not enough, because mutual benefits must be given. Both parties must be convinced of the medium of exchange
- Does lack of knowledge about cryptocurrencies significantly hinder their adoption in Germany? [**Adoption barriers**]
 - Yes, lack of knowledge about cryptocurrencies is a barrier. Lack of knowledge is not only the given about cryptocurrencies, but also about the functionality of money in general
 - There are many untruths about cryptocurrencies, but the knowledge increases over the years

- Does a (possibly existing) bad reputation of cryptocurrencies prevent their rise as a means of payment in Germany? [*Adoption barriers*]
 - A bad reputation is indeed a problem, see the case of Mt. Gox (crypto-currency exchange rates collapsed as a result). However, a bad reputation is mostly unfounded, because in this case the fault is caused by the operators, not by the technology.
 - Conclusion: Bad reputation is an obstacle, but it is getting better (as prejudices are gradually eliminated), both among the population and in politics.
- In general, which other factors and issues may prevent the uptake of cryptocurrencies by Germans as an important means of payment? [*Adoption barriers*]
 - Low network effects, user-friendliness, reputation (disastrous single events such as Mt. Gox), economic crisis, strong regulations

- Are technological conditions already in place for the easy use of cryptocurrencies as a means of payment in Germany? [*Technology usability*]
 - The technological requirements are given:
 - Several wallet providers exist everyone can use
 - There are stock exchange places (for instance Bison), in which one can buy cryptocurrencies
 - Possible to apply for licenses to offer custody services for cryptocurrencies
 - A "super cool" app with a particularly good user interface may still be missing
- Are there security issues (real or perceived) associated with the use of cryptocurrencies? If so, to what extent do those limit their usability as a means of payment? [*Technology usability*]
 - The Achilles' heel, or rather the decisive security gap, is the safekeeping of the private key. The wallet is only as safe as the safekeeping of the private key. Beyond that, I do not see any serious security issues.

- How do you assess the current regulatory environment regarding cryptocurrencies in Germany? [*Legal environment*]
 - The regulatory environment is very positive, as I have been involved in its development and no serious mistakes have been made. The regulatory environment is perhaps even leading in Europe.
 - The licensing process for providing custody service is clearly regulated
 - It is also officially regulated that assets can be launched on a blockchain in tokenized form. For this purpose, a security prospectus must be published, which needs to be approved by the BAFIN. A start-up called Bitbond deals with this
 - The legislative achievements that have been made in recent years are therefore worthy of recognition and considerable
- Should the German government further regulate cryptocurrencies? If so, why? If not, why? [*Legal environment*]
 - No further regulations are necessary, because cryptocurrencies are just another medium next to shares, bonds, etc. It is enough to apply the existing laws, if there is a problem, one should change the laws in general. The worst thing you can do would be to have autonomy legislation that discriminates positively or negatively something. In other words, the law must be neutral with regards to technology and competition.

Wrap-up

“This brings us to the end of our interview. I would like to thank you for your time. Thank you once again.”

Interview: Business Development Manager

THE EFFECT OF CRYPTOCURRENCIES ON THE GERMAN PAYMENT ECOSYSTEM: A CRITICAL ANALYSIS OF ITS FUTURE DISRUPTION POTENTIAL

EXPERT INTERVIEW WITH A BUSINESS DEVELOPMENT MANAGER

Date: 27.10.2020, 07:00 PM

Warm-Up

“Thank you for agreeing to talk to me today. I am conducting a research on cryptocurrencies and their effect on the German payment’s ecosystem. In what follows, there are no right or wrong answers and, of course, everything we talk about today is confidential. Do you mind if I record this interview? We’re going to cover different topics in the next 45 minutes. If you have any questions, please don’t hesitate to ask them at any time.”

Background Information

- Could you briefly introduce yourself and describe your responsibilities at SatoshiPay?
 - I am responsible for Business Development Germany of SatoshiPay
 - SatoshiPay is comparable to Paypal with a focus on microtransactions
 - Traditional payment provider fees are expensive, blockchain enables low transaction costs
 - My main tasks are selling cryptocurrency-based payment solutions to merchants
- For how many years have you been dealing with the topic of cryptocurrencies?
 - 3-4 years
- How does the emergence of cryptocurrencies affect your company?
 - strongly affected the company as the business case is based on cryptocurrencies and the technology

Specific Questions

- Money has three main characteristics: (i) unit of account, (ii) store of value, and (iii) medium of exchange. In your opinion do cryptocurrencies in general, and Bitcoin in particular, meet any or all of these criteria? [**Money Character**]
 - Cryptocurrencies meet all characteristics but not to the same extent
 - Bitcoin is definitely a unit of account especially for Altcoins, where Bitcoins are mostly used as a reference for exchanges. This is because Bitcoins existed for a long time
 - The exchange from bitcoin to fiat money is increasingly facilitated through more and more exchanges and brokers across every nation and region
 - However, money is established over a long period of time and not in a short time
 - There must be a social consensus and above all, trust must be built first
- Do *you* perceive cryptocurrencies in general, and Bitcoin in particular, as innovative payment methods or just as a hyped novelty that will fade away? [**Sustainability**]
 - It will definitely not fade away; however, I am not sure if it will establish as a primary means of payment. Cryptocurrencies will probably be more successful with large transaction volumes. It is a great opportunity, and it is widely used already.
- Do you think *Germans* perceive cryptocurrencies in general, and Bitcoin in particular, as innovative payment methods or just as a hyped novelty that will fade away? [**Sustainability**]

- Exposed to different perspectives
 - Some perceive it as illegal or only suitable for financing terrorism and expect the marginalization of cryptocurrencies
 - I increasingly know people who perceive it as relevant innovation and are enthusiastic about it
 - I see education as a barrier. People see the potential, but are still intimidated by the technology
- Will cryptocurrencies establish themselves as a means of payment in Germany by achieving a significant market share of all transactions carried out in the country? If so, will this happen in the next 5 years? If not, what would be a better basis/time to start their implementation, if any? [*Customers' acceptance*]
 - Classical POS systems will not become generally accepted in the next 2-3 years, since transaction speed is still too slow
 - Payment for Cross Border Payments with Stable Coins will quickly establish itself
 - Stable Coin market capitalization is already exploding due to Cross Border Payments (high transaction speed, cheap, cannot be censored)
 - What must be done to achieve broad acceptance of cryptocurrencies by German customers as a means of payment? [*Customers' acceptance*]
 - Acceptance by merchants is important, but not yet given
 - Education is necessary
 - Products must become user-friendly
 - In particular, what actions would increase Germans' trust in cryptocurrencies? [*Adoption Push*]
 - The purchase of Bitcoins by large companies such as MicroStrategy or Square, as this news have a strong signaling effect and create trust.
 - Would broad merchants' acceptance of cryptocurrencies be enough to induce acceptance of cryptocurrencies by Germans? [*Adoption Push*]
 - Yes, acceptance would be strengthened, but further incentives would still have to be offered. The interest lies rather on the side of small merchants, who save transaction costs by accepting cryptocurrencies (Mastercard for instance charges 2-3% per transaction excluding fix costs).
 - Does lack of knowledge about cryptocurrencies significantly hinder their adoption in Germany? [*Adoption barriers*]
 - Yes, 100%. The topic is very technical and therefore it becomes deterrent
 - The most important task is to explain the topic easily and develop appropriate narratives
 - Does a (possibly existing) bad reputation of cryptocurrencies prevent their rise as a means of payment in Germany? [*Adoption barriers*]
 - No, I would not say so
 - In general, which other factors and issues may prevent the uptake of cryptocurrencies by Germans as an important means of payment? [*Adoption barriers*]
 - Regulation (tax matters, money laundering laws, identification requirements)
 - Private wallets could be banned in some nations, which would massively impede adoption and destroy innovation. However, a ban would be unlikely.
 - Are technological conditions already in place for the easy use of cryptocurrencies as a means of payment in Germany? [*Technology usability*]
 - Yes, more or less
 - Basic infrastructure is settled for instance through wallets
 - Network is working properly (e.g anyone can pay with a QR Code, by simply scanning it through a wallet app)

- Transactions via BaseChain are unfortunately not yet possible
- Are there security issues (real or perceived) associated with the use of cryptocurrencies? If so, to what extent do those limit their usability as a means of payment? [*Technology usability*]
 - The use of wallets left room for improvement
 - The user has 100% control but also bears the whole responsibility at the same time. When the private key disappears, the coins are gone
- How do you assess the current regulatory environment regarding cryptocurrencies in Germany? [*Legal environment*]
 - the German government is not hostile towards the topic, which is basically advantageous
 - it is tried to understand the topic
 - good laws are on the way in the area of security tokens and crypto custody
- Should the German government further regulate cryptocurrencies? If so, why? If not, why? [*Legal environment*]
 - Regulations are basically not bad, but one should also be careful of overregulation
 - It can continue as before, by doing nothing, because people will be more courageous in innovating
 - There is no "Pain Point" which makes further regulation necessary at present
 - However, there will be more regulation as progress is accompanied by problems (problems we don't even think about today)

Wrap-up

“This brings us to the end of our interview. I would like to thank you for your time. Thank you once again.”

Interview: Portfolio Manager

THE EFFECT OF CRYPTOCURRENCIES ON THE GERMAN PAYMENT ECOSYSTEM: A CRITICAL ANALYSIS OF ITS FUTURE DISRUPTION POTENTIAL

EXPERT INTERVIEW WITH A PORTFOLIO MANAGER

Date: 28.10.2020, 09:00 AM

Warm-Up

“Thank you for agreeing to talk to me today. I am conducting a research on cryptocurrencies and their effect on the German payment’s ecosystem. In what follows, there are no right or wrong answers and, of course, everything we talk about today is confidential. Do you mind if I record this interview? We’re going to cover different topics in the next 45 minutes. If you have any questions, please don’t hesitate to ask them at any time.”

Background Information

- Could you briefly introduce yourself and describe your responsibilities at Deutsche Bahn Blockchain Crew?
 - I am a Portfolio manager and part of the Blockchain crew, which is responsible for all Blockchain projects of the Deutsche Bahn
 - Topics covered: Operations, Infrastructure, Passenger Traffic
 - Additionally, I have a role as a corporate spokesperson for the topic Blockchain
- For how many years have you been dealing with the topic of cryptocurrencies?
 - End of 2016
- How does the emergence of cryptocurrencies affect your company?
 - Deutsche Bahn will never issue its own cryptocurrencies but focusing strongly on digital payment methods since the emergence of cryptocurrencies.

Specific Questions

- Money has three main characteristics: (i) unit of account, (ii) store of value, and (iii) medium of exchange. In your opinion do cryptocurrencies in general, and Bitcoin in particular, meet any or all of these criteria? [***Money Character***]
 - Cryptocurrencies are matching all characteristics. You can calculate with it, use it as a store of value, and exchange it
- Do *you* perceive cryptocurrencies in general, and Bitcoin in particular, as innovative payment methods or just as a hyped novelty that will fade away? [***Sustainability***]
 - From a private person’s perspective, cryptocurrencies are a hyped novelty since there is no difference between paying with the credit card or with cryptocurrencies.
 - From a corporate perspective, cryptocurrency brings clear advantages depending on the industry to what extent. Banks for instance profit the most.

