SECURITY AND PERFORMANCE IN CRYPTOCURRENCY EXCHANGES

A comparative analysis of key factors

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Työn nimi Turvallisuus ja suorituskyky kryptovaluuttapörsseissä: Vertaileva analyysi avaintekijöistä

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Tämän opinnäytetyön tarkoituksena oli selvittää miten erilaiset kryptovaluuttapörssit muodostavat markkinoiden segmentointistrategian käyttämilleen turvaominaisuuksille ja teknologialle. Tarkoituksena oli myös selvittää miten kryptovaluuttapörssit luovat kestävän kilpailuedun välityspalkkioiden, käyttökokemuksen, ja suorituskykyilmaisimien suhteen.

Opinnäytetyön teoreettisessa viitekehyksessä esitellään tärkeimmät tutkimuksessa käytetyt teoriat, sekä kerrotaan aiheeseen liittyvää tietoa kryptovaluuttaekosysteemistä, turvaominaisuuksista, suorituskykyilmaisimista, teknologiasta, käytännöistä ja määräyksistä.

Tutkimus tätä opinnäytetyötä varten tehtiin tapaustutkimuksena, jossa tehtiin vertaileva analyysi kahdesta erilaisesta kryptovaluuttapörssistä, Binancesta ja Coinbasesta. Lisäksi, tämä opinnäytetyö hyödyntää kvalitatiivisia haastatteluja, joissa haastateltiin eri kryptovaluuttapörssien asiakkaita. Haastattelujen tarkoituksena oli saada syvempi ymmärrys yksittäisten asiakkaiden kokemuksista ja mielipiteistä koetuista turvallisuusominaisuuksista, teknologioista, sekä suorituskykyilmaisimista eri kryptovaluuttapörsseissä.

Tutkimuksessa havaittiin, että erityyppiset kryptovaluuttapörssit muodostavat markkinoiden segmentointistrategian käyttämilleen turvaominaisuuksille ja teknologialle seuraavilla menetelmillä: vähemmän edistyneille käyttäjille kryptovaluuttapörssit tarjoavat turvallisuutta ja helppokäyttöisyyttä. Edistyneemmille käyttäjille kryptovaluuttapörssit tarjoavat kehittyneitä kaupankäyntivaihtoehtoja, kilpailukykyisiä hinnoittelumalleja välitysmaksuille, sekä mukautettavia käyttöliittymiä. Kryptovaluuttapörssit luovat kestävän kilpailuedun välityspalkkioiden, käyttökokemuksen, ja muiden suorituskykyilmaisimien suhteen seuraavilla menetelmillä: tarjoamalla kilpailukykyiset hinnoittelumallit välityspalkkioille, jotka perustuvat kaupankäyntivolyymiin, sisäänrakennettua teknologiaa kuten omia kryptovaluuttoja joiden käyttäminen antaa käyttäjälle alennuksia välityspalkkioista, sekä tarjoamalla alan parhaat turvaominaisuudet asiakkailleen.

Avainsanat Kryptovaluutta, turvallisuus, suorituskyky
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International Business — Abstract
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Subject Security and Performance in Cryptocurrency Exchanges: A comparative analysis of key factors
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The purpose of this thesis was to research how different types of cryptocurrency exchanges formulate a proper market segmentation strategy for the security features and technologies that they use. In addition, the purpose of this thesis was to research how cryptocurrency exchanges create a sustained competitive advantage in terms of fees, user experience, and other key performance indicators.

The theoretical framework introduced the main theories used for the research: the Porters Five Forces analysis, the VRIO framework, the resource-based view, and the market segmentation theory. In addition, related information regarding the cryptocurrency ecosystem, security features, key performance indicators, technology, policies and regulations were briefly explained.

The research for this thesis was conducted in the form of a case study, in which the author did a comparative analysis of two different cryptocurrency exchanges, Binance and Coinbase. In addition, this thesis utilizes qualitative interviews, where the author interviewed customers of different cryptocurrency exchanges. The purpose of the interviews was to establish a deeper understanding of the state of individual customer's opinions and experiences on the perceived security features, technologies, and key performance indicators in different cryptocurrency exchanges.

The research shows that different cryptocurrency exchanges formulate a proper market segmentation strategy in terms of the security features, and the technologies that they use by the following methods: for the less advanced users, cryptocurrency exchanges offer security and convenience. For the more advanced users, cryptocurrency exchanges offer advanced trading options, competitive fee pricing models, and customizable user interfaces. In addition, cryptocurrency exchanges create sustained competitive advantages in terms of fees, user experience, and other key performance indicators by the following methods: by offering competitive fee pricing models that are based on trading volume, built-in technologies such as their own cryptocurrencies that allocate discounts to the users in terms of fees, and the best security features in the industry for their customers.

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Content

Figures

Appendices

1 Introduction

The global cryptocurrency market has grown and developed in an explosive manner ever since the Bitcoin white paper was published in 2009 by Satoshi Nakamoto. Because of such rapid growth and development of new cryptocurrencies, there is a lack of available research to be studied, and the majority of the research published is often already outdated. Due to the fact that Bitcoin is generally considered to be the most popular cryptocurrency, most of the existing research is done with a focus on Bitcoin. However, the problem is that the existing research often gets outpaced by the advancement in technology, new policies and regulations influencing the cryptocurrency markets set in place by governments. (Farrell, 2015, p.3)

After Bitcoin was introduced to the public in 2009, by the year 2014 more than 64 000 businesses in the United States were accepting payment in the form of Bitcoin, offering an alternative method of payment alongside the U.S. dollar, which is the government-issued currency also known as fiat money. The ongoing momentum in the widespread adoption and popularization of Bitcoin took a plunge, as the largest Bitcoin exchange at that time, Mt. Gox, filed for bankruptcy during the same year. The initial reason leading to the bankruptcy of the exchange was that MT. Gox reportedly lost custody of the customer's Bitcoin worth 500 million USD at the time due to a security breach. The event caused widespread distrust and uncertainty in the future of Bitcoin and the cryptocurrency markets. The opportunities of the new technology presented by Bitcoin brought along risks that were clearly not understood well enough yet at all. (Badev & Chen, 2014, p.1-2)

Due to the fact that the majority of the studies focus on researching the competition between different cryptocurrencies, only a minimal amount of focus is placed on the research of competition between different cryptocurrency exchanges. As the popularity among cryptocurrencies is only growing, it is vital to conduct more research in order to gain a better understanding of the key factors in terms of competition between cryptocurrency exchanges. For the cryptocurrency industry as a whole, competition between large-scale cryptocurrency exchanges would only bring healthy benefits in terms of market fragmentation. In order for governments to be better able to regulate cryptocurrency exchanges in the future, a proper understanding of the state of competition between the leading cryptocurrency exchanges has to be established first. However, it is important to note that due to the fact that

cryptocurrencies are decentralized, any direct attempt to regulate cryptocurrencies itself can be deemed useless. (Janze & Gvozdevskiy, 2017, p.1-2)

The development and upbringing of the possibility of using cryptocurrencies as a form of payment, in contrast to traditional fiat money, has raised concern from the perspective of the central banks. Where the banks previously held a power of monopoly in the regulation and issuance of currency, the possibility to store value in cryptocurrencies and use them for payment purposes raises the question of how the cryptocurrencies should be regulated to ensure customer protection. The impact of widespread cryptocurrency adoption in the future is a topic of discussion in the modern day and is talked about by politicians, specialists in the financial markets and economists. As with all advancements in terms of technology, the response of different stakeholders varies depending on several factors. The younger generation that has grown up with modern technology can be assumed to be more accepting and welcoming of cryptocurrencies and the technology behind them, in contrast to the older generation, that grew up with the traditional financial structure. (Zekarias, 2022, p.6)

The value of Bitcoin has been volatile ever since it was traded for the first time, and every now and then the price continues to increase and decrease explosively in a matter of months, weeks or even days. This phenomenon is seen as an opportunity by some investors looking to capitalize on the volatility, but also as a threat by other investors who believe that the risks outweigh the opportunities in the long term. There has been a lot of research around the question of what the true value of Bitcoin is, and if there is an ongoing bubble in the price. However, just like the traditional fiat currency, the consensus is that cryptocurrencies are only worth what the traders are willing to pay for them, as both currencies are not backed by anything, but still have a positive value. (Gronwald, 2021, p.12-13)

1.1 Research question

The main research question for this thesis is: How do different types of cryptocurrency exchanges formulate a proper market segmentation strategy for the security features and technologies that they use?

The secondary research question is: How do cryptocurrency exchanges create a sustained competitive advantage in terms of fees, user experience, and other key performance indicators?

1.2 Research objectives

The primary objective of the research was to analyze how different types of cryptocurrency exchanges formulate a proper market segmentation strategy for the security features, and technologies that they use.

The secondary objective was to analyze how do cryptocurrency exchanges create a sustained competitive advantage in terms of fees, user experience, and other key performance indicators.

The cryptocurrency markets experience a lot of volatility in terms of cryptocurrency prices. In addition, many new traders enter the market without enough understanding of how cryptocurrencies work or have knowledge of the technology behind cryptocurrencies. The author was inspired to research about the topic of this thesis after one of the biggest cryptocurrency exchanges in 2022, the FTX cryptocurrency exchange, filed for bankruptcy. This caused a series of events where the price of Bitcoin and other cryptocurrencies plummeted following the news of the bankruptcy. This left many customers of the cryptocurrency exchanges with the question that which cryptocurrency exchanges could be trusted, if any. In addition, the question around the fact that if the only safe form of holding cryptocurrencies would be in their own custody in offline wallets in the future. By conducting this research, the author can provide more information about the differences between cryptocurrency exchanges in terms of their security features, technologies, and how they compare with one another in terms of the key performance indicators.

1.3 Limitations

The limitations in conducting the research revolve around the fact that the existing research of the cryptocurrency markets is still scarce. In addition, any existing research often gets quickly outdated as the markets and technology are still constantly developing. In addition, as stated by (Janze & Gvozdevskiy, 2017, p.1-2) while the majority of the studies conducted focus on studying the competition between different cryptocurrencies, there is only a small amount of studies revolving around the competition between cryptocurrency exchanges. The research was conducted by the author of this thesis by identifying and analyzing any existing research, publications and literature on the cryptocurrency markets and technology. In the selection of the existing research to be used in this thesis, any studies published in the last 10 years were given priority in terms of being used as sources.

1.4 Significance of the research

The volatile price fluctuation of Bitcoin as well as other cryptocurrencies has sparked the interest of many new investors looking to enter the world of cryptocurrency investing and trading. However, the problem is that there is a general lack of understanding what cryptocurrencies such as Bitcoin are, and what is the technology behind them. Because of the price volatility, where the price of Bitcoin can increase or decrease drastically in just a single day, people who are not familiar with the technology can develop a negative opinion of the cryptocurrencies in question. Due to the recent collapse of the FTX exchange in 2022, the saying “not your keys, not your coins” has gained a lot of attention in the world of cryptocurrencies. Traders have the option to either let the exchange they are using hold the cryptocurrency in their custody, or they can set up their own offline wallet which can be accessed with their personal string of words, as in a private key. (Key, 2022)

1.5 Definitions

Cryptocurrency is a virtual or digital currency that uses cryptography for security, making the currency challenging to counterfeit or double-spend. Cryptocurrencies are decentralized, which means that they operate independently without a central bank in the middle between the sender and the recipient. (Nakamoto, 2008)

Bitcoin was created by Satoshi Nakamoto in 2008 along the publication of the Bitcoin white paper. In the article (What is Bitcoin? 2023) the author explains Bitcoin in a simple concept: “Bitcoin is digital money that allows for secure peer-to-peer transactions on the internet.”