- Do you think *Germans* perceive cryptocurrencies in general, and Bitcoin in particular, as innovative payment methods or just as a hyped novelty that will fade away? [*Sustainability*]
 - Hyped novelty

- Will cryptocurrencies establish themselves as a means of payment in Germany by achieving a significant market share of all transactions carried out in the country? If so, will this happen in the next 5 years? If not, what would be a better basis/time to start their implementation, if any? [*Customers' acceptance*]
 - Yes, it will establish as a means of payment within the next 5 years. At the latest after the news with PayPal broke out cryptocurrencies will become mainstream. The main difficulty was to access cryptocurrencies this is however facilitated by Paypal now.
- What must be done to achieve broad acceptance of cryptocurrencies by German customers as a means of payment? [*Customers' acceptance*]
 - Understanding of the application and the underlying technology must be promoted
 - Cryptocurrency prices need to remain stable to assert themselves in Germany

- In particular, what actions would increase Germans' trust in cryptocurrencies? [*Adoption Push*]
 - Educational work is necessary to help people classifying the innovation better
 - Prevent banks to sell cryptocurrencies since Germans will then equate it with shares (association with a risky asset is then given)
 - The reputation (DarkWeb) needs to be improved
- Would broad merchants' acceptance of cryptocurrencies be enough to induce acceptance of cryptocurrencies by Germans? [*Adoption Push*]
 - No, as customers need to know first where to get access to cryptocurrencies and
 - Necessity is still missing and needs to be given, therefore. Why using cryptocurrencies although I can pay with PayPal?
- Does lack of knowledge about cryptocurrencies significantly hinder their adoption in Germany? [*Adoption barriers*]
 - Yes, definitely!
- Does a (possibly existing) bad reputation of cryptocurrencies prevent their rise as a means of payment in Germany? [*Adoption barriers*]
 - Partially, it slows down the adoption, but only slightly
 - "SUVs" have a bad reputation, but is driven anyway
- In general, which other factors and issues may prevent the uptake of cryptocurrencies by Germans as an important means of payment? [*Adoption barriers*]
 - Regulatory Uncertainties for merchants especially
 - How do you report it on the balance sheet, especially in the case of price increases (how is it taxed)?
 - Inconsistent positioning of the ECB towards cryptocurrencies

- Are technological conditions already in place for the easy use of cryptocurrencies as a means of payment in Germany? [*Technology usability*]

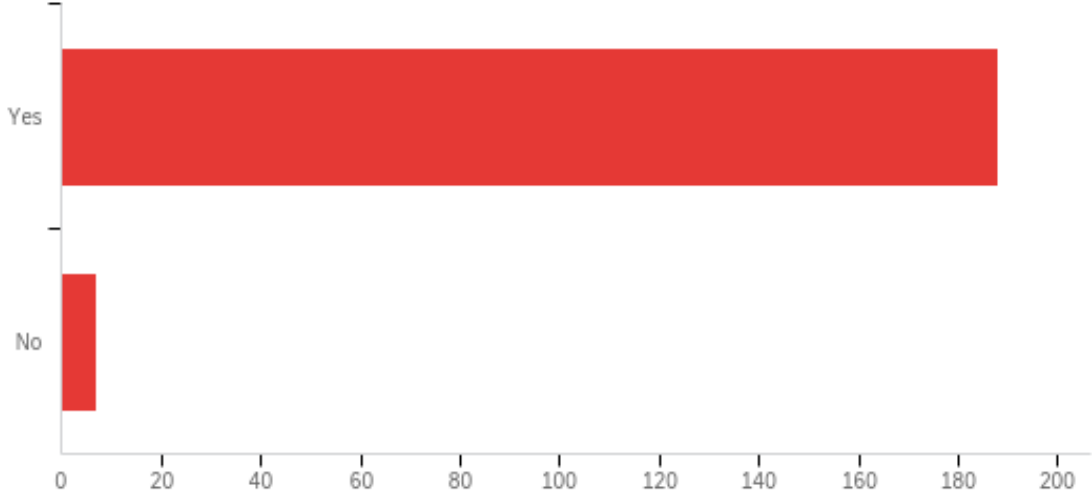
- No, not really
 - Occasionally restaurants & bars offer BTC ATMs, but they are not trustworthy
- Are there security issues (real or perceived) associated with the use of cryptocurrencies? If so, to what extent do those limit their usability as a means of payment? [*Technology usability*]
 - There are diverse challenges, yes! They lie primarily in the technical design (e.g. Mt. Gox)
 - Keys, wallets, stock exchanges can be hacked
 - Differently than with a bank, the money is disappeared with no possibilities to undo it, there is no governance structure
 - Security mechanisms on the stock exchange are limited
 - Bitcoin Blockchain is not suitable for transaction, because transaction speed is too slow
- How do you assess the current regulatory environment regarding cryptocurrencies in Germany? [*Legal environment*]
 - Weak, as there is no clear line from the government
 - The German government has tried to formulate a blockchain strategy, but it has not yet been implemented
 - Luxembourg, for example, has a clear regulatory framework, Germany is comparatively poorly positioned
- Should the German government further regulate cryptocurrencies? If so, why? If not, why? [*Legal environment*]
 - Very difficult question, because it is very complex to answer from my personal point of view
 - Clear regulation in times in which cryptocurrency is seen as a speculation object is recommended
 - Too much regulation is not good either, as it further slows down the innovation drive. One should rather get into a normal currency context

Wrap-up

“This brings us to the end of our interview. I would like to thank you for your time. Thank you once again.”

Appendix 7: Survey Results

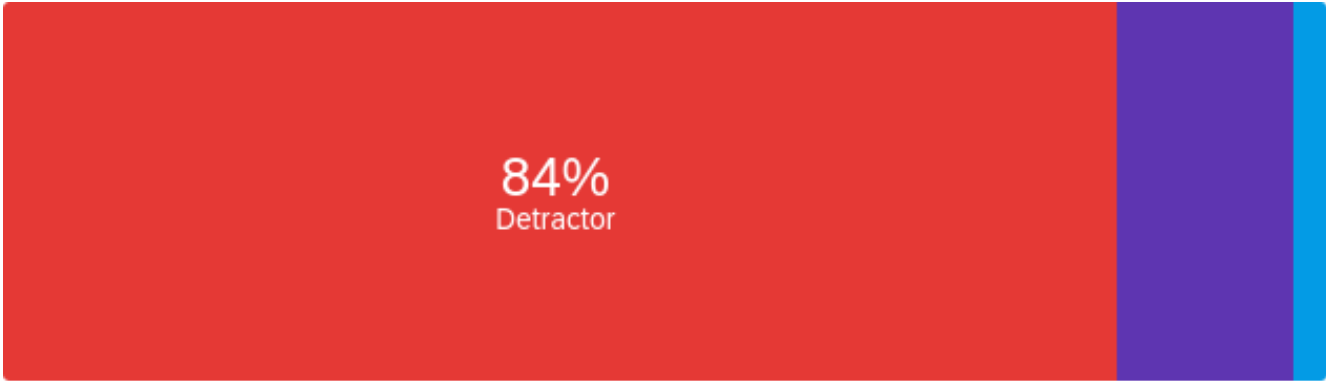
Q1 - Have you ever heard or read about cryptocurrencies (such as, for instance, Bitcoin)?



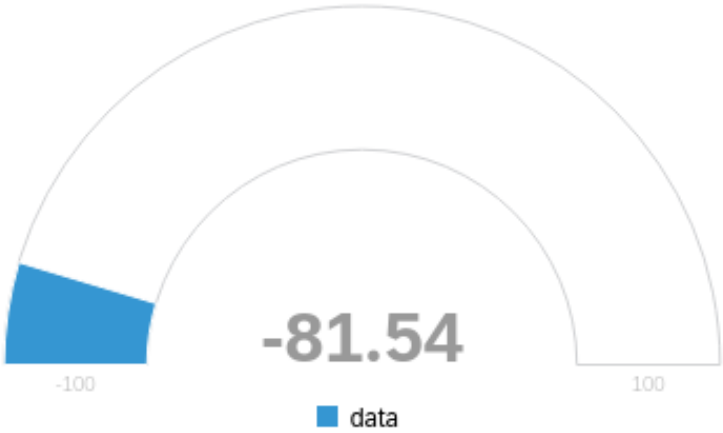
#	Answer	%	Count
1	Yes	96.41%	188
2	No	3.59%	7
	Total	100%	195

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Have you ever heard or read about cryptocurrencies (such as, for instance, Bitcoin)? Single Choice	1.00	2.00	1.04	0.19	0.03	195

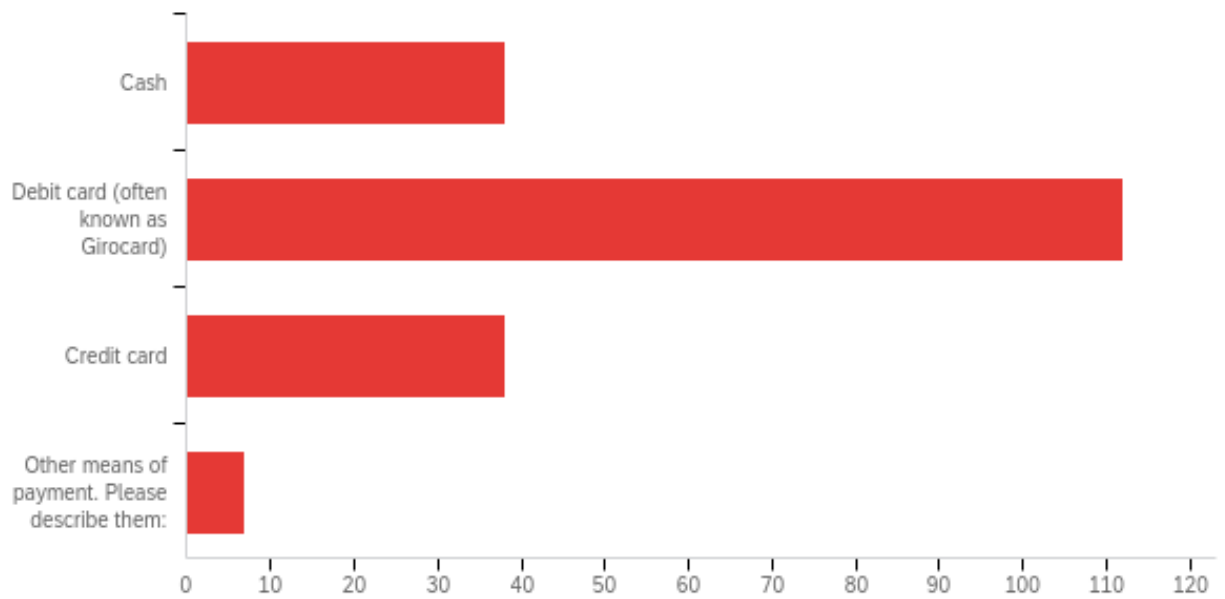
Q2 How familiar do you rate yourself regarding cryptocurrencies? Single Choice



■ Detractor ■ Passive ■ Promoter



Q3 - What is your preferred means of payment? Single Choice



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	What is your preferred means of payment? Single Choice - Selected Choice	1.00	4.00	2.07	0.73	0.53	195

#	Answer	%	Count
1	Cash	19.49%	38
2	Debit card (often known as Girocard)	57.44%	112
3	Credit card	19.49%	38
4	Other means of payment. Please describe them:	3.59%	7
	Total	100%	195

Q4_4_TEXT - Other means of payment. Please describe them:

Other means of payment. Please describe them: - Text

Via Handy NFC

Apple Pay

Apple pay

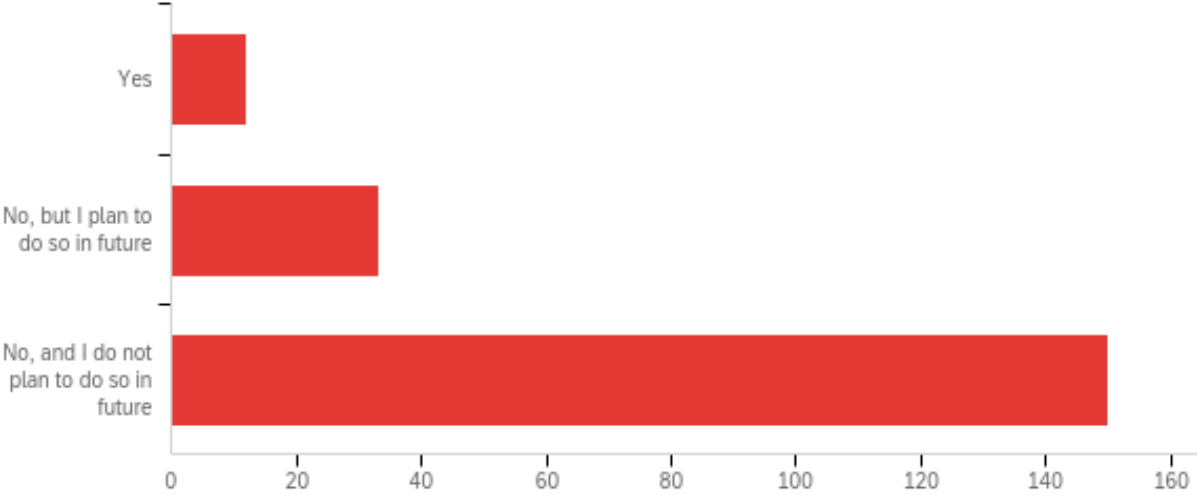
Apple Pay

Apple Pay

Paypal

Paypal

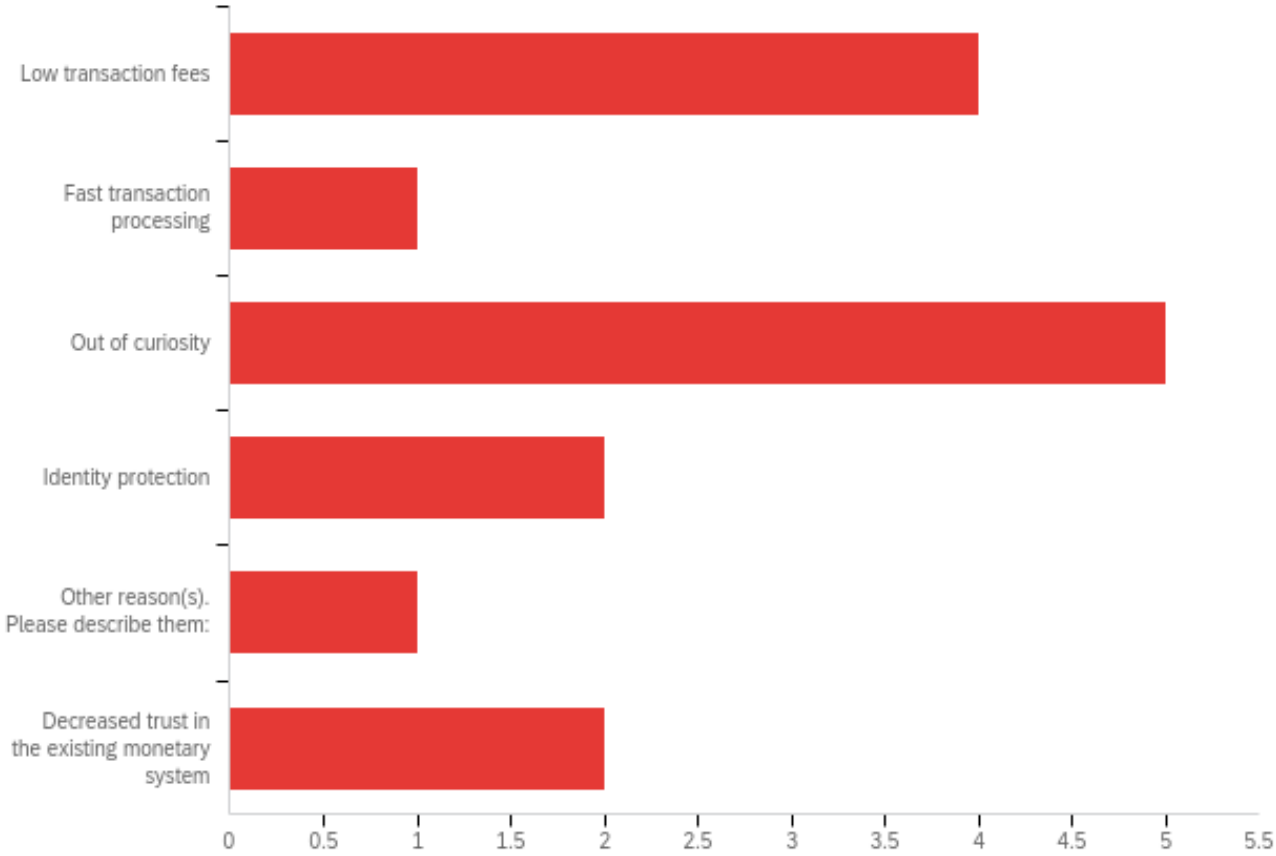
Q4 - Have you ever used cryptocurrencies (such as, for instance, bitcoins) to make or receive a payment? Single Choice



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Have you ever used cryptocurrencies (such as, for instance, bitcoins) to make or receive a payment? Single Choice	1.00	3.00	2.71	0.57	0.33	195

#	Answer	%	Count
1	Yes	6.15%	12
2	No, but I plan to do so in future	16.92%	33
3	No, and I do not plan to do so in future	76.92%	150
	Total	100%	195

Q4.1 - Why have you used cryptocurrencies in the past to make or receive a payment? Multiple Choice



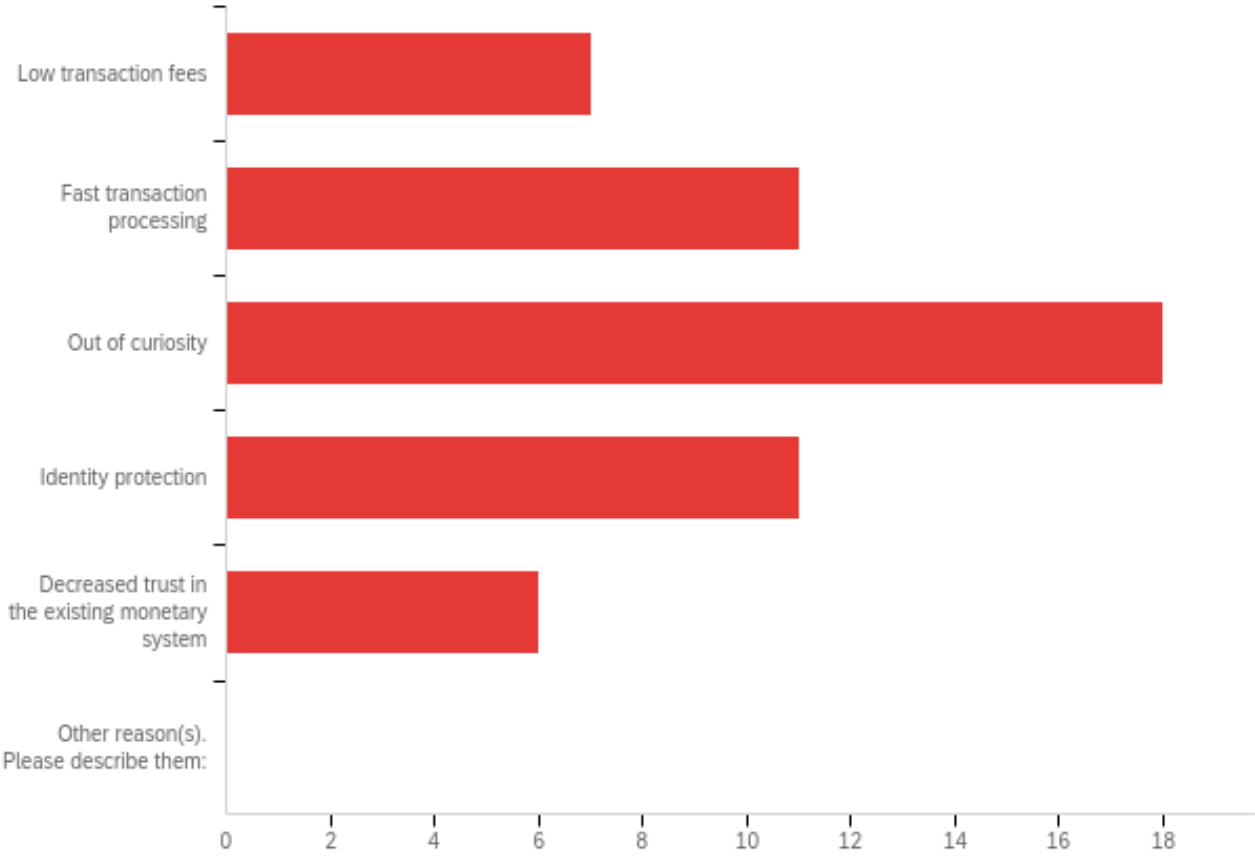
#	Answer	%	Count
1	Low transaction fees	26.67%	4
2	Fast transaction processing	6.67%	1
3	Out of curiosity	33.33%	5
4	Identity protection	13.33%	2
6	Other reason(s). Please describe them:	6.67%	1
7	Decreased trust in the existing monetary system	13.33%	2
	Total	100%	15

Q5.1_6_TEXT - Other reason(s). Please describe them:

Other reason(s). Please describe them: - Text

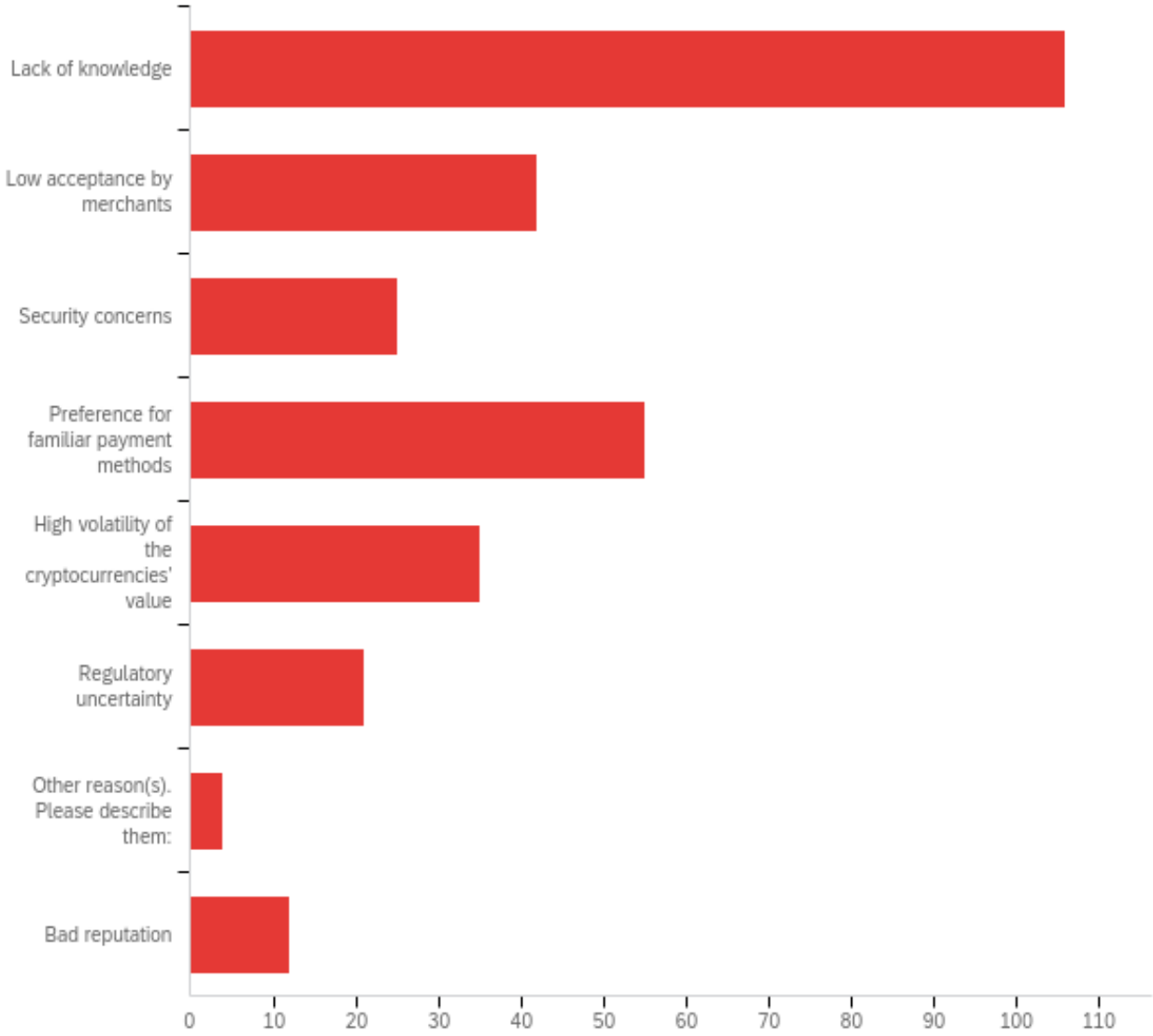
Transaktionsgebühren für krypto wurden in krypto bezahlt