Centralized exchange (CEX) is a type of cryptocurrency trading platform where you can buy and sell cryptocurrency. Centralized exchanges are typically owned and operated by a single entity that controls and facilitates the trades between users. Customer funds and cryptocurrencies are stored and protected in the custody of the exchange. (The State of Centralized Exchanges, 2021)

De-centralized exchange (DEX) is a type of cryptocurrency marketplace where trades are facilitated directly peer-to-peer (P2P) between two users without any entity controlling the transaction in the middle. De-centralized exchanges realize one of the core points of cryptocurrency which is the ability to make financial transactions that are not controlled by any kind of middlemen. (What is a DEX, 2023)

Software wallet is a cryptocurrency wallet that is connected to the internet (online) and typically a program that is installed on the computer of the user. Software wallets can be compared to digital bank accounts, but only the user holding the private key generated by the wallet is able to access the cryptocurrency stored in the wallet. Software wallets are commonly known as soft wallets, online wallets, or hot wallets. (Iredale, 2021)

Hardware wallet is a cryptocurrency wallet that is not connected to the internet (offline) and typically physical devices that resemble a USB stick but can also be a simple piece of paper that the private key is written on. Hardware wallets are commonly known as hard wallets, offline wallets, and cold wallets. (Hardware wallets explained: How they work & how to use them like a whale, 2022)

2 Theoretical Framework

In this section, the main theories for this research have been introduced, and the author briefly explains the basic security measures and key performance indicators in order for the reader to be able to further understand the key factors to be analyzed. This section also provides general information about the types of analyzing tools used in the process of implementing the comparative analysis of key factors.

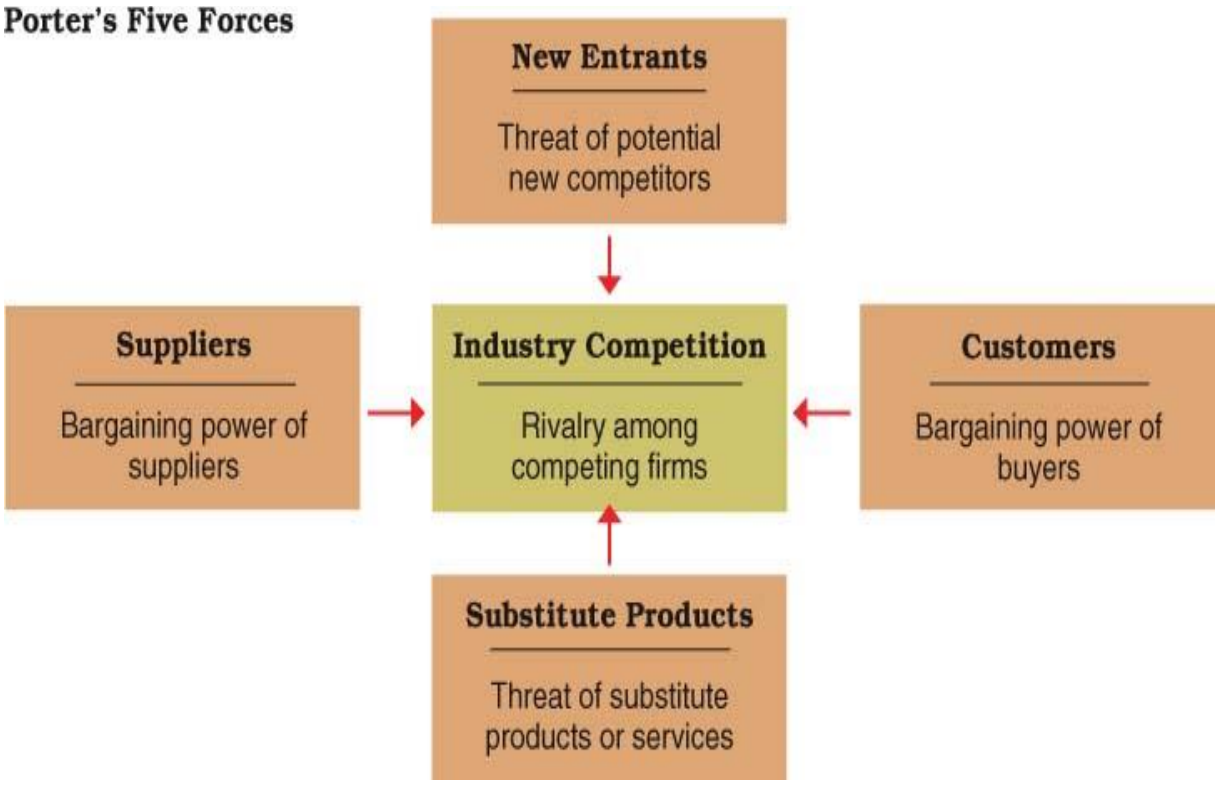
In addition, related information regarding the cryptocurrency ecosystem, technology, policies and regulations were briefly explained in this section.

2.1 Porters Five Forces

Porters Five Forces is a tool utilized by companies and businesses to calculate and identify competition in the industry that their business is practiced in. It is vital to identify all the players that have influence on the specific industry to effectively be able to plan, execute and adjust the planned strategy. In the areas that the business is already strong can be taken advantage of and fortified further, yet also by identifying the weaknesses the direction can be avoided in the future and taking steps towards strengthening the existing weaknesses. Porters Five Forces was introduced by Michael Porter in 1980, and the tool has been widely adopted for use ever since its creation. (Porters Five Forces – The framework explained, 2023)

As visualized in the graph below (Figure 1) the author has introduced the five forces that identify the most vital points in terms of any business being able to compete with its rivals in any industry.

Figure 1 – Porters Five Forces (Porter, 2008)



Competitive rivalry - The first part identifies and analyzes the amount and scale of influence of the specific competitors in the industry. In more competitive markets, businesses can use more aggressive options to seek increased market share and customers by lowering prices or placing great effort on marketing campaigns to overshadow competitors.

Supplier power - The second part discusses the fact that in principle the more suppliers a business can choose from, the less power each of the suppliers has. If a business only has a single supplier providing a particular item or service, the supplier has more power where the supplier can increase the price of the provided item or service or fluctuate the quality of their provided service and items.

Buyer power - The third part is similar to supplier power but from the perspective of the buyers. The more buyers a business has, the less power the buyers have. If a business has only a few buyers who make up most of the revenue for the business, the said buyers have higher power over the business because of the threat of deciding to buy from somewhere else potentially.

Threat of substitution - The fourth part aims to identify the chances of any new competition in the market that could substitute the products or services that a specific business is providing, or if the customers of the same business find the same offer from an alternative supplier for a lower price, with better delivery terms or better customer service for example.
Threat of new entry - The fifth and final part of Porters Five Forces talks about the possibility of a new or an existing competitor in the same industry looking to make a move. If a business has already established a strong presence in the market of their industry and is a known practitioner, it is more difficult for an upcoming business to push themselves in the same market. In contrast, if the company's presence is weak in the market, a new competitor entering the market will have to use less starting capital and effort to gain the attention of the customers. Offering lower prices, better delivery terms or higher quality could lead to existing customers of the old company taking their business to the new company. (Porter, 2008)

2.2 VRIO Framework

The VRIO framework was first introduced by Barney, J.B in 1991 in his publication "Firm Resources and Sustained Competitive Advantage." The 'VRIO' term means value, rarity, imitability and organization. According to Barney, as visualized in the graph below (Figure 2) these four factors determine if a business will be able to sustain competitive advantage in the long term. (Jurevicius, 2023)

Figure 2 – VRIO Framework (Barney, 1991)

Summary of VRIO, Competitive Implications, and Economic Implications					
Valuable?	**Rare?**	**Costly to Imitate?**	**Organized Properly?**	**Competitive Implications**	**Economic Implications**
No			No	Disadvantage	Below Normal
Yes	No		↕	Parity	Normal
Yes	Yes	No	↕	Temporary Advantage	Above Normal (at least for some amount of time)
Yes	Yes	Yes	Yes	Sustained Advantage	Above Normal

Value – If the resource that a business is offering brings value to the customer, then it can be considered valuable. If such a proposed service or product does not bring value to the customer, there is no reason to implement said service or product because they are not competitive in terms of business.

Rare – If the resource that the mentioned business is offering is rare, as in not many of the competitors in the specific industry offer the resource, the resource can be considered rare. In the case that such a proposed resource already has value and can be considered rare, there is already a competitive advantage for that specific resource.

Imitability – If the proposed resource is difficult to imitate by competitors in the market, the resource can be considered to have a competitive advantage. The competitors in the market could attempt to imitate such a product or service by duplication, as in offering the same product or service at a cheaper price. The other method of possible imitation is substitution, where the competitor could offer a similar product or service at a cheaper price.

Organization – None of the three aforementioned factors offer any advantage for the business if the business lacks organization and is not able to take advantage of the value provided by the three advantageous aspects. The business has to be organized in order to maximize the potential of the proposed product or service that has value, is rare and is difficult to imitate. (Jurevicius, 2023)

2.3 Resource-based view

Resource-based view (RBV) was introduced as a framework to be utilized in the process of conducting research in terms of strategic management by Jay Barney in 2001. RBV has a significant influence in terms of strategic management due to the central proposition of the framework that the unique resources and capabilities provided by a company are the key to achieving sustained competitive advantage. In the process of determining the validity of unique resources and capabilities, Barney emphasizes the importance of the assessment of resources and capabilities that provide value, are rare, hard to imitate and difficult to substitute. However, due to the fact that resources and capabilities will without a doubt evolve over time for better or worse, the importance of keeping a dynamic perspective in terms of the RBV framework is of top importance. In addition, various external factors such as the current conditions in the specific industry can have a negative or a positive impact on the current competitive advantage of a business. Companies should not only solely rely on the RBV framework but utilize and integrate the framework with other assessment tools and

frameworks in order to reach the best understanding of the current issues and possibilities in terms of strategic management. (Barney, 2001)

2.4 Market segmentation theory

In the modern day where the amount of information available is only constantly increasing, businesses are presented with the challenge of finding their respective target markets. This is due to the fact that it is not possible for a business to cater to all customers in terms of diverse markets with high competition. In addition, the process of businesses identifying their correct market segment is considered to be the key factor in reaching success in terms of marketing. (Lauzon, 2020) The main principle of market segmentation theory is well-defined by (Kotler & Keller, 2016, p. 268) “Market segmentation divides a market into well-defined slices.” While some companies go with the strategy of full market coverage, where a business takes on the objective of serving all kinds of customers with all and any products that they might be interested in, the other “slices” consist of multiple segments, single segments and individuals as the segments. By utilizing proper market segmentation, businesses have a better chance in the process of building a stronger brand. Every business should slice their respective markets into segments and place their efforts in the correct segment which will enable them to reach a stronger position among the customers in the selected market. (Lauzon, 2020)

2.5 Market structure

MT. Gox was the first exchange where Bitcoin was traded, and the exchange eventually became so popular among traders and investors, that Mt. Gox was handling 80% of all the transactions done in the years leading up to 2014. However, after MT. Gox lost the custody of 850,000 bitcoins worth 450 million USD at that time due to a security breach, the trust in cryptocurrency exchanges took a hit and the price of Bitcoin plummeted. (Nica et al., 2022, p.5)

Before the downfall of Mt. Gox, a large percentage of the remaining volume in the cryptocurrency markets was traded in two exchanges located in China, the BTC China and OkCoin exchanges. However, as a result from the event where the People’s Bank of China announced the ban of financial institutions permission to facilitate Bitcoin transactions, BTC China lost the majority of the trading volume taking place in the exchange. The majority of the volume taking place in BTC China previously shifted over to the smaller exchange

OKCoin at the time. After the Mt. Gox exchange ceased its operations as a result of the bankruptcy, the cryptocurrency market was open for new or already existing exchanges to step up to facilitate the trading of cryptocurrency. The majority of the trading volume of Bitcoin-USD was divided into the hands of three exchanges: BTC-e, Bitstamp and Bitfinex. (Gandal & Halaburda, 2015, p. 18)

In the following years, the interest towards cryptocurrencies started to gain more momentum once again as the price of Bitcoin kept increasing in a slow but steady manner. From the lows of 152 USD per Bitcoin in January 2015, the price reached 434 USD in January 2016. (Jones, 2023) In this chapter, the author introduced the two leading cryptocurrency exchanges at the time of writing this thesis, which are Binance and Coinbase.