Q4.2 - Why do you plan to use cryptocurrencies to make or receive a payment? Multiple Choice



#	Answer	%	Count
3	Out of curiosity	33.96%	18
2	Fast transaction processing	20.75%	11
4	Identity protection	20.75%	11
1	Low transaction fees	13.21%	7
5	Decreased trust in the existing monetary system	11.32%	6
6	Other reason(s). Please describe them:	0.00%	0
	Total	100%	53

Q4.3 - Why have you never used cryptocurrencies to make or receive a payment? Multiple Choice



#	Answer	%	Count
1	Lack of knowledge	35.33%	106
2	Low acceptance by merchants	14.00%	42
3	Security concerns	8.33%	25
4	Preference for familiar payment methods	18.33%	55
5	High volatility of the cryptocurrencies' value	11.67%	35
6	Regulatory uncertainty	7.00%	21
7	Other reason(s). Please describe them:	1.33%	4

8	Bad reputation	4.00%	12
	Total	100%	300

Q5.3_7_TEXT - Other reason(s). Please describe them:

Other reason(s). Please describe them: - Text

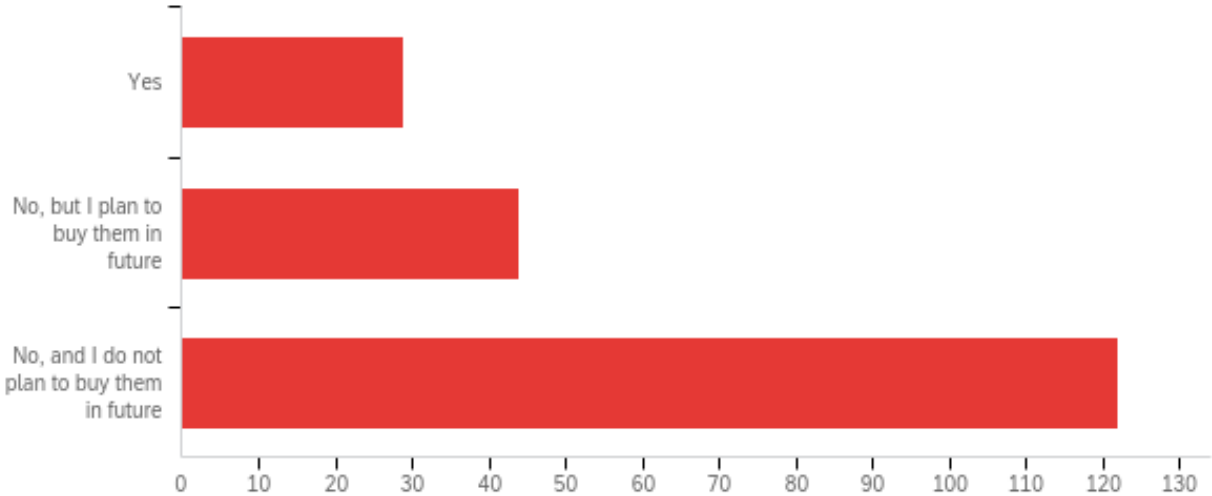
Kein Need

Bisher keine Notwendigkeit gesehen mich damit zu beschäftigen

Sehe virtuelle Währungen als großes Risiko.

Habe mich mit dem Thema noch nicht intensiv genug befasst & sah bisher auch keine Notwendigkeit zur Verwendung.

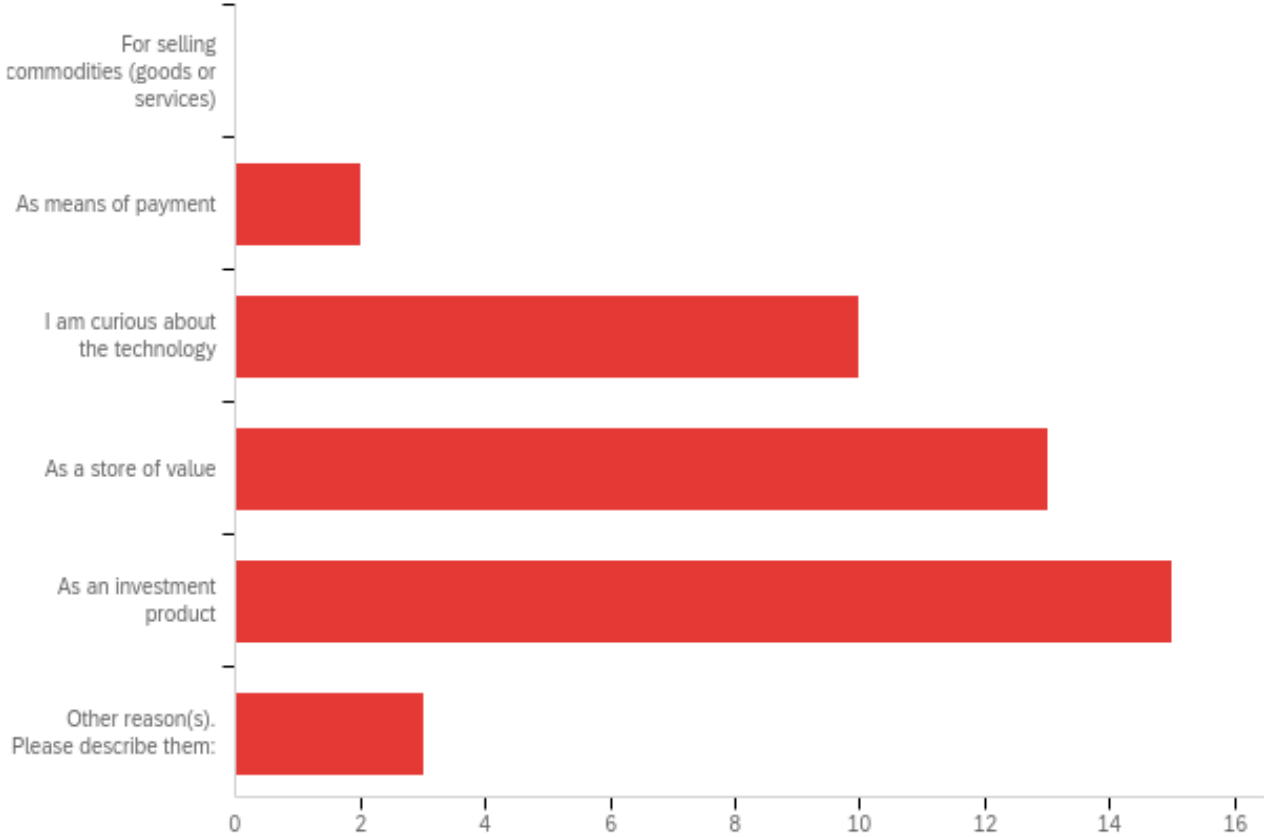
Q5 - Do you own cryptocurrencies (such as, for instance, Bitcoins)? Single Choice



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Do you own cryptocurrencies (such as, for instance, Bitcoins)? Single Choice	1.00	3.00	2.48	0.74	0.55	195

#	Answer	%	Count
1	Yes	14.87%	29
2	No, but I plan to buy them in future	22.56%	44
3	No, and I do not plan to buy them in future	62.56%	122
	Total	100%	195

Q5.1 - Why do you own cryptocurrencies? Multiple Choice



#	Answer	%	Count
1	For selling commodities (goods or services)	0.00%	0
2	As means of payment	4.65%	2
3	I am curious about the technology	23.26%	10
4	As a store of value	30.23%	13
5	As an investment product	34.88%	15
6	Other reason(s). Please describe them:	6.98%	3
	Total	100%	43

Q6.1_6_TEXT - Other reason(s). Please describe them:

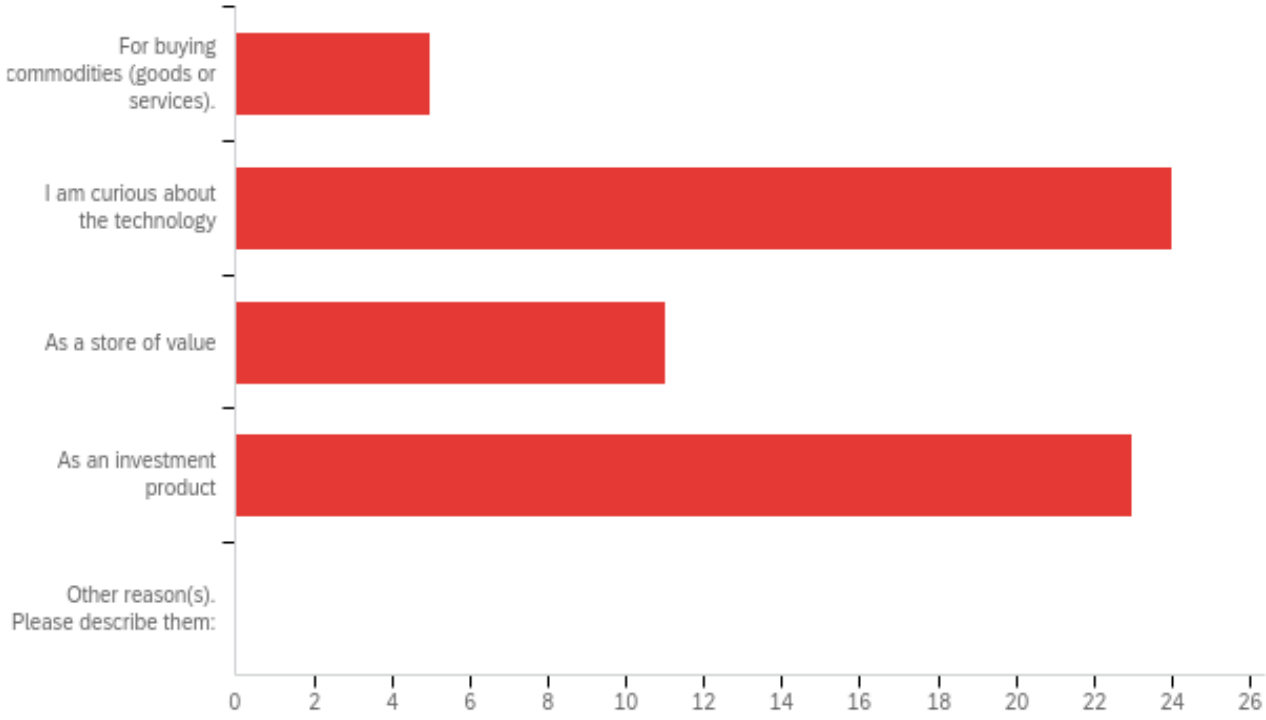
Other reason(s). Please describe them: - Text

Wurde mir geschenkt

Spekulationsinvestition

Speculation

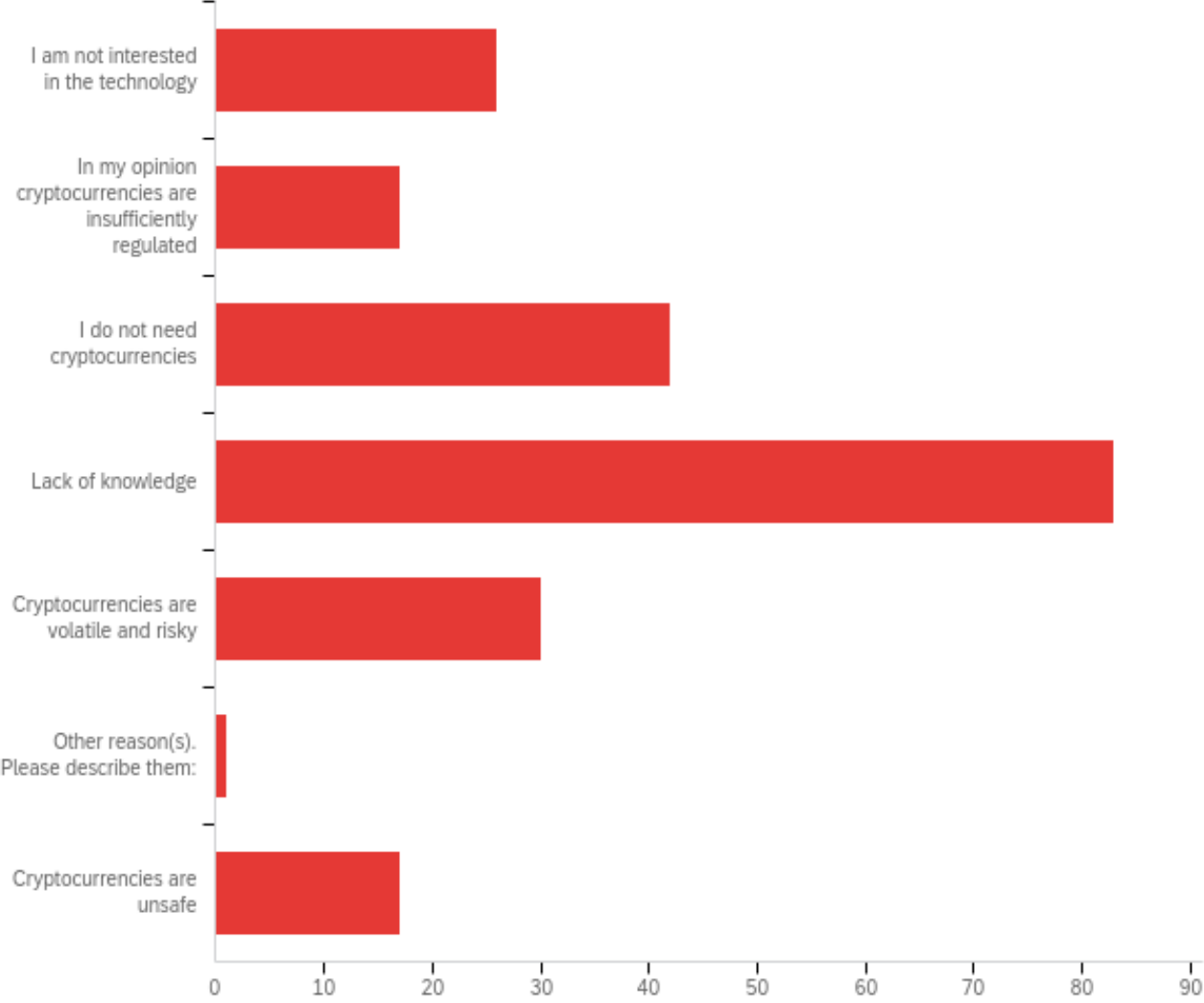
Q5.2 - Why would you like to buy cryptocurrencies in the future? Multiple Choice



#	Answer	%	Count
1	For buying commodities (goods or services).	7.94%	5
3	I am curious about the technology	38.10%	24
4	As a store of value	17.46%	11
5	As an investment product	36.51%	23
6	Other reason(s). Please describe them:	0.00%	0
	Total	100%	63

Q6.1_6_TEXT - Other reason(s). Please describe them:
 Other reason(s). Please describe them: - Text

Q5.3 - Why do you not own cryptocurrencies? Multiple Choice



Data source misconfigured for this visualization

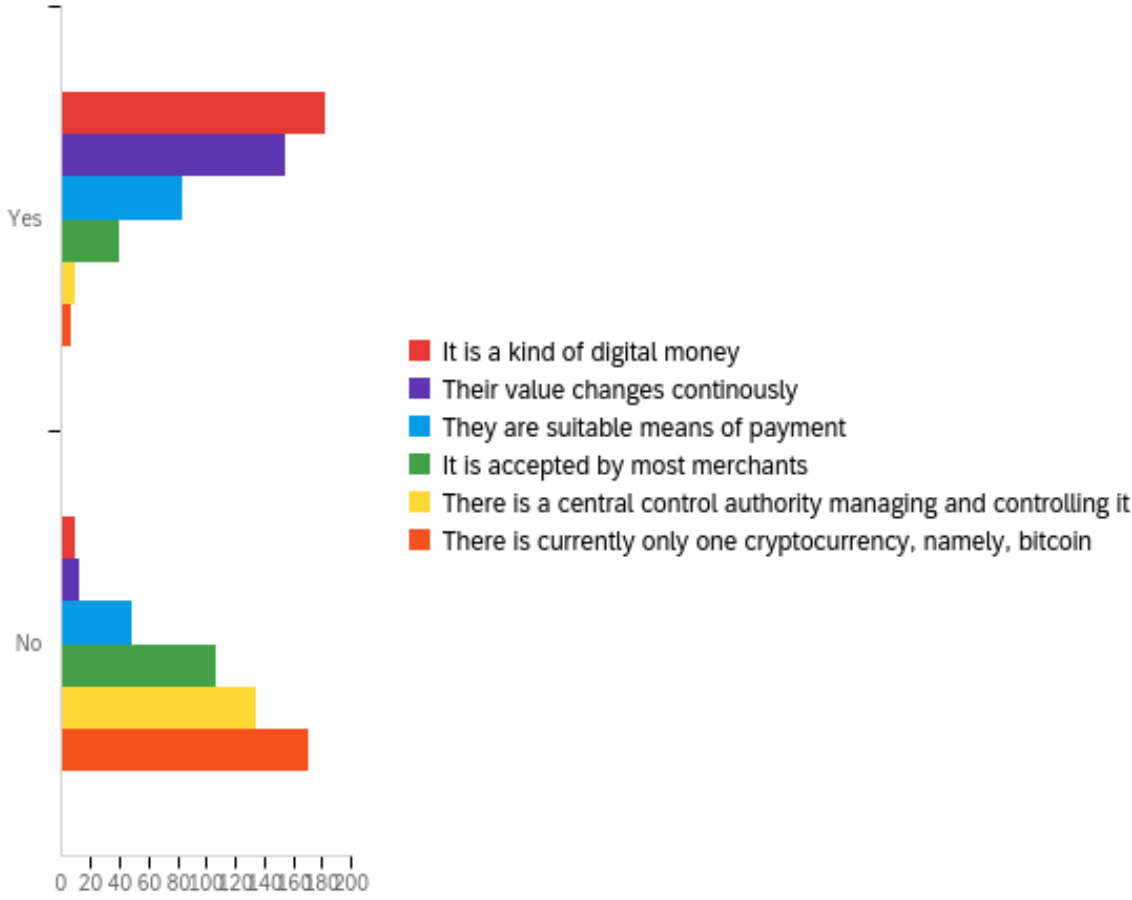
#	Answer	%	Count
2	I am not interested in the technology	12.04%	26
3	In my opinion cryptocurrencies are insufficiently regulated	7.87%	17
4	I do not need cryptocurrencies	19.44%	42
5	Lack of knowledge	38.43%	83
6	Cryptocurrencies are volatile and risky	13.89%	30
7	Other reason(s). Please describe them:	0.46%	1
8	Cryptocurrencies are unsafe	7.87%	17
	Total	100%	216

Q6.1_7_TEXT - Other reason(s). Please describe them:

Other reason(s). Please describe them: - Text

Unnötiger Mehraufwand

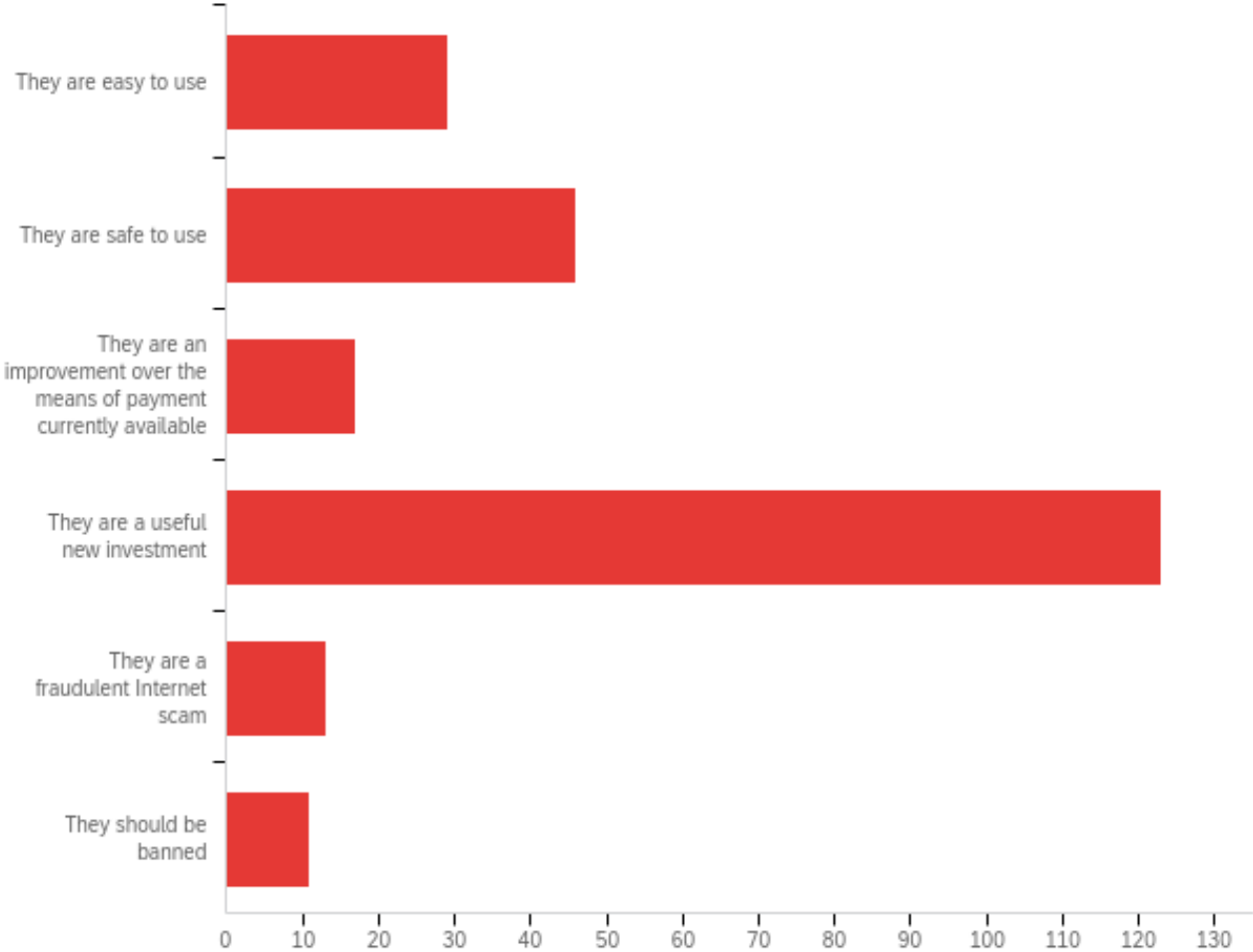
Q6 - In your opinion, which of the following aspects characterize cryptocurrencies?