2.5.1 Binance

The Binance cryptocurrency exchange was founded by Changpeng Zhao in 2017. Only 180 days after the launch of Binance, the exchange was already the leading cryptocurrency exchange ranked by volume. (Binance, 2023). Binance emphasizes a primary focus on altcoin trading, therefore in the exchange, the traders have the availability of trading between 350 cryptocurrencies as of 2023. As a result of the high trading liquidity in Binance, the exchange is able to offer low trading fees among all the cryptocurrency exchanges. Among trading, Binance offers other services for the users which include Binance earn, lending, smart pool and Binance Coin. The Binance exchange was banned in the United States in 2019 due to concerns regarding various regulations, which resulted to the launch of Binance.US. Following this, Binance does not allow any of the global users outside Binance.US to deposit U.S. dollars as of 2023. (Peters, 2023)

2.5.2 Coinbase

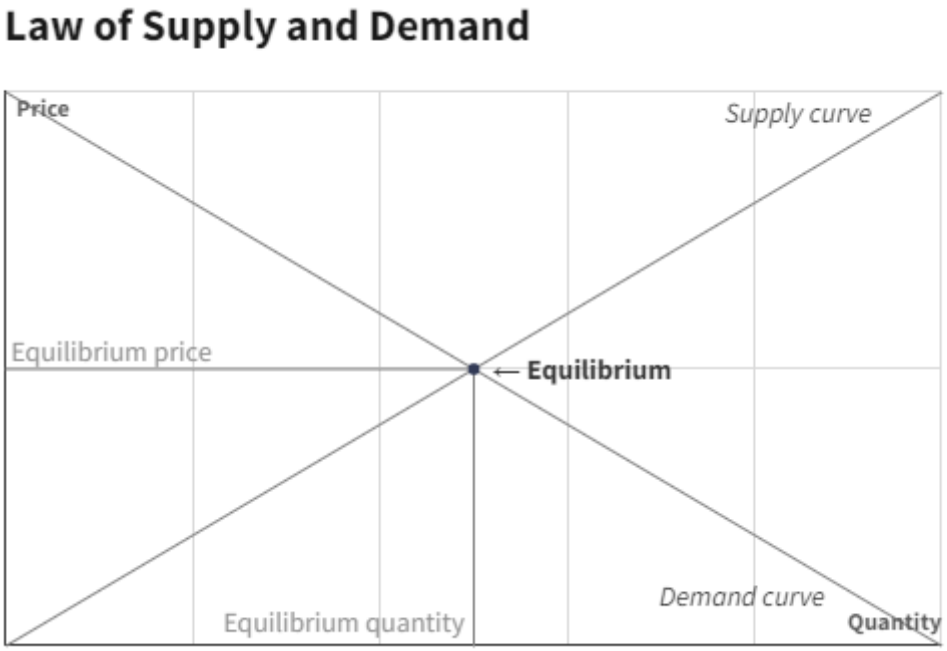
The Coinbase cryptocurrency exchange was founded in 2012 by Brian Armstrong. The exchange started to gain momentum initially after launching, and already by the year 2014 the exchange had acquired one million users. Coinbase is an exchange that primarily serves the purpose of buying, selling and trading cryptocurrencies. The users of the exchange have the option of trading more than 100 various cryptocurrencies as of 2023. Among cryptocurrency trading, the exchange offers other services including cryptocurrency investing and custody services for companies. Coinbase was involved in multiple controversies at the beginning of 2021, and the Office of Foreign Assets Control filed numerous complaints to the

exchange regarding compliance and regulations. In the same year, Coinbase was listed publicly in the Nasdaq exchange and thus became the first publicly listed cryptocurrency exchange. (Bales, 2023)

2.6 Economic theory

The law of supply and demand has a direct effect on any specific asset, product or resource that has a positive value. When the price of said asset decreases, the supply lowers which leads to the fact that the demand will grow. On the other hand, when the price of the asset increases, supply increases and eventually the demand will decrease. As can be visualized from the graph of the law of supply and demand (Figure 3) at the equilibrium, where the curves meet, price discovery is reached where supply meets demand. In order for a purchase of any specific asset, product or resource to happen the price has to be agreed upon by both the buyer and the seller. However, the price volatility of such assets is not always in proportion to the law of supply and demand. Products or services that are necessary in the everyday lives of consumers have less price elasticity because they are required, and by that, the demand for them will not change as drastically even though the price fluctuates. In contrast, products or services that are not necessary in the everyday lives of consumers have more price elasticity, as they are not mandatory to be acquired when the price has increased. (Fernando, 2023)

Figure 3 – Law of Supply and Demand (Fernando, 2023)



2.6.1 Bitcoin price volatility

As visualized by the graph below that displays the price of Bitcoin (Figure 4), after Bitcoin was launched in 2008, the price slowly creeped up eventually reaching 1.06 USD in February 2011. Followed by this, the price slowly decreased back down to 0.87 USD. In the same year, Forbes.com posted a news story about Bitcoin, which lead to the first drastic increase in the price of Bitcoin as the price increased from 0.86 USD to 8.89 USD in just two months. The first event in the history of Bitcoin price volatility had taken place. As of June 2011, Gawker.com posted a news article about Bitcoin and the use of Bitcoin in the black markets and drug trade, which lead to the price of Bitcoin increasing from about 9 USD to 27 USD in just a single week. For the following years, the price of Bitcoin displayed great volatility as the price kept fluctuating between 100 USD and 1200 USD. (Jones, 2023)

Figure 4 – Price of Bitcoin 2011/2023. (CoinMarketCap, 2023)

One of the most notable events in terms of the history of the price volatility of Bitcoin took place in 2014, when the biggest Bitcoin exchange, the Mt. Gox exchange, filed for bankruptcy. The reason for the collapse of the exchange was that Mt. Gox reportedly lost custody of 850,000 Bitcoins due to a security breach, which resulted in the price of Bitcoin plummeting as the fear of buying grew in the cryptocurrency markets. Because of the fear in the markets, in the following 3 years, the price of Bitcoin remained relatively stable and nothing notable happened before 2017. In the same year, when the cryptocurrency exchange Binance was launched, the price started to increase from around 2700 USD all the way up to almost 20,000 USD in a matter of 4 months. The drastic increase in the price resulted in news articles, that led to publicity, which in turn created discussion about the various cryptocurrencies and their possibilities. However, discussion about security concerns in the future, and the ones that took place in the past was a hot topic. These discussions started the gradual decline in the price once again, and the price of Bitcoin decreased to 3700 USD by the end of the year 2018. The volatility in the price of Bitcoin was interpreted as a signal to stay away by some, but others saw it as a possibility. At the end of 2020, a company called MicroStrategy announced the purchase of Bitcoins worth 250 million USD at the time. This was the start of the biggest bull run in the price so far, where the constant increase in the price of Bitcoin gained more and more momentum. At the beginning of 2021, a company called Tesla announced the purchase of 1.5 billion USD worth in Bitcoin. In November 2021, the price of Bitcoin reached its all-time high of 69,000 USD. (Jones, 2023)

2.7 Security measures

Information is one of the most important assets of any organization. To keep that information safe from breaches and misuse, organizations must take precautionary actions to ensure the safety of the information in their possession. Yet the same information still has to be accessible, manageable, and secured for the people who have the right to access said information. This can be achieved by organizations with the process of offering various security measures in place to prevent any attempted security breaches. (Topalov et al., 2015)

The flood of new investors interested in Bitcoin and the cryptocurrency markets raises the threat of cybercrime at an alarming rate. There is no argument against the fact that cryptocurrency exchanges should prioritize the effectiveness of their security measures, which the author explains more in-depth in the following section. (How to Secure a Cryptocurrency Exchange, 2022)

2.7.1 Two-factor authentication (2FA)

Two-factor authentication (2FA) can be defined as an extra layer of security on top of the traditional password. How the process works, is that after a user has entered the username and password, the system will prompt the user to provide additional information to confirm that the user trying to access the system is the actual user. In the article (What is Two-Factor Authentication (2FA), 2023) the author has mentioned three common categories that the 2FA can be utilized in.

Something the user knows: The user can come up with any information that is personal, which could be for example an answer to a secret question, a specific pattern of how they connect certain dots on the login screen or the traditional personal identification number (PIN).

Something the user has: A common method is that the system that the user is trying to access sends a code via text message to the mobile phone number that the user has provided during the creation of their account. After receiving the text message, the user enters the code and is granted access if the code matches the code that the system initially sent.

Something the user is: Modern mobile phones are often equipped with biometric recognition systems that can scan the voice, fingerprint or iris pattern belonging to the authorized user. (What is Two-Factor Authentication (2FA), 2023)

2.7.2 Cold storage

Cold storage can be defined as storing cryptocurrency in a wallet that is not connected to the internet (offline). The common form of offline wallet is an USB-stick that can be connected to a computer but can also be a simple piece of paper that the private key is written on which is known as a paper wallet. The idea behind cold storage is that if a wallet is not connected to internet, the risk of a breach is minimized as the wallet can't be accessed remotely. Because cryptocurrencies are decentralized, the sole responsibility of storing them is on the owner. If the owner loses access, forgets the private key, or has the cryptocurrencies stolen, there is unfortunately no procedure to get the cryptocurrencies back. By no means cold storage is only used by private investors, but also one of the most secure ways for cryptocurrency exchanges to store the majority of cryptocurrencies held in their possession. (Daly, 2021)

2.7.3 Multi-signature

When a traditional cryptocurrency wallet only has a single private key to approve transactions, in multi-signature wallets every transaction requires minimum of two private keys to approve any transaction from the wallet. Multi-signature creates a layer of security on top of all the existing security measures set in place by making any attempt of breach difficult because of the multiple signatures required to access the cryptocurrency. This security measure is a valid option for long-term holding of high amounts of cryptocurrencies by big organizations or groups that have operations worldwide. (What are multi-signature wallets and how do they work, 2022)

2.7.4 Encryption

Encryption is the process of disorganizing data, text or information in a way that only the recipient or any authorized party is able to re-organize the information back to its original form. To encrypt a message, the process requires a cryptographic key that consists of mathematical values that are agreed on by the parties involved. There are two types of encryptions commonly used which are known as symmetric encryption and asymmetric encryption. Symmetric encryption only utilizes one key that is used to both encrypt and

decrypt the information. Asymmetric encryption uses a key for encryption, and another separate key for decryption after the information is delivered in its encrypted form. In the article the author divides the necessity of information encryption in three different sections:

Security - In the event of a security breach where data or information is accessed without authorization, the information is still in its encrypted form and rendered useless for the parties involved in the breach without the key to decrypt the data. Encryption also makes it possible for the parties involved in a communication to exchange sensitive information.

Privacy - The sole purpose of encryption is to restrict the access of unwanted parties to any certain data or information. The protection of user privacy is an important factor when sending sensitive information that could be accessed unwantedly by internet service providers, networks or even governments.