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	It is a kind of digital money	1.00	2.00	1.05	0.22	0.05	192
2	Their value changes continuously	1.00	2.00	1.07	0.26	0.07	166
3	They are suitable means of payment	1.00	2.00	1.37	0.48	0.23	133
4	It is accepted by most merchants	1.00	2.00	1.73	0.45	0.20	146
5	There is a central control authority managing and controlling it	1.00	2.00	1.93	0.25	0.06	145
6	There is currently only one cryptocurrency, namely, bitcoin	1.00	2.00	1.97	0.18	0.03	177

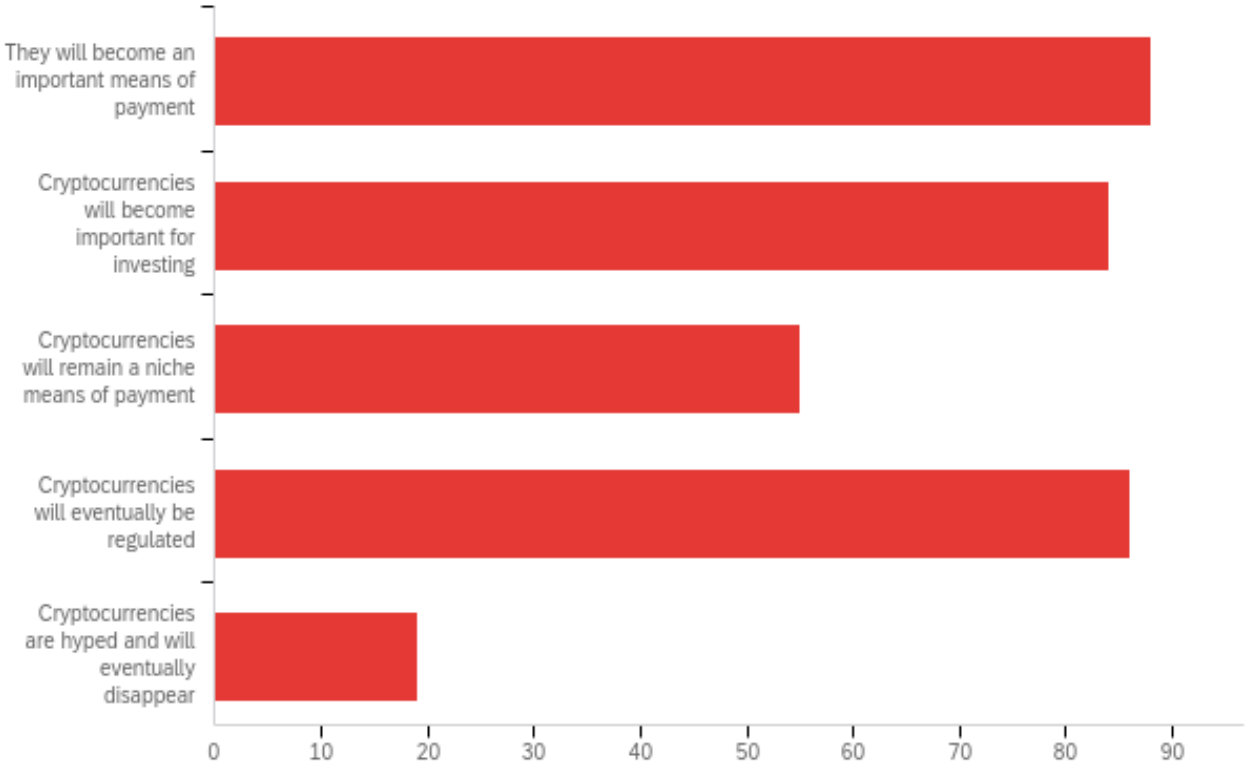
#	Question	Yes		No		Total
1	It is a kind of digital money	94.79%	182	5.21%	10	192
2	Their value changes continuously	92.77%	154	7.23%	12	166
3	They are suitable means of payment	63.16%	84	36.84%	49	133
4	It is accepted by most merchants	27.40%	40	72.60%	106	146
5	There is a central control authority managing and controlling it	6.90%	10	93.10%	135	145
6	There is currently only one cryptocurrency, namely, bitcoin	3.39%	6	96.61%	171	177

Q7 - How do you presently regard cryptocurrencies? Multiple Choice



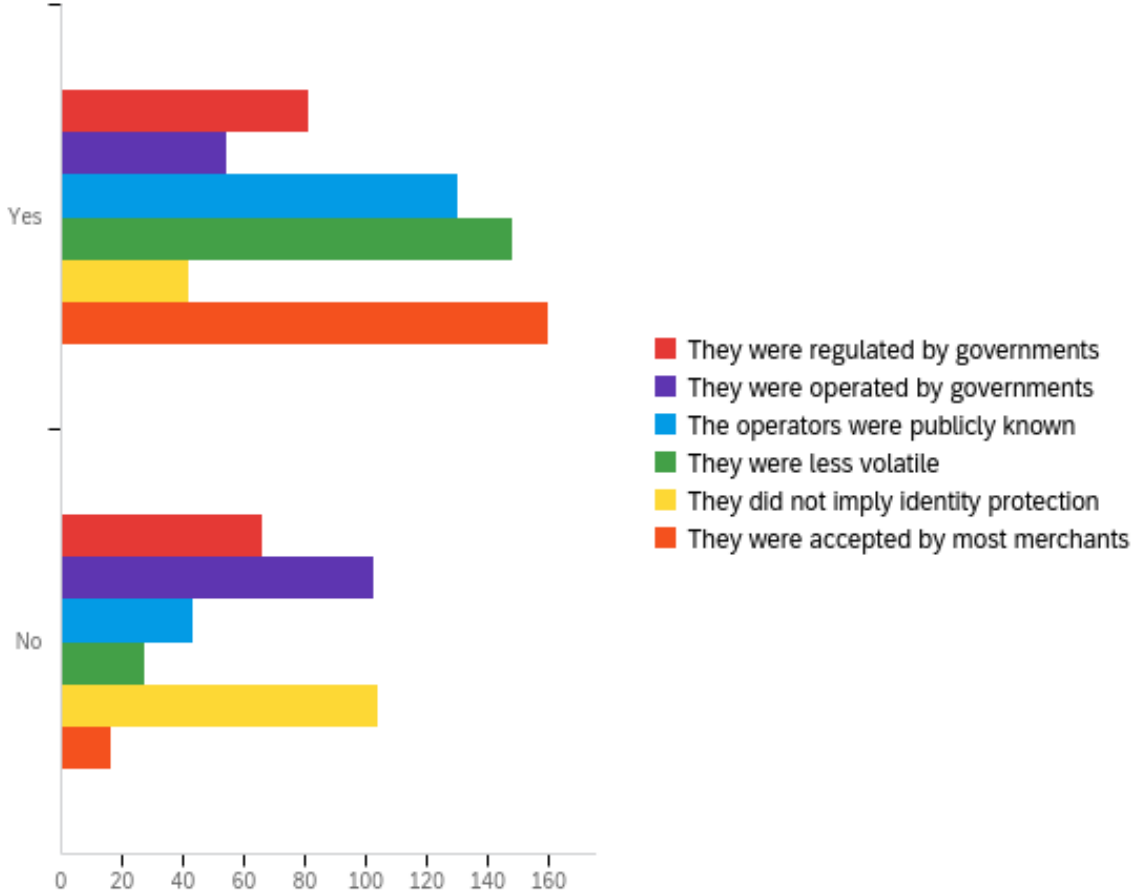
#	Answer	%	Count
1	They are easy to use	12.13%	29
2	They are safe to use	19.25%	46
3	They are an improvement over the means of payment currently available	7.11%	17
4	They are a useful new investment	51.46%	123
5	They are a fraudulent Internet scam	5.44%	13
6	They should be banned	4.60%	11
	Total	100%	239

Q8 - How do you regard the future of cryptocurrencies? Multiple Choice



#	Answer	%	Count
1	They will become an important means of payment	26.51%	88
2	Cryptocurrencies will become important for investing	25.30%	84
3	Cryptocurrencies will remain a niche means of payment	16.57%	55
4	Cryptocurrencies will eventually be regulated	25.90%	86
5	Cryptocurrencies are hyped and will eventually disappear	5.72%	19
	Total	100%	332

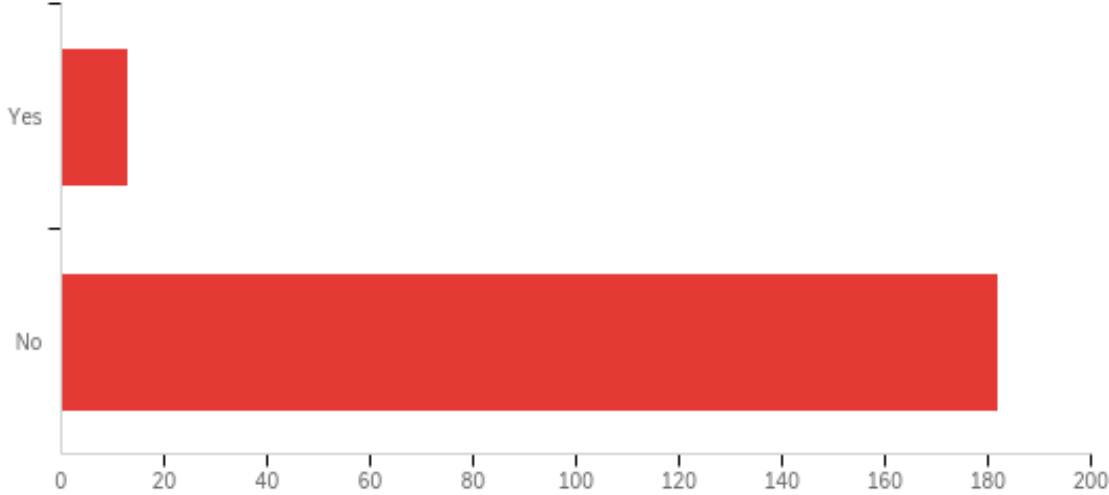
Q9 - Would you trust cryptocurrencies significantly more if



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	They were regulated by governments	1.00	2.00	1.45	0.50	0.25	147
2	They were operated by governments	1.00	2.00	1.66	0.48	0.23	157
3	The operators were publicly known	1.00	2.00	1.25	0.43	0.19	173
4	They were less volatile	1.00	2.00	1.15	0.36	0.13	175
5	They did not imply identity protection	1.00	2.00	1.71	0.45	0.20	146
6	They were accepted by most merchants	1.00	2.00	1.09	0.29	0.08	176

#	Question	Yes		No		Total
1	They were regulated by governments	55.10%	81	44.90%	66	147
2	They were operated by governments	34.39%	54	65.61%	103	157
3	The operators were publicly known	75.14%	130	24.86%	43	173
4	They were less volatile	84.57%	148	15.43%	27	175
5	They did not imply identity protection	28.77%	42	71.23%	104	146
6	They were accepted by most merchants	90.91%	160	9.09%	16	176

Q10 - Has the COVID-19 outbreak changed your perception of cryptocurrencies? Single Choice



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Has the COVID-19 outbreak changed your perception of cryptocurrencies? Single Choice	1.00	2.00	1.93	0.25	0.06	195

#	Answer	%	Count
1	Yes	6.67%	13
2	No	93.33%	182
	Total	100%	195

Q11 - How did the COVID-19 outbreak changed your perception of cryptocurrencies?

How did the COVID-19 outbreak changed your perception of cryptocurrencies?

They become more relevant as my trust for paying with cards/ online banking/ the governments decreases

I had more time and I was looking for new investment opportunities

Das erste mal damit auseinander gesetzt, weil ich Zeit hatte

Keine ahnung

Instabiler Wert der Währung

Ausschwankungen/ Existenzverluste

Covid hat die kryptowährungen nicht so drastisch beeinflusst wie reale Währungen

Privatsphäre wichtiger geworden

Rolle des Geldsystems in Folge von CoVid Maßnahmen der Regierungen / Zentralbanken

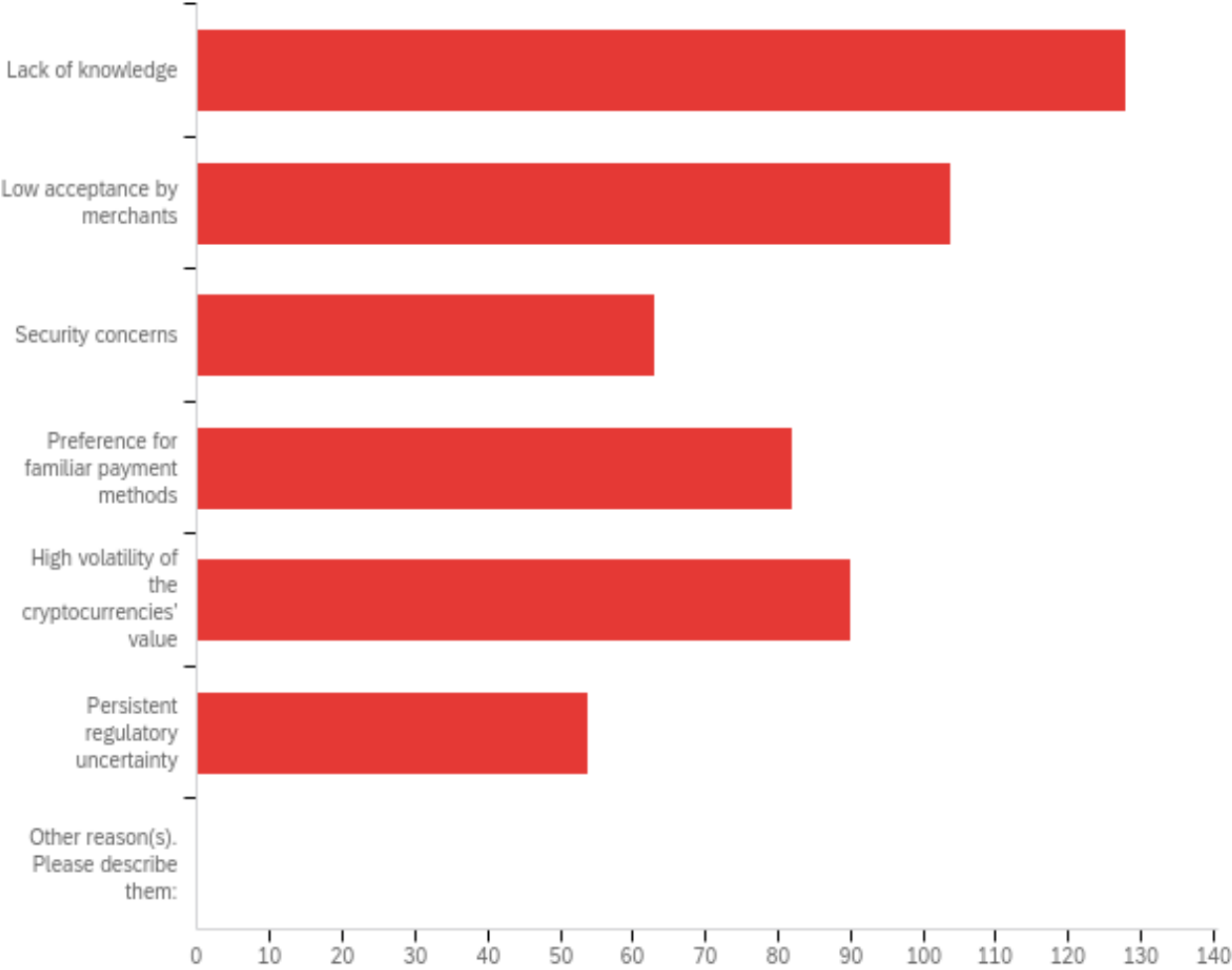
Es sollte überall als Zahlungsmittel akzeptiert werden

Deregulation von Währung positiv ! Inflation, Geld drucken, bei Kyrp nicht möglich

Alternative kontaktlose Zahlungsmöglichkeit

Positiv, gewannen zunehmend an Relevanz

Q12 - Which of the following reasons would deter you from using cryptocurrencies as a means of payment Multiple Choice



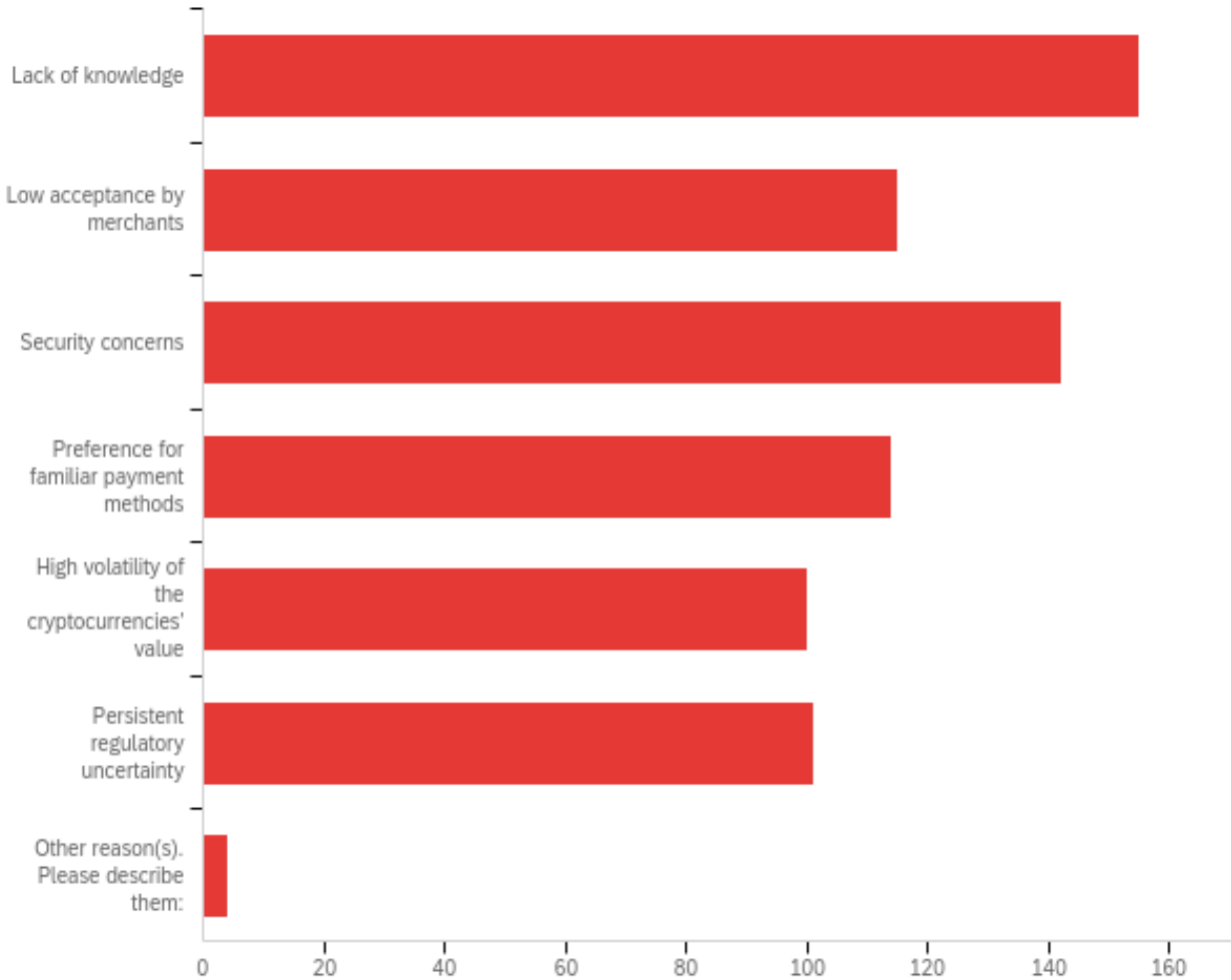
Data source misconfigured for this visualization

#	Answer	%	Count
1	Lack of knowledge	24.57%	128
2	Low acceptance by merchants	19.96%	104
3	Security concerns	12.09%	63
4	Preference for familiar payment methods	15.74%	82
5	High volatility of the cryptocurrencies' value	17.27%	90
6	Persistent regulatory uncertainty	10.36%	54
7	Other reason(s). Please describe them:	0.00%	0
	Total	100%	521

Q13_7_TEXT - Other reason(s). Please describe them:

Other reason(s). Please describe them: - Text

Q13 - Which of the following reasons do you think would prevent German citizens from using cryptocurrency as a means of payment? Multiple Choice



Data source misconfigured for this visualization

#	Answer	%	Count
1	Lack of knowledge	21.20%	155
2	Low acceptance by merchants	15.73%	115
3	Security concerns	19.43%	142
4	Preference for familiar payment methods	15.60%	114
5	High volatility of the cryptocurrencies' value	13.68%	100
6	Persistent regulatory uncertainty	13.82%	101
7	Other reason(s). Please describe them:	0.55%	4

Total	100%	731
-------	------	-----

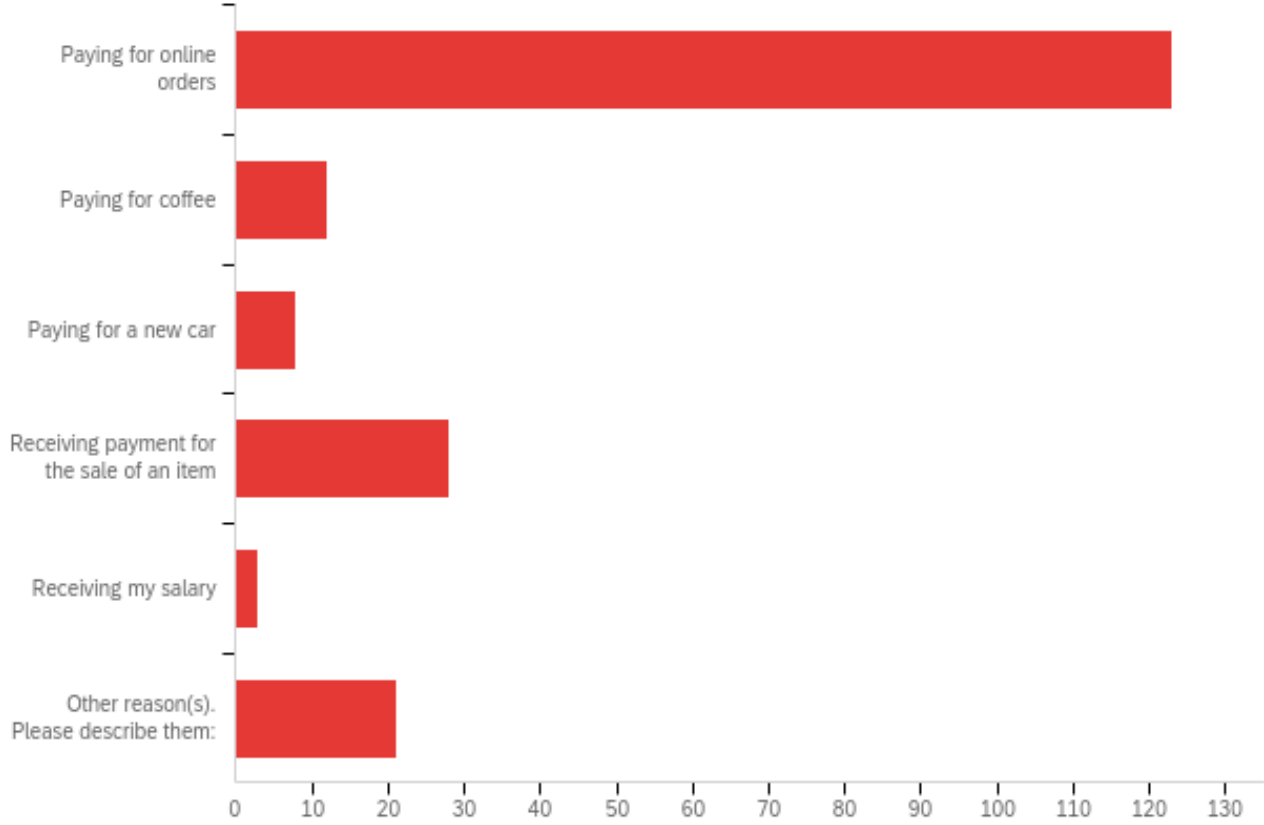
Q14_7_TEXT - Other reason(s). Please describe them:

Other reason(s). Please describe them: - Text

Inwiefern unterscheiden sich deutsche Verbraucher von französischen, spanischen etc.?