Regulations - Because of both security and privacy reasons many regulations in the modern day require any organization or business that handles user data to keep all the information encrypted, which minimizes the unwanted access and theft of data effectively. (What is encryption, 2023)

2.7.5 DDoS protection

Distributed denial-of-service (DDoS) attack is the process of an attacker attempting to flood a targeted website, service or for example a cryptocurrency exchange by disrupting the normal amount of traffic handled by the recipient. The key to effectively implement security protocols against DDoS attacks is to make sure the security feature does not restrict the access of regular website visitors and customers. The sole point of a DDoS attack is to mask the flooded traffic as regular website visitors, which makes it difficult to only restrict the attackers access to the target service. Examples or DDoS protection include blackhole routing, rate limiting, web application firewall and anycast network diffusion. (What is a DDoS attack, 2023)

2.7.6 Security audits

Security audit is the process of evaluating the security practices and protocols set in place in the company subjected to the audit. The point of a security audit is to ensure that the implemented security measures are up to the standards set by regulations and the newest available information. In the process of a security audit the weak parts of the implemented

system often reveal themselves, and action can be taken to prevent any unwanted attackers from being able to take advantage of the weakness of the system. Security audits can typically be split into four different categories consisting of physical components like computers, smartphones, alarm systems, any software or applications used by the company, networks, and the human dimension. (What is a security audit? The basics you need to get started, 2021)

2.8 Key performance indicators

Key Performance Indicators (KPIs) can be described as the fundamental indicators that give direct feedback on the progress towards an established goal. Key performance indicators can be utilized particularly for both strategic and operational purposes because key performance indicators can help the decision-making process when they are utilized as an analytical basis. In order to utilize key performance indicators, clear targets have to be established that a particular business wants to reach. After the targets have been identified, by analyzing the chosen key performance indicators, the business in question can keep track of how the process is developing towards the established goals. There are various KPIs to be used, but all the good KPIs possess at least some of the following characteristics: the KPI is able to identify if progress is being made towards the established goal, if it is possible to assess the chosen metrics, and thus help make in the process of making decisions what specific metrics to adjust. The KPIs should also be able to track how the performance of advancement towards the established goal has changed over time. (What is a key performance indicator (KPI), 2022)

2.8.1 Fees and commissions

Cryptocurrency exchanges create revenue from every trade completed on the exchange by charging trading fees and commissions from the users trading their cryptocurrencies on the platform. The fees and commissions of different cryptocurrency exchanges vary from exchange to exchange and depend on factors such as trading volume as well as the specific cryptocurrency being traded. Typically, the higher the trading volume is in a particular exchange, the lower the trading fees are. The reason for the difference in fees and commissions between cryptocurrency exchanges can be explained by the fact, that some users are prepared to pay a little bit more for a more secure exchange with a better reputation, more flexibility and higher liquidity. Then again, other users are willing to take the

risk of cryptocurrency exchanges with less reputation, lower liquidity but also lower trading fees. (Arcane Research: The State of Crypto Trading Fees, 2020)

Cryptocurrency exchanges also have withdrawal fees of different percentages depending on the exchange. Because of the withdrawal fees, any particular user that trades their cryptocurrencies to their native currency, and withdraw the funds to their bank account, has to pay a withdrawal fee. (How cryptocurrency exchange fees work, 2023)

2.8.2 User experience

User experience design can be defined as the type of design that aims to give the best possible user experience to the user of any website or application. The process includes all the various aspects that influence the experience rendered to the user such as branding, design, how the website functions and how the website can be used. The main point of user experience revolves around the optimization of solutions that figure out the needs of the user and any possible pain points. As stated in the referenced article, there is no reason to use any kind of product that does not serve a purpose for the user. However, the designers of any certain user experience design do not have control over or have the ability to influence how the user reacts to and perceives the website in question. However, the designers have the ability to control how the website looks and operates, and how easy the website is to navigate and use. (What is User Experience (UX) Design? n.d.)

2.8.3 Trading volume

Trading volume can be defined as an indicator of how much interest there is around a specific security which can be stocks, bonds, options, currency, and cryptocurrency for example. Trading volume informs how much of a certain security, like a stock for example was traded during a single day of trading. When a security is traded many times during a trading day, means that for that specific day, the trading volume is high. When the same security is traded less, the trading volume for that day is low. Trading volume is important for any trader to keep track of because trading volume displays if other traders are also interested in the specific security. When many traders display interest in a security at the same time, the interest will lead to momentum around the specific security. Once the momentum starts to slow down, daily trading volume starts to lower too. High trading volume is a positive indicator because it means that the liquidity of the security is higher. Additionally, as there are more traders trading the specific security, leads to the fact that price of the

security will be more stable. Low trading volume, as in low interest, leads to lower liquidity and fewer buyers and sellers, which could lead to more explosive price volatility. (Rodini, 2023)

2.9 Types of cryptocurrencies

As reported by CoinMarketCap (2023) there are currently about 22,932 different cryptocurrencies in existence with the combined market cap of 1.1 trillion USD. Safe to say, since the introduction of Bitcoin in 2009, the growth of cryptocurrency industry has been phenomenal. In 2011, the first alternative coins, known primarily as altcoins, started to gain popularity especially due to an altcoin called Ethereum. Bitcoin is still to this day used more as an investment and a way of storing value, rather than to primarily do transactions with. On the other hand, Ethereum has more favorable technology to be used in transactional purposes and is widely used for that purpose. When talking about cryptocurrencies, there are cryptocurrency coins and cryptocurrency tokens. The most popular coin Bitcoin, and the most popular altcoin Ethereum, are both coins that are mined and operate on their own blockchain technology. Cryptocurrency tokens differ from the coins because they do not have their own blockchains but are merely created on already existing blockchains. In addition, cryptocurrency tokens are also stored in the blockchain. Cryptocurrency tokens work similarly to a certificate of ownership or a key. The token provides the owner of the token access to an application, or a specific service. (Hicks, 2023)

2.9.1 Tokens

There are three types of cryptocurrency tokens that all serve a different kind of purpose for the holder of the token. Value tokens work similarly as a certificate of ownership to a specific object of value, which could be a piece of digital art or music for example. Utility tokens grant a permission to the holder of the token to perform an action in a specific application, blockchain or network. Security tokens serve the purpose of proving the ownership of any specific asset. (Hicks, 2023)

2.9.2 Altcoins

Back in 2009, when Bitcoin was first introduced, every other coin in existence was considered an alternative coin to Bitcoin. However, due to the constant growth and development of the cryptocurrency industry, many things have changed. The consensus is

that not all of the cryptocurrency coins are exactly competitors of Bitcoin. Ethereum is the most popular altcoin with a market cap of 150 billion USD in the year 2023. In contrast to cryptocurrencies like Bitcoin, that just serve the purpose of being a digital form of decentralized currency, altcoins serve other purposes in addition. For example, Ethereum is a network with the primary focus of making it possible for users to operate decentralized applications in the blockchain that Ethereum operates on. (Hicks, 2023)

2.9.3 Stablecoins

Stablecoins are their own form of cryptocurrency with the objective of keeping their value as stable as possible. This is due to the fact that stablecoins are attached to the price of another form of asset. For example, a particular stablecoin that is attached to the USD should always have the value of a single USD. There are primarily two forms of stablecoins, that are known as collateralized stablecoins, and algorithmic stablecoins. Collateralized stablecoins operate in a way where a collateral holding is kept in reserve, and every time any investor decides to sell their tokens, an equal amount is taken from the collateral holding to keep the balance equal. Algorithmic stablecoins operate by utilizing algorithms to keep the price attached to the specific asset via the method of controlling the supply and demand. (Hicks, 2023)

2.9.4 Meme Coins

Meme coins are cryptocurrencies that have primarily gained popularity from various memes circulating in social media. In addition, the term meme coin is also associated with coins that gain a lot of attention in a short amount of time. The most popular meme coin is Dogecoin, that originally started as a joke. Because of the amount of attention and popularity Dogecoin gained, more meme coins started to get introduced to the market. The price volatility of meme coins is high, and much of the volatility depend on the momentum caused by influence from social media. (Hicks, 2023)

2.10 Technology

The decentralization of cryptocurrencies, such as Bitcoin, is made possible by a mechanism known as cryptography. By the same mechanism, Bitcoin is the first form of currency that can be transferred between two parties involved, without the requirement for a central authority in the middle to facilitate the transaction. The technology behind the majority of cryptocurrencies relies on blockchain technology, which the author will explain more in detail

in the next chapter below. Unlike in traditional banks, in the cryptocurrency system, the balance of each user is public information. Each individual user that is part of the network has a unique public address that the user can be identified from. In addition to the public address, the user is also provided with a private key in the process of creating their account. This private key is required to facilitate any form of transaction from the user's wallet. When a user in the network wishes to transfer cryptocurrency to another address, the process is started by the user creating a message that states the amount in question, and the destination in the system. At the same time, a "hash" is created, which is a form of code that can be used to retrieve information about the exact transaction being made. As the next step in the process, the user who initiated the transaction has to sign the message that was just created by the user via a combination of the user's private key and the message. After this, the transaction is sent to the network to be processed. In order for the transaction to be processed successfully, two things have to be confirmed first; the signature has to be valid, and there has to be enough balance in the wallet of the user that originally initiated the transaction. If both things are confirmed to be true, the transaction is successfully processed to the blockchain. (Nica et al., 2022, p.7-8)

2.10.1 Blockchain

Blockchain is a network of information made up of individual blocks, in which each of the blocks contains the information of the previous transactions completed. Once the individual blocks are made part of the blockchain, the blocks can't be changed anymore. This is also the vital part that makes blockchain technology secure. Blockchain works in a peer-to-peer network, where individual computers with a certain software installed are all connected to the blockchain. In order for a new block to be made part of the blockchain, all the individual computers connected to the peer-to-peer network take part in the process of solving a mathematical puzzle. In the event of successfully solving the mathematical puzzle, the new block is made part of the blockchain in a process known as validating. In the blockchain, where all the blocks are stringed together, is stored the information of all the transactions made in the history of the blockchain. The information of said transactions can be viewed by any individual computer connected to the peer-to-peer network via the software. The process where a new block is made part of the blockchain, commonly known as validation, is called "mining" in technical terms. (Nica et al., 2022, p. 11)

2.10.2 Mining

Because of the fact that there is no central authority in decentralized networks, the individual computers connected to the peer-to-peer network are the only ones that can add more information as new blocks to the blockchain. The process of adding a new block to the blockchain is known as “mining” which is a task that is carried out by “miners”. (Nica et al., 2022, p.12)

In the case of Bitcoin, the miners are rewarded with Bitcoins as a reward for the computing power required to facilitate the mining process. What makes Bitcoin unique, is that Bitcoin was created with the core idea, that there will ever be only 21,000,000 Bitcoins in total once all of them are mined. In the blockchain of Bitcoin, during the process where a new block is made part of the blockchain, new Bitcoins are mined. These Bitcoins are paid as a reward to the specific miners who solve the mathematical puzzles. It is speculated that once all of the 21,000,000 Bitcoins have been mined, and no longer it is possible to be rewarded with new coins, the miners in the Bitcoin blockchain will be rewarded with transaction fees from the transactions in the blockchain. (Zekarias, 2022)

2.11 Policies and regulations

The difference between a cryptocurrency such as Bitcoin, and any other currency such as the US dollar or Euro, is the fact that Bitcoin is decentralized. Decentralized means that in order to send or receive Bitcoin, the two participants involved in the transaction do not require any form of central authority to facilitate the transaction. (Nica et al., 2022, p.2)

In order to further understand the regulations and policies regarding cryptocurrencies such as Bitcoin, the author briefly explained about the taxation of Bitcoin in the USA and Europe in this chapter.

2.11.1 USA

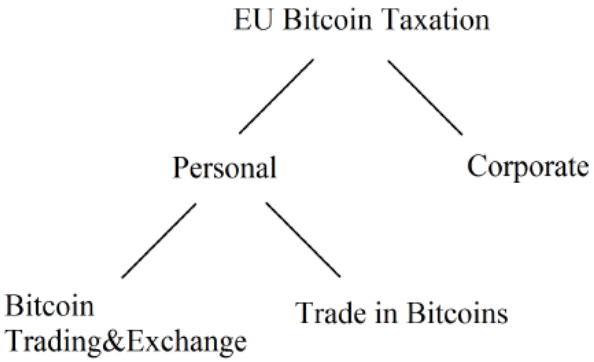
Due to the fact that Bitcoin is a decentralized form of currency, the government has no control over Bitcoin. Because of this, the Internal Revenue Service (IRS) had trouble in the process of applying tax on the traders and investors involved in the trading of Bitcoin. In order to find a solution for this, the IRS decided to apply the same form of tax to Bitcoin that is applied when purchasing a property. Bitcoins are not treated as a form of currency in terms

of taxation but as a property. In the event of purchasing, selling or mining Bitcoin, depending on the price that the Bitcoin was received or transferred, any realized gains are liable to tax. As stated earlier, Bitcoin is not considered a form of currency from the perspective of the government, but in contrast categorized as a commodity in addition. Notable examples of commodities would be gold and oil. However, Bitcoin is deemed to not have any actual value. As a form of regulation, the IRS taxes any realized gains made in the process of purchasing Bitcoins for a certain price, and eventually selling the Bitcoins for a higher price. In every transaction where Bitcoins are transferred, the participants involved in the transaction have to identify and later note the actual price of Bitcoin at the moment of the transaction in their tax report. (Zmaznev, 2017, p.28-29)

2.11.2 Europe

To have a better understanding of the taxation of Bitcoin in Europe, the process of taxation is divided in two different ways, personal and corporate as visualized in the illustration below. (Figure 5)

Figure 5 – EU Bitcoin Taxation (Zmaznev, 2017, p.30-31)



In contrast to the United States, where Bitcoin is not deemed as a form of currency, in Europe Bitcoin is considered as much a form of payment as the primary currency Euro. The process of purchasing, trading or transferring Bitcoin is not applicable to tax in Europe. However, mining, receiving or selling Bitcoin which results in profit realized from the process is applicable to tax. Several countries in the EU including Germany, Finland, Estonia, Lithuania, Slovenia and Denmark have all published national tax treatments. In the tax treatments the specified countries inform their citizens about the clear policies and regulations set on process of mining, purchasing and selling Bitcoin. (Zmaznev, 2017)

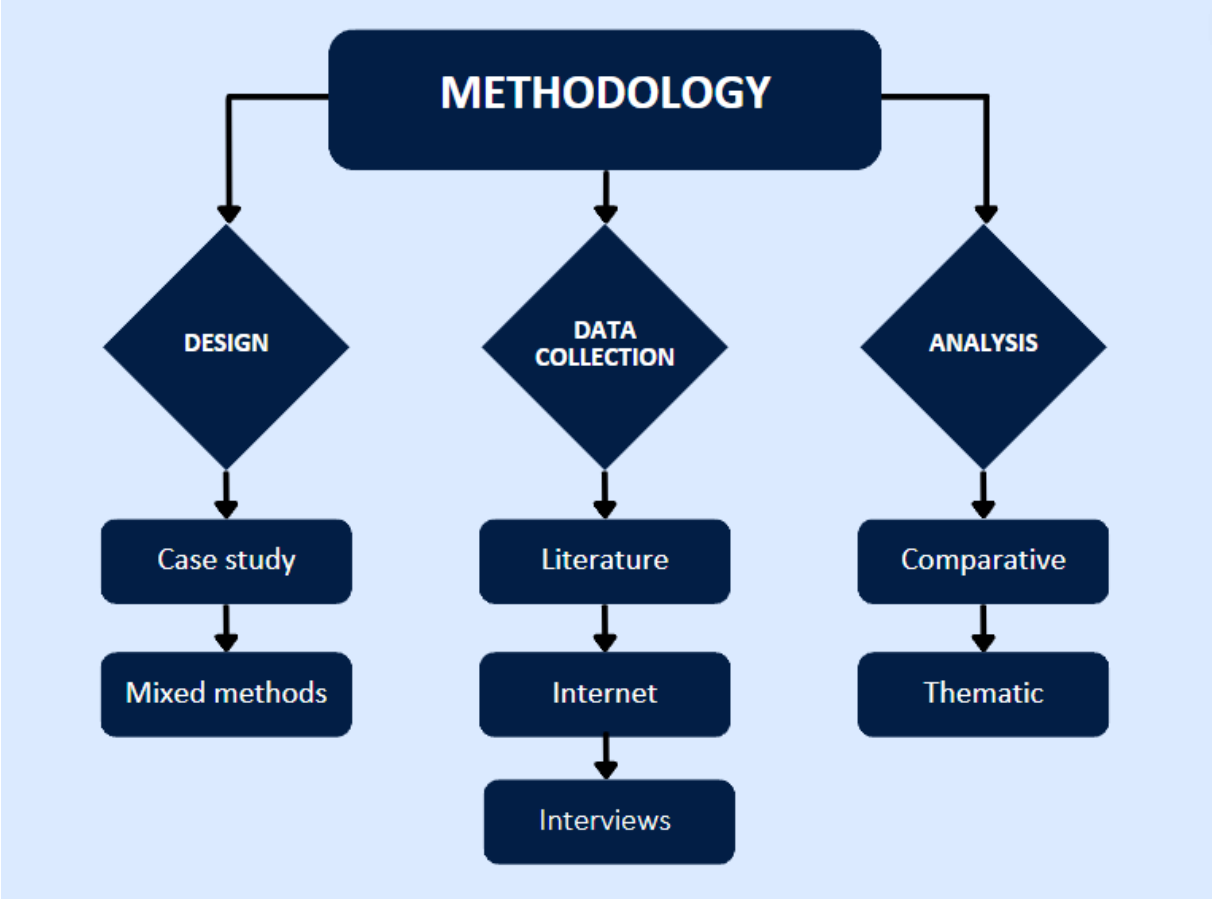
3 Methodology

3.1.1 Research methodology

In this research, the author utilized the methodology of case study in order to research how cryptocurrency exchanges formulate a proper market segmentation strategy for the security features and technologies that they use. In addition, the methodology of case study was utilized in order to research how cryptocurrency exchanges create a sustained competitive advantage in terms of fees, user experience, and other key performance indicators. Along with the case study methodology, the author selected the mixed research method to be utilized in the process of writing this thesis.

The author created the methodology flowchart below (Figure 6) in order to better visualize the methodology used in this research.

Figure 6 – Methodology flowchart (Author's own work, 2023)



The author collected the primary data via existing literature, research, publications, and other valid sources on the internet. With the primary data, the author did a Porters 5 Forces analysis, and a VRIO framework of Binance and Coinbase. Followed by this, by utilizing the data received from the use of the aforementioned tools, the author did a comparative analysis of Binance and Coinbase in terms of security features, technologies, and key performance indicators. The results of the Porters 5 Forces analysis, VRIO framework, and the comparative analysis of Binance and Coinbase are discussed in depth in the results section of this thesis.

The secondary data was collected by the author by conducting interviews with 5 individual customers from different cryptocurrency exchanges. Two of the interviews were organized face-to-face with small-scale cryptocurrency investors from the author's close social circle. The remaining three interviews were organized via voice chat in online meetings with willing respondents found from a cryptocurrency community named "Cryptocurrency". The aforementioned community is a sub-community in the online discussion website Reddit. All of the participants involved in the interviews wished to take part anonymously for personal reasons. The purpose of the interviews was to establish a deeper understanding of the state of individual customers personal opinions and experiences on the perceived security features, technology, user experience, and other key performance indicators in different cryptocurrency exchanges.

The face-to-face interviews were organized on two separate occasions, where the first interview was held on September 9th, 2023, and the second interview on September 10th, 2023. The online interviews were also organized on two separate occasions, where the first two interviews were both held on September 16th, 2023, and the third interview was held on September 21st, 2023. With the data collected from the interviews, the author did a thematic analysis of the interviews with the objective of identifying common themes in the answers of the respondents.

3.1.2 Justification of the selected research methodology

In order to accomplish the best results in the process of this study, the author selected the methodology of a case study as the research methodology. By utilizing the methodology of a case study, the author was better able to research and answer the selected research questions of this thesis. The case study methodology is an effective way to reach a deeper understanding of a certain issue or event of interest. (Yin, 2018)

Along with the case study methodology, the author selected the mixed research method to be utilized in the process of writing this thesis. The mixed research method was utilized with the objective of gathering a deeper understanding of the differences in security features, technologies, and key performance indicators in different cryptocurrency exchanges. The mixed research method was chosen because the author deemed it important to collect both types of research data. Qualitative research was used in the process of collecting non-numerical data from the primary sources of information, which include any previous research on the topic, literature, publications and the internet. In addition, qualitative research was used to collect data from the interviews in order to understand the opinions and experiences of the respondents in terms of security features, technologies, and key performance indicators in different cryptocurrency exchanges.

Quantitative research was used in the process of collecting numerical data from online sources to research the differences in the fees, trading volumes, and other quantitative variables in different cryptocurrency exchanges. In addition, quantitative research was also used in the process of analyzing Bitcoin price charts on the internet in order to study the price discovery and the history of Bitcoin price volatility. The objective of analyzing the price charts in terms of price volatility, and the price discovery of Bitcoin was to reach a better understanding of the underlying reasons causing the fluctuations of the price. The mixed research method is primarily utilized in a situation, where using quantitative or qualitative data alone does not result in the desired outcome in terms of the research. The mixed research method takes advantage of both quantitative and qualitative research methods in order to achieve a deeper understanding of the research topic in question. By the author conducting the research via the mixed research method, the results will be more credible and valid. (George, 2022)

4 Results and analysis of the research

4.1 Binance Porters Five Forces

Competitive rivalry

The competition among the leading cryptocurrency exchanges is high (Gandal & Halaburda, 2015, p. 3), and as reported by (CoinMarketCap, 2023) Binance's biggest competitors are the Coinbase, Kraken and Bitstamp exchanges. One of the reasons that make the cryptocurrency exchange industry so competitive, is the fact that switching from one exchange to another has low costs, if any. For that reason, many active traders switch between different cryptocurrency exchanges and choose to trade on the exchange that happens to be most suitable for them at the moment of trading. (Janze & Gvozdevskiy, 2017, p. 5) For the investors and traders that are registered on Binance, it is a relatively easy process with the low effort required to register a new account in any of the competing cryptocurrency exchanges. Binance mitigates the power of competitive rivalry by the following methods: Binance offers low fees, more than 350 tradeable cryptocurrencies, and many other trading options including advanced trading features. By the aforementioned methods, Binance is able to further fortify its position as the leading cryptocurrency exchange. (Binance, 2023)

Supplier power

The power of suppliers was analyzed through the cryptocurrencies, and cryptocurrency projects that are listed on Binance as tradeable coins, tokens or non-fungible tokens. As mentioned above in the competitive rivalry section, Binance has more than 350 cryptocurrencies listed on the platform, and more than 150 million registered users in 180 countries worldwide. In the event that a cryptocurrency with a large number of users would decide to not be traded on Binance, the impact on Binance would be moderate at least. However, Binance is the leading cryptocurrency exchange in terms of trading volume (CoinMarketCap, 2023), has a large number of users on the platform, and the majority of the most known cryptocurrencies are listed on the platform. These key factors make Binance an attractive exchange for any particular cryptocurrency to be listed on, which makes the power of suppliers low in terms of cryptocurrencies listed on the platform. (Binance, 2023)

Buyer power

The users on the Binance platform, who are either investors or traders, have low buyer power on the individual level. Upon registration in the Binance exchange, users have to agree to the terms and fees set by Binance. In the case that any individual investors or traders would decide to switch over to one of the competing cryptocurrency exchanges, the impact on Binance would be minimal because of Binance's large user base worldwide. However, in terms of large institutional investors, the buyer power is higher. In the event that such institution would switch over to one of the competitors, the impact on Binance would be more negative. In order to mitigate the power of buyers, Binance offers various sign-up offers for new users that incentivize them to register on the platform. In addition, Binance also offers asset management solutions for companies and institutions.

By offering the aforementioned services, Binance has better chances in terms of retaining more buyers on the exchange, while simultaneously maximizing the flood of new buyers to the exchange. (Binance, 2023)

Threat of substitution

In terms of a cryptocurrency exchange such as Binance, the threat of substitute services is relatively low. For example, a substitute service would be a peer-to-peer cryptocurrency trading platform, which is also known as decentralized exchange. The threat of substitution from such decentralized exchanges is low, due to the fact that peer-to-peer trading is also possible on Binance. In addition, Binance is able to offer many other services along with the peer-to-peer trading. (Binance, 2023)

Threat of new entry

The threat of new competitors entering the cryptocurrency market is low from Binance's point of view. In order for the new competitor to be able to operate at the level that Binance is operating on, the new exchange would require a massive amount of starting capital to even begin with. After acquiring the required amount of capital, the next step would involve a long tedious process of building their brand in the industry in order to establish trust among the investors and traders. In addition, all and any necessary licenses would have to be acquired in order to adhere to the regulations set in place by governments. (Titenok, 2023) However, in terms of the future, the threat of a new or already existing cryptocurrency exchange that is

constantly developing, and building up their operations could become a threat to Binance in the long run.