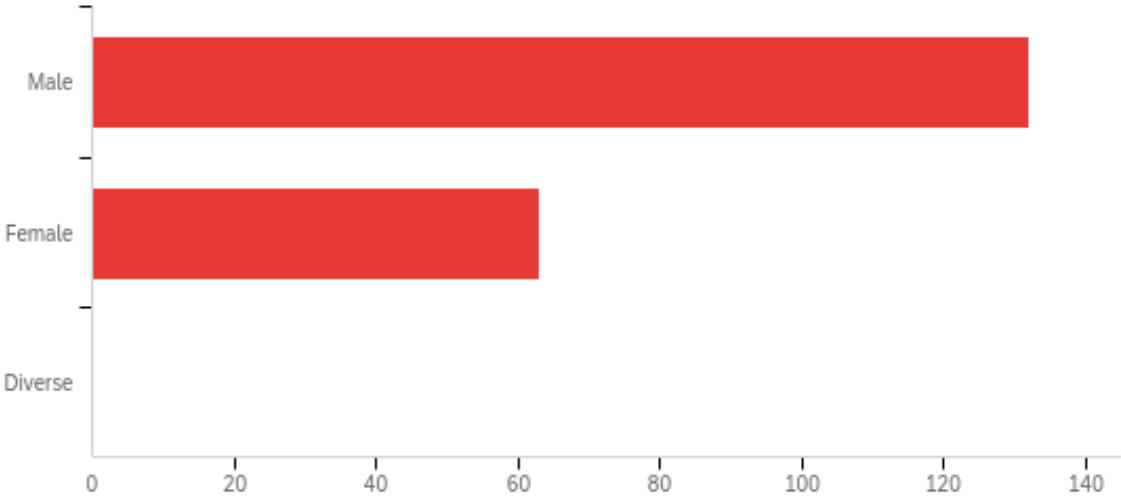
Stark ausgeprägte Bargeldpräferenz

Q14 - I would use cryptocurrencies for Single Choice



#	Answer	%	Count
1	Paying for online orders	63.08%	123
2	Paying for coffee	6.15%	12
3	Paying for a new car	4.10%	8
4	Receiving payment for the sale of an item	14.36%	28
5	Receiving my salary	1.54%	3
6	Other reason(s). Please describe them:	10.77%	21
	Total	100%	195

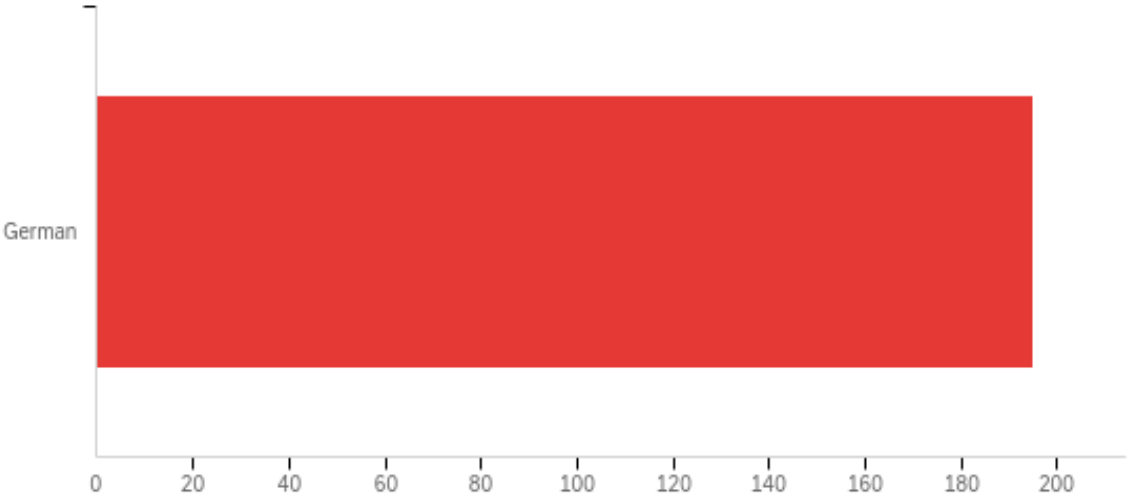
Q15 - Please indicate your gender Single Choice



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Please indicate your gender Single Choice	1.00	2.00	1.32	0.47	0.22	195

#	Answer	%	Count
1	Male	67.69%	132
2	Female	32.31%	63
3	Diverse	0.00%	0
	Total	100%	195

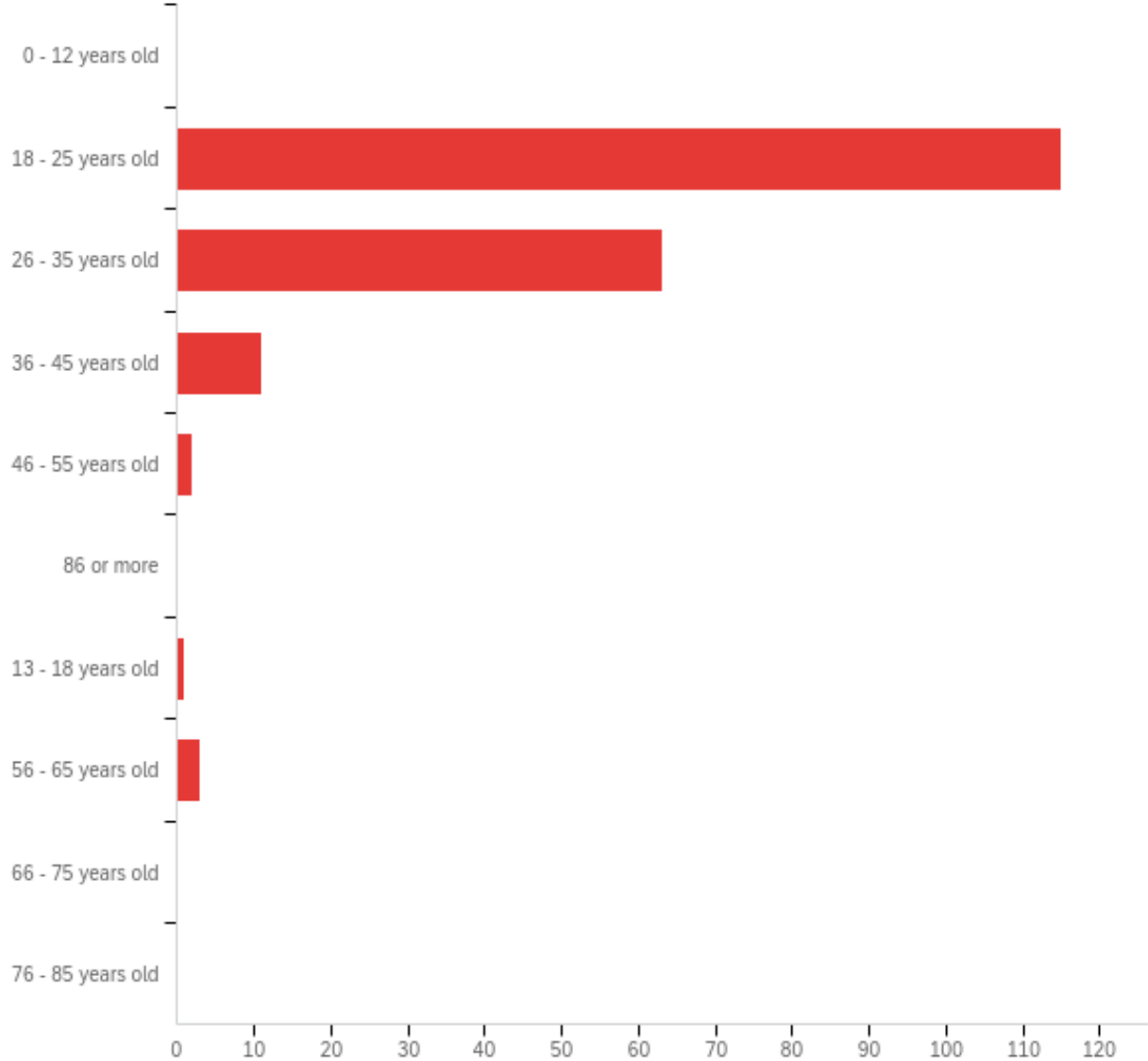
Q16 - Please indicate your nationality Single Choice



#	Answer	%	Count
8	German	100.00%	195
	Total	100%	195

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Please indicate your nationality Single Choice	89.00	89.00	89.00	0.00	0.00	195

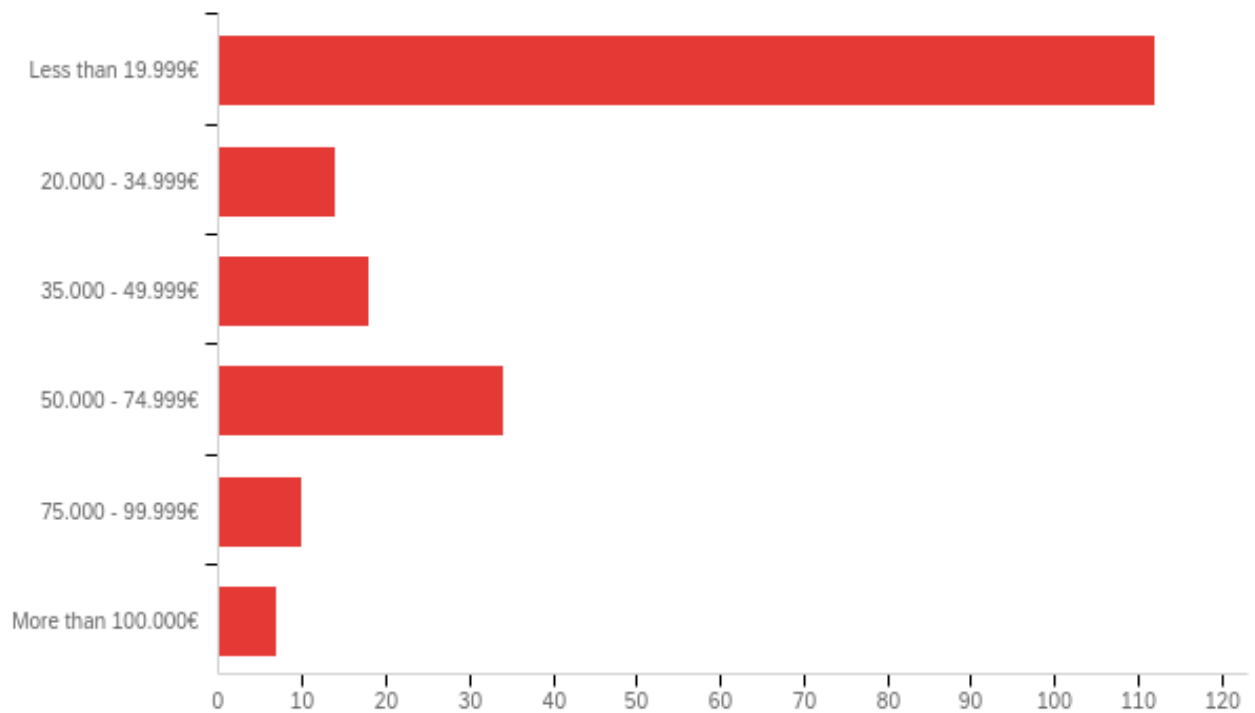
Q17 - Please indicate your age group Single Choice



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Please indicate your age group Single Choice	2.00	8.00	2.58	0.99	0.98	195

#	Answer	%	Count
1	0 - 12 years old	0.00%	0
2	18 - 25 years old	58.97%	115
3	26 - 35 years old	32.31%	63
4	36 - 45 years old	5.64%	11
5	46 - 55 years old	1.03%	2
6	86 or more	0.00%	0
7	13 - 18 years old	0.51%	1
8	56 - 65 years old	1.54%	3
9	66 - 75 years old	0.00%	0
10	76 - 85 years old	0.00%	0
	Total	100%	195

Q18 - Please indicate your yearly gross income level Single Choice



#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Please indicate your yearly gross income level Single Choice	1.00	6.00	2.16	1.54	2.37	195

#	Answer	%	Count
1	Less than 19.999€	57.44%	112
2	20.000 - 34.999€	7.18%	14
3	35.000 - 49.999€	9.23%	18
4	50.000 - 74.999€	17.44%	34
5	75.000 - 99.999€	5.13%	10
6	More than 100.000€	3.59%	7
	Total	100%	195

Q19 - Please indicate the highest level of education that you have completed
Single Choice

#	Field	Minimum	Maximum	Mean	Std Deviation	Variance	Count
1	Please indicate the highest level of education that you have completed Single Choice	1.00	6.00	3.99	0.87	0.76	195

#	Answer	%	Count
1	No degree	1.54%	3
2	Apprenticeship	3.59%	7
3	High-school graduate	17.95%	35
4	Bachelor's	48.21%	94
5	Master's	28.21%	55
6	PhD	0.51%	1
	Total	100%	195