4.2 Binance VRIO Framework

Value

As the largest cryptocurrency trading platform worldwide (CoinMarketCap, 2023) Binance offers a wide range of services for the registered users on the platform to choose from. In Binance, the users have the selection of more than 350 different cryptocurrencies to be traded on the platform. In addition, the international users on the platform have the option of using their national fiat currencies, which include the USD, EUR, AUD, GBP, and HKD. The users have the option to choose from services such as trading different cryptocurrencies on spot, margin and futures trading. In addition, the users have the ability to earn interest on their staked cryptocurrencies on “Binance Earn”, the option to directly trade cryptocurrencies peer-to-peer on “Binance P2P”, and the ability to trade non-fungible tokens (NFT) on the “Binance NFT” marketplace. Because of the aforementioned services provided by Binance, and due to the fact that the Binance cryptocurrency exchange has over 150 million users worldwide in over 180 countries (Binance, 2023), Binance effectively meets the needs of customers in the cryptocurrency markets. By meeting the needs of the users on the platform, Binance is able to provide value to its customers via the wide range of services provided on the platform.

Rare

Binance has its own cryptocurrency that is known as Binance Coin (BNB). The users registered on Binance have the ability to use BNB for various purposes, of which one example would be paying for their personal travelling expenses. Another method of utilizing the BNB is that the users have the option of paying transaction, or trading fees with BNB. On Binance, the standard fee for every transaction facilitated is 0.1% (which may vary depending on several factors), but users can choose to pay the fee with BNB, which in turn grants them a discount on the fee. Because of this, traders on Binance are incentivized to acquire BNB for different reasons. (What is BNB, 2023) Because of the fact that Binance has its own cryptocurrency, it can be concluded that Binance has rare technology that sets it apart from the competing cryptocurrency exchanges.

Imitability

Binance offers low fees for registered users on the platform, which are considered to be among the lowest fees commissioned by cryptocurrency exchanges in the industry. (Clinebell, 2023) How Binance is able to offer such low fees, is because of the fact that Binance has over 150 million registered users worldwide, which provide high trading liquidity on the platform. (Binance, 2023) In addition, because of the fact that users on the Binance platform have the option to utilize the Binance coin in order to make their trading fees even lower. (What is BNB, 2023) Concluding from the fact that Binance is able to offer low fees and high liquidity on the platform, Binance is in a position of competitive advantage against its competitors. This can be justified by the fact that it can be considered difficult to offer the same advantages that Binance is offering to its users.

Organization

The CEO of Binance is Changpeng Zhao, who has a strong experience in the cryptocurrency industry from working in the blockchain industry, before launching Binance in 2017. Along with Changpeng Zhao, Binance was co-founded by Yi He, who is in charge of business, marketing, and branding strategy on the Binance exchange. Before joining Changpeng Zhao to launch Binance, Yi He has a strong marketing and branding background from the mobile video technology industry. (Binance, 2023)

As stated by (Binance, 2023) on their “Regulatory Compliance & Policy” page, Binance has acquired all the required licenses, registrations and permissions in jurisdictions that include: “Abu Dhabi, Australia, Bahrain, Cyprus, Dubai, France, Italy, Japan, Kazakhstan, Lithuania, New Zealand, Poland, South Africa, Spain and Sweden as of January 2023.” By obtaining the required operating licenses required and complying with the regulations set in place in the aforementioned countries, Binance demonstrates strong organizational capabilities.

Concluding from the assessment of the VRIO framework, Binance is able to successfully sustain a competitive advantage by offering a wide range of cryptocurrencies for the users registered on the platform, a competitive fee pricing model and advanced trading features. Binance is able to provide value to its users, has rare technology that sets it apart from the competing exchanges, is able to offer low fees along with high liquidity, and demonstrates strong organizational capabilities. (Jurevicius, 2023)

4.3 Coinbase Porters Five Forces

Competitive rivalry

As reported by (CoinMarketCap, 2023) Coinbase is in direct competition with other leading cryptocurrency exchanges such as Binance, Kraken and Bitstamp. As stated before, what makes the cryptocurrency industry so competitive, is the fact that customers have the ability to switch between different cryptocurrency exchanges for low costs. (Janze & Gvozdevskiy, 2017, p. 5) Coinbase advertises their platform as the “easiest place to buy and sell cryptocurrency”. In addition, Coinbase claims to adhere to the best industry practices in terms of security and regulation. In order to mitigate the power of competitive rivalry, Coinbase lists the following reasons to incentivize users to register on their platform: “secure storage, protected assets and industry best practices.” Furthermore, as reported on their front page, Coinbase has roughly 145 billion USD traded per quarter, is supported in over 100 countries worldwide, and has roughly 130 billion USD in assets stored on the platform. (Coinbase, 2023)

Supplier power

The power of suppliers was analyzed in terms of cryptocurrencies, and cryptocurrency projects listed on the exchange. As reported by (CoinMarketCap, 2023) Coinbase is the second largest cryptocurrency exchange in the world. Due to Coinbase’s position as the second largest exchange, the power of the suppliers in terms of cryptocurrencies listed on the platform is limited. There is a risk that a cryptocurrency, a cryptocurrency project, a token or a non-fungible token with a large number of users would decide not to be listed on Coinbase, which would negatively impact Coinbase. However, due to the fact that Coinbase has a high trading volume racking up to 145 billion USD every quarter, the aforementioned suppliers are incentivized to stay on the platform. (Coinbase, 2023)

Buyer power

The users registered on the Coinbase exchange, who are either traders or investors, are the buyers that were analyzed in this assessment. Due to the fact that Coinbase is ranked as the second largest cryptocurrency exchange (CoinMarketCap, 2023), and marketed as the easiest cryptocurrency exchange to use, Coinbase establishes a strong presence in the cryptocurrency industry. The power of buyers is low in terms of individual users on the platform. In the event that a small number of users would decide to switch over to one of the

competing exchanges, the impact on Coinbase would be minimal. Once again, in terms of large institutions or companies, the power of buyers is higher. By adhering to the best industry practices, Coinbase motivates individual users, institutions, and companies to stay as long-term customers. (Coinbase, 2023)

Threat of substitution

Coinbase does not offer direct peer-to-peer (P2P) trading as of September 2023 on the centralized exchange. Because of this, a substitute service for Coinbase would be a decentralized exchange, where P2P trading is possible between individual users. Due to the fact that Coinbase is unable to offer P2P trading for the users registered on the platform, the threat of substitution is moderate. However, Coinbase has set up a guide on their website which has direct instructions how to do P2P trading through the Coinbase Wallet. (Coinbase, 2023) This mitigates the threat of substitution, because Coinbase is placing effort in the process of keeping users as customers on the platform.

Threat of new entry

For a new cryptocurrency exchange to enter the markets and operate at the level that Coinbase operates on, it would require the cryptocurrency exchange several key resources. The resources would include a large amount of capital, and a time-consuming process of building brand identity in order to gain the trust of the investors and traders in the markets. Not only that but in order to be legally allowed to practice business in certain jurisdictions, numerous licenses have to be acquired to fulfill the regulations set in place by governments. (Titenok, 2023) Due to the position that Coinbase is in the cryptocurrency industry, the assumed threat of new entry is relatively low. However, the threat of new entry is still present, as an already existing, or a new cryptocurrency exchange could build up their operations and become a threat to Coinbase in the future.

4.4 Coinbase VRIO Framework

Value

Coinbase is ranked as the second largest cryptocurrency exchange in the world (CoinMarketCap, 2023) and has built their brand identity as the easiest place to trade cryptocurrency in. The Coinbase exchange is a user-friendly, and a convenient platform even for new investors and traders in the industry. Coinbase has placed a lot of effort in the

process of establishing regulatory compliance among governments, and the exchange is reported to be very reliable. As per the values of Coinbase, they focus on the process of gaining trust of their users as their top priority. In addition, Coinbase is reportedly the largest publicly traded cryptocurrency company worldwide, which provides the best security features, transparency and risk management practices to the users registered on the platform. (Coinbase, 2023) It can be concluded, that Coinbase is effectively able to meet the needs of the customers in the cryptocurrency markets. In addition, Coinbase is able to provide value to the users registered on the platform via the aforementioned services and resources.

Rare

Coinbase is the largest cryptocurrency company that is publicly traded on the stock market. As a result, Coinbase reports that they operate with more transparency in terms of their financial operations in contrast to the competing cryptocurrency exchanges, due to the fact that the Coinbase exchange is audited every year as required by law. In addition, Coinbase backs up the cryptocurrency deposited on the platform in the ratio of 1:1 and is in possession of the industry-leading encryption as well as security technology. (Coinbase, 2023) The aforementioned resources and capabilities of the Coinbase exchange set it apart from the competing cryptocurrency exchanges.

Imitability

While it is possible for competing cryptocurrency exchanges to directly imitate the resources possessed and services provided by Coinbase, it is without a doubt a time-consuming process. Coinbase has prioritized the process of gaining the trust of investors and traders in the cryptocurrency markets ever since its launch in 2012. Furthermore, with the best security practices in the industry, and exceptional regulatory compliance (Coinbase, 2023) the direct threat of imitability can be argued to be relatively low.

Organization

Coinbase has placed a great emphasis on compliance in terms of regulations in order to strive toward becoming the most trusted cryptocurrency exchange. Coinbase has developed a Compliance Program, which enables them to uphold the best practices in terms of financial operations. In contrast to the majority of the competing cryptocurrency exchanges, Coinbase is subjected to financial audits annually. Because of this, Coinbase has established a strong

brand in the cryptocurrency industry in terms of transparency and security. In addition to the financial audits, Coinbase complies with the Know Your Customer (KYC), and Anti-Money Laundering (AML) regulations set in place by governments. (Coinbase, 2023)

Concluding from the assessment of the VRIO Framework, Coinbase is able to sustain a competitive advantage by the following methods: Coinbase provides customers in the cryptocurrency markets a convenient and user-friendly interface. Coinbase has built its brand as the most trusted platform, which is an incentivizing factor for new investors. In addition, by offering institutional services, and proactively working with regulators and governments Coinbase further strengthens their brand in terms of transparency. Coinbase is able to provide value to the users registered on the platform, provides services that are rare, has resources that are difficult to imitate and displays strong organizational capabilities in terms of regulation adherence. (Jurevicius, 2023)

4.5 Comparative analysis of Binance and Coinbase

4.5.1 Security Features

Binance

In terms of user security, Binance provides their users the option to enable two-factor authentication, which can be either hardware, application, SMS or email controlled. To further improve the user security on the platform, Binance provides the option of IP address as well as wallet address whitelisting, which means that the user can access the exchange only from their personal IP address, and transfer cryptocurrencies only to a whitelisted address. In terms of platform security, Binance states that the majority of funds and assets deposited by the users on the exchange are stored in cold storage. The exchange also utilizes real time monitoring technology, which has a risk management system that constantly analyzes security related actions on the platform. This includes users attempting to reset their passwords, change their e-mail address or reset their two-factor authentication. Personal information and user data are protected via advanced data encryption, which means that the information provided to the platform in the process of Know-Your-Customer (KYC) verification is encrypted while held in storage. (Binance, 2023)

Coinbase

In terms of user security, Coinbase automatically requires the users to enable two-factor authentication when they register on the platform. The user passwords stored in Coinbase's database are encrypted via a "bcrypt" algorithm, which works in a way that the encryption is not possible to be decrypted, not even by Coinbase. Coinbase actively monitors the markets in the darknet for threats in terms of security breaches, or malicious exploitations in order to take proactive measures to keep the users safe that they otherwise deem to be in risk. In addition to the built-in Coinbase wallet, Coinbase also provides the registered users the service of Coinbase Vault, which is an offline method of securing cryptocurrency, but with additional security features that do not allow instant withdrawals. Every transaction made by users on the platform is monitored by machine learning models, which use the data received from the prior transactions to evaluate the legitimacy of the transaction in process. If the machine learning model doubts the legitimacy of the transaction, the user is prompted with the option to cancel the transaction. (Coinbase, 2023)

4.5.2 Technology

Binance

In terms of unique technologies, Binance has its own cryptocurrency called the Binance coin (BNB). Originally designed to serve the purpose of reducing fees for users trading on the platform, BNB has been further developed in order to serve other purposes as well in the last years. In addition, BNB also plays a vital role in the process of powering the Binance Smart Chain (BSC). BSC enables the facilitation of smart contracts on the platform, which include mechanisms such as the Proof-of-Staked Authority (PoSA). In more simple terms, the BSC enables more secure transactions with faster speeds. Originally, the limited supply of BNB was set to be allocated to the total number of 200 million coins. However, as stated in the BNB white paper upon its launch, by utilizing the built-in burn mechanism, the total number of BNB in existence will eventually be reduced to 100 million coins in total. (BNB, 2020)

Coinbase

Coinbase has developed its own cryptocurrency wallet, the Coinbase wallet, to be used by the users registered on the platform. The Coinbase wallet is a self-custody offline wallet, which means that only the user has access to the wallet, and that the wallet can be only accessed via a private key. As stated on their website, the wallet is developed with industry-leading security practices, which guarantee the safety of the cryptocurrencies stored in the wallet. In addition, the wallet can be linked to any users Coinbase account, which in turn creates a simple and secure pathway to facilitate the transfer of cryptocurrencies between the exchange and the wallet. Along with the Coinbase wallet, the platform offers the possibility of using Coinbase Vault that is much like a wallet, but with extra security protocols set in place. While depositing cryptocurrency to the Vault is a simple process, and does not require any extra steps, instant withdrawals are not possible in order to mitigate the threat of unauthorized access. For example, users have the option to utilize multi-signature authentication in terms of placing a co-signer on their Vault, which requires the authorization of 2 users to enable the withdrawal in question. (Coinbase, 2023)

4.5.3 Fees

Binance

Depositing cryptocurrency on Binance is free of charge. Depositing fiat currency is free of charge as well, but if a user decides to purchase cryptocurrency via a credit card, there is a 1.8% fee and 4.5% fee on the Binance.US exchange. In terms of trading, the standard fee is 0.1%, which can vary by several factors such as if the user has BNB to pay the fee with, and their trading volume from the past month. By paying the fees with BNB, the user is granted a 25% discount. For trading futures or options, as well as the process of staking cryptocurrencies, the fees vary on multiple factors, and each has their own built-in fee structure. (Binance, 2023)

Coinbase

Depositing cryptocurrency on Coinbase is free of charge. While Coinbase does not directly list its fees like Binance, the fees for bank transfers and credit card purchases typically range from 0.99% to 2.99% per purchase. In terms of trading, the percentage of the fees is calculated at the moment of placing the order. In addition, the fees vary by several factors such as the method of payment, the size of the order, current conditions in the

cryptocurrency market, and the location of the users doing the trade. Along with the calculated fee in the process of trading, Coinbase adds an additional market maker/taker fee which ranges from 0.05% to 0.60% depending on the circumstances of the trade in question. (Coinbase, 2023)

4.5.4 User experience

Binance

Binance provides the selection of more than 350 cryptocurrencies listed on the platform for the users registered on the exchange. Compared to Coinbase, Binance offers a wider range of services for the users on the platform. However, navigating the exchange and the user interface can be argued to be more complex. The services provided by Binance are spot, margin and futures trading. In addition, the services include Binance Earn which allows the users to earn interest on their deposited cryptocurrencies, and the Binance NFT marketplace which facilitates the trading, staking and loaning of non-fungible tokens. (Binance, 2023) While the user interface of Binance could prove itself overwhelming to less experienced users, the ability to customize the interface can improve the user experience of more advanced users on the platform.

Coinbase

Coinbase has built their brand identity around the purpose of becoming the easiest place to buy and sell cryptocurrency. Compared to Binance, the selection of cryptocurrencies listed on the platform, and the services provided by Coinbase is lower. However, the user interface is arguably more beginner friendly and convenient. (Coinbase, 2023) In contrast to Binance, Coinbase provides a limited number of features, which can improve the user experience of less experienced users but can be a limiting factor for the more advanced users in terms of user experience.

4.5.5 Summary of the comparative analysis

As per reported by (CoinMarketCap, 2023) Binance and Coinbase are in direct competition with each other as the leading cryptocurrency exchanges in the world. However, while Coinbase has a simplistic approach in terms of user interface and services provided, Binance is more designed for advanced users who prefer more options in terms of trading features due to the complexity of the platform. Binance offers a wide selection of cryptocurrencies

listed on the platform and advanced trading options. Coinbase emphasizes the aspects of security and convenience on the platform. While fees are not directly listed in Coinbase, as they might vary by a lot depending on several factors, Binance is considered to have the lowest total fees in the cryptocurrency market. Both of the exchanges have modern security features set in place, such as the two-factor authentication. However, in contrast to Binance, Coinbase has its own built-in cryptocurrency wallet and furthermore provides the service of Coinbase Vault for users that require an advanced level of security. (Elliot, 2023) Both of the exchanges have their strengths and weaknesses, while still displaying similarities in a few of the aspects.

The comparative analysis shows that both Binance, and Coinbase have formulated different market segmentation strategies in terms of the security features, and technologies that they use. In addition, Binance and Coinbase create sustained competitive advantages in terms of fees, user experience, and other key performance indicators by different methods compared to each other. The market segmentation strategy of Binance is formulated towards more advanced users, that prefer a wider selection of cryptocurrencies, and advanced trading options. Binance is able to create a sustained competitive advantage by offering the aforementioned wide selection of cryptocurrencies, advanced trading options and a competitive fee pricing model. The market segmentation strategy of Coinbase is formulated for less advanced users, but also users who prefer a user-friendly interface, more advanced security features, and transparency in terms of regulatory compliance. Coinbase is able to create a sustained competitive advantage by offering the aforementioned services, as well as branding the Coinbase exchange as the most trusted platform that is convenient and user-friendly. The customers in the cryptocurrency markets are presented with the option of choosing their preferred exchange depending on their individual needs, and preferences.

4.6 Thematic analysis of the interviews

The results from the interviews are analyzed based on common themes regarding the personal experiences as well as opinions of the respondents. The topic of the interview questions was the perceived security features, technologies, and key performance indicators in different cryptocurrency exchanges. In the following sections set apart by different themes, the opinions, and answers of all five interview respondents will be combined.

Due to the fact that the face-to-face interviews were conducted in Finnish, some of the answers given by the respondents were translated to English by the author of this thesis.

4.6.1 Factors influencing the choice of selecting a cryptocurrency exchange

In terms of factors influencing the choice of selecting a cryptocurrency exchange, the majority of the respondents prioritized the importance of security. Respondent 2 had switched from a less known cryptocurrency exchange to Binance last year, stating the “perceived level of security as the most popular exchange” as the main reason. Respondent 3 claimed that he did thorough research, before deciding which exchange to use, and stated that “I prioritize safety over all other factors because I want to ensure that my investments are protected.”

Respondents 4 and 5 talked about the importance of low fees and the variety of cryptocurrencies available for trading. Respondent 4 stated that access to a variety of the less popular cryptocurrencies allows him to take advantage of the opportunities presented in the cryptocurrency markets. Respondent 5 stated that “fees played a big role in my decision when selecting a cryptocurrency exchange." He continued by explaining that he is mindful in terms of transaction costs, trading fees, as well as withdrawal and deposit fees. Ultimately, he decided to select an exchange that offers competitive fees, in order to minimize expenses in the process of trading.

4.6.2 Preference for convenience or security

One of the themes that came up continuously during the interviews was the preference for either convenience, or security. Four out of the five respondents agreed that security is of top priority over convenience. Respondent 1 stated that “Security is much more preferred, even though convenience is always a bonus.” He continued by saying that by prioritizing security over convenience, he is able to stay more relaxed, and not stress so much about the possibility of losing the invested money due to a security breach for example. Respondent 2 agreed and said that due to the fact that he only invests in cryptocurrencies in random intervals, it is not a problem even though the process of buying cryptocurrency would be more slow or unconventional, as long as the security is firm. “In the volatile world of crypto, it is crucial to minimize risks, even if it means sacrificing convenience” concluded respondent 3.

In terms of preference for convenience or security, respondent 4 was the only one out of the 5 respondents that preferred convenience over security. While he claimed that he is taking all the necessary security precautions, such as using strong passwords and two-factor authentication, he stated that “I prefer exchanges and wallets that offer user-friendly

interfaces, quick transactions, and easy access.” Respondent 5 preferred the aspect of security but stated that he recognizes the importance of convenience among users. “I believe it is possible to find a middle ground.” He stated and added that the importance of staying up to date about the security practices in the cryptocurrency world should be of top importance to everyone.

4.6.3 Important security features

When asked about the most important security features the respondents consider essential, all of the respondents agreed on the importance of the two-factor authentication. Respondent 2 stated that “Two-factor authentication paired with Google authenticator, because the SMS or e-mail authenticators can be more vulnerable for breaches.” He also continued with the statement that everyone should keep the majority of their cryptocurrencies in an offline wallet, but the use of an online wallet makes it easier to send or receive cryptocurrency. Respondent 5 mentioned the option of utilizing multi-signature wallets for long-term holding, due to the fact that there is no need to access the wallet frequently.

4.6.4 Evaluating the differences in fees, security and performance

Among the themes that caused most discussion during the interviews, was the individual thought process when evaluating the differences in fees, security and performance. Respondent 1 started by stating that “Previously a customer of Coinbase, but because of the high fees due to the low volume of trading activity, I decided to switch over to Binance. Binance has low fees, with a good combination of security.” Respondent 2 agreed on the same thought process and stated that he had initially found a suitable exchange that offered low fees, which motivated him to stay as a customer there. Respondent 3 said that “I tend to prioritize exchanges with low trading, withdrawal and deposit fees. Of course, security and performance are important, but not on top of the priority list.”

Respondent 5 claimed that even though the prefers exchanges with low fees, he believes that exchanges with a large number of users that adhere to regulatory standards are always a good choice. Respondent 4 stated that they believe in the balanced approach, with a good combination of security, fees and performance. “I research each exchange on my radar thoroughly, read user reviews and compare their reputation in the crypto community.”

4.6.5 User experience among exchanges

User experience was one of the themes that kept coming up during the interviews. Respondent 3 said that in his view, the perceived user experience, and the interface of an exchange play a crucial role in the process of shaping his perception of the particular cryptocurrency exchange. “A good interface with easy navigation gives me confidence that the exchange is well-maintained all around.” In addition, he believed that exchanges that have good looking interfaces often prioritize the process of retaining users on the platform. Respondent 2 stated that even though the complexity of the Binance interface might prove itself overwhelming for certain users, the complexity itself adds to his perception of the technology and performance on the Binance exchange.

Respondent 4 started by stating that one of the most important factors shaping his user experience is a smooth experience in terms of performance. In his opinion, the performance of any exchange during high-volume trading periods is far more important than the “aesthetics” of the platform. Respondent 5 believed in the importance of good user experience but stated that a good user interface does not always necessarily correlate with security and performance in his opinion. He continued by stating that “My perception of any particular exchange’s security, and performance is always based on their history, reputation, and security features.” To conclude, he stated that he naturally appreciates a pleasant user interface, but ultimately relies on other factors to assess the actual reliability of any particular exchange.

4.6.6 Summary of the thematic analysis

According to the interviews, the key factors influencing the choice of selecting a cryptocurrency exchange were security features, a competitive fee pricing model, and access to a variety of cryptocurrencies to be traded. The majority of the respondents rooted for the importance of security over convenience in different cryptocurrency exchanges. In terms of the most important security features, all of the respondents agreed on the importance of two-factor authentication. In addition, the option of utilizing multi-signature wallets, and offline wallets was mentioned.

On the topic of evaluating the differences in fees, security and performance the respondents had altering opinions. While some of the respondents preferred low fees over security and performance, others preferred better security and performance over low fees. In addition, the user experience among different exchanges had also altering opinions. One of the

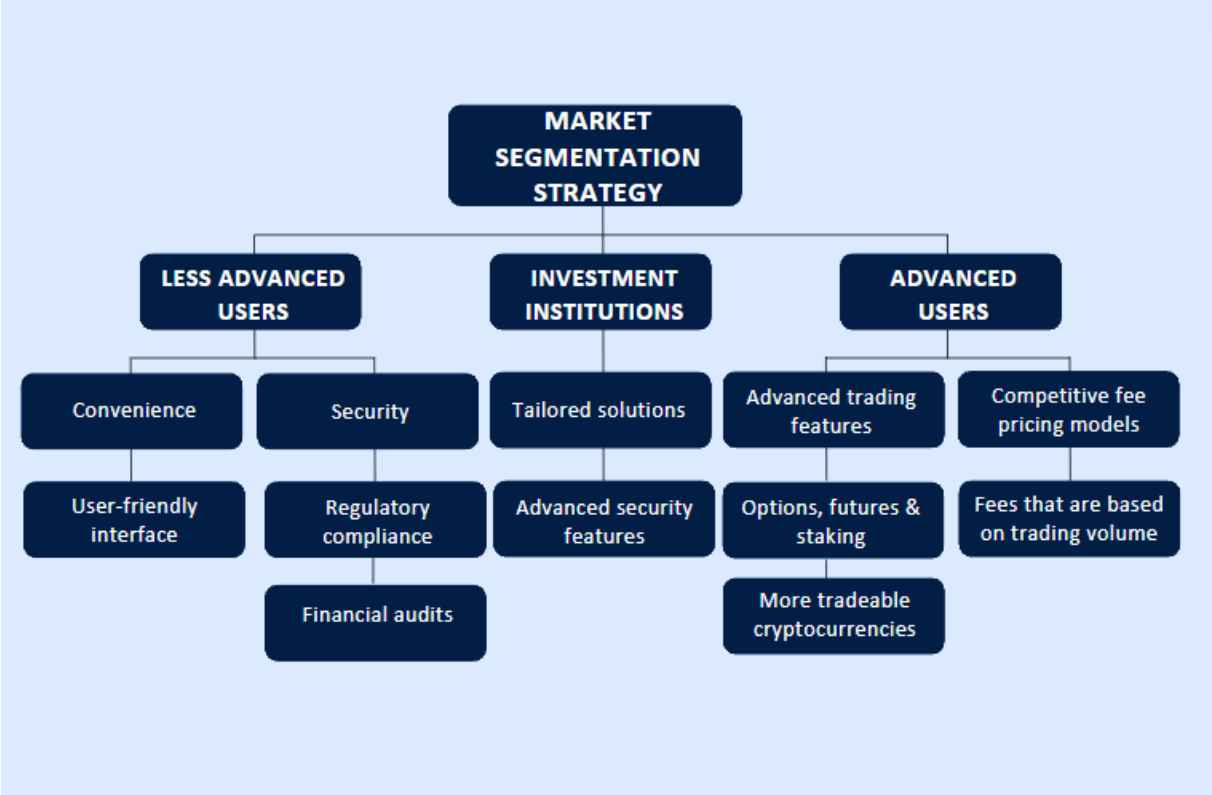
respondents stated, that the user experience and the interface of any particular cryptocurrency exchange play a crucial role in the process of shaping their perception of the specific exchange. This was agreed by another one of the respondents, who also added that a good interface gives them confidence that the cryptocurrency exchange is well-maintained all around. However, as concluded by one of the respondents, the pleasant interface of a cryptocurrency exchange is always appreciated, but users should always rely on other factors to assess the actual reliability of any specific exchange.

5 Main results and recommendations of the research

The aim of this research was to answer how different types of cryptocurrency exchanges formulate a proper market segmentation strategy for the security features and technologies that they use. In addition, the aim of this research was to answer how cryptocurrency exchanges create a sustained competitive advantage in terms of fees, transaction speeds, and other key performance indicators.

The research shows that cryptocurrency exchanges cater their services to different market segmentations of the cryptocurrency markets in terms of the security features, and services that they provide. Some users, including the less advanced users, prefer convenience and security. Other users, but also those that are more advanced in terms of trading, prefer the selection of advanced trading options, competitive fee pricing models, and the ability to customize the user interface to their individual preferences. Cryptocurrency exchanges have different strategies and offer different services for different parts of the segments, as visualized in the mind map below. (Figure 7)

Figure 7 – Market segmentation strategy (Author's own work, 2023)



The research shows that for the less advanced users, cryptocurrency exchanges offer convenience, which means that the exchange is easy to use in terms of trading and the interface is more user-friendly. In addition, cryptocurrency exchanges offer security, which means that the cryptocurrency exchanges adhere to regulations, provide the industry-best security features and are subjected to annual financial audits.

For investment institutions, cryptocurrency exchanges offer tailored solutions in terms of advanced security features. A notable example of tailored solutions is the Coinbase Vault, which is an offline wallet with additional security features, which include the option of utilizing the multi-factor authentication security feature.

For the more advanced users, cryptocurrency exchanges offer a wider selection of trading options that include more tradeable cryptocurrencies listed on the platform, customizable interfaces, options trading, futures trading, and cryptocurrency staking. Furthermore, cryptocurrency exchanges offer competitive fee pricing models, which consist of fees that are based on trading volume. In addition, by offering customizable security features, cryptocurrency exchanges have the ability to cater to the needs of different segments. For example, customizable security features include online wallets for smaller traders. Online wallets are easier to use and can be accessed with less effort, in contrast to offline wallets, which provide more security for users who require better security.

In order to formulate the best strategy in terms of market segmentation, it is important for cryptocurrency exchanges to assess the state of effectiveness of their security features in continuous intervals. In addition, by investing in research and development, cryptocurrency exchanges have a better understanding of the changing market conditions, as well as the ability to react to them in the cryptocurrency markets. Furthermore, cryptocurrency exchanges would have a better chance of mitigating threats such as security breaches in the future.

The research also shows that cryptocurrency exchanges create sustained competitive advantages in terms of fees, user experience, and other key performance indicators by the following methods: cryptocurrency exchanges offer competitive fee pricing models that are based on trading volume, which in turn incentivize high-volume traders to use the platform. In addition, cryptocurrency exchanges offer built-in technologies such as their own cryptocurrencies, that allocate discounts to the users in terms of fees and other commissions when being used as a form of payment. Furthermore, cryptocurrency exchanges provide the industry’s best security features in order to cater to the security needs of the users registered

on their platforms, while actively staying up to date with the new regulations and changes in laws in order to prevent legal issues or trust issues among the customers.

By placing effort in continuous innovation, such as adding new features in terms of security, and trading options as the technology progresses, cryptocurrency exchanges will have better chances of sustaining competitive advantages in the future.

While cryptocurrency exchanges have an important role in providing the industry's best security features, the customers of cryptocurrency exchanges have the responsibility to stay up to date with the newest security practices. Customers of cryptocurrency exchanges should actively reflect on their behavior and continuously seek to learn more about their security.

6 Conclusion

The objective of this thesis was to research the differences between cryptocurrency exchanges in terms of security features, technologies, user experience and other key performance indicators. In addition, the aim of this thesis was to answer the questions “How do different types of cryptocurrency exchanges formulate a proper market segmentation strategy for the security features and technologies that they use?” and “How do cryptocurrency exchanges create a sustained competitive advantage in terms of fees, user experience and other key performance indicators?”

The theoretical framework introduced the main theories used for the research: the Porters Five Forces analysis, the VRIO framework, the resource-based view, and the market segmentation theory. In addition, related information regarding the cryptocurrency ecosystem, security features, key performance indicators, technology, policies and regulations were briefly explained.

In the research part, the author conducted a case study that consisted of a Porters Five Forces analysis and a VRIO framework of Binance and Coinbase. The objective of the analyzes was to research the strengths, weaknesses, resources, and capabilities of the selected cryptocurrency exchanges. By utilizing the data received from the use of the aforementioned tools, the author did a comparative analysis of Binance and Coinbase in terms of security features, technologies, and key performance indicators. In addition, the author conducted qualitative interviews with 5 individual customers from different types of cryptocurrency exchanges. The purpose of the interviews was to establish a deeper understanding of the state of individual customer’s personal opinions and experiences on the perceived security features, technologies, and key performance indicators in different cryptocurrency exchanges.

The research shows that different cryptocurrency exchanges formulate a proper market segmentation strategy in terms of the security features and technologies that they use by the following methods: for the less advanced users, cryptocurrency exchanges offer security and convenience. For the more advanced users, cryptocurrency exchanges offer advanced trading options, competitive fee pricing models, and advanced interfaces that are customizable. In addition, cryptocurrency exchanges offer tailored solutions in terms of advanced security features for large institutional investors in contrast to smaller retail traders or investors.

The research also shows that cryptocurrency exchanges create sustained competitive advantages in terms of fees, user experience, and other key performance indicators by the following methods: cryptocurrency exchanges offer competitive fee pricing models that are based on trading volume, which incentivize high-volume traders to use the platform. In addition, cryptocurrency exchanges offer built-in technologies such as their own cryptocurrencies that allocate discounts to the users in terms of fees. Furthermore, cryptocurrency exchanges provide the best security features in the industry, while actively staying up to date with the new regulations and changes in laws in order to prevent legal issues, or trust issues among customers.

For future research, the author recommends researching incident responses together with crisis management after security breaches in terms of strategies, and their impact on cryptocurrency exchanges. In addition, the economic implications of security breaches in cryptocurrency exchanges, and their impact on the trust of customers in the cryptocurrency markets are recommended for further research.

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Appendix 1. Data management plan

The author of this thesis has read and acknowledged the guidelines for the collection, processing, storage, and destruction of data from HAMK's thesis guide. During the process of research, the author has collected data from primary and secondary sources. The author is familiar with and acknowledges the guidelines of research methods and responsible research.

Primary data was collected from existing literature, research, publications, and other valid sources on the internet. With the primary data, the author first implemented a Porters 5 Forces analysis and a VRIO framework of Binance and Coinbase. Following this, by utilizing the data received from the use of the aforementioned tools, the author did a comparative analysis of Binance and Coinbase in terms of security, technology, and key performance indicators. The primary data includes graphs and price charts. The sources of the graphs and price charts are mentioned in the text as in-text references and as full references in the references section.

Secondary data was collected from face-to-face and online interviews that the author organized on four separate occasions. The first face-to-face interview was conducted on September 9th, 2023. The second face-to-face interview was conducted on September 10, 2023. The online interviews were conducted on September 16th, 2023, and September 21st, 2023. The data from the interviews include information about personal experiences, opinions, and responses to the interview questions. The data from the interviews does not contain any information that any single respondent can be identified from.

All of the data collected by the author is stored in the author's OneDrive account, which is password-protected and has the two-factor authentication security feature enabled.

Appendix 2. Interview questions

1. Age group? 18-24 / 25-33 / 35-44 / 45-54 / 55-64 / 65+

2. What cryptocurrency exchange(s) are you currently using?

3. What were the most influencing factors when deciding which cryptocurrency exchange to use?

4. Do you prefer convenience or security as an investor/trader? Please elaborate, if possible.

5. What are the most important security features that you consider essential for a cryptocurrency exchange?

6. Different cryptocurrency exchanges vary in terms of fees. Please describe your own thought process when evaluating the differences in fees, security and performance when choosing an exchange to use?

7. Different cryptocurrency exchanges vary in terms of user experience and user interface. In your own experience, how do the user experience and interface influence your own perception of the security and performance of the exchange?

8. Have you had a situation where exchange performance issues negatively impacted your trading?

9. Even in the modern day, security breaches and hacks occur in cryptocurrency exchanges. How do you ensure the security of your own cryptocurrencies stored on the exchange?

10. How would you improve the security and performance of cryptocurrency exchanges? Can you name any specific technologies or practices that you would like to see implemented?