

THE IMPACT OF NON-FUNGIBLE TOKENS (NFTs) ON INVESTMENT CHOICES IN THE ART MARKET

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Affidavit

I hereby affirm that this Bachelor's Thesis represents my own written work and that I have used no sources and aids other than those indicated. All passages quoted from publications or paraphrased from these sources are properly cited and attributed.

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Abstract

Non-fungible tokens raised a lot of attention in the year 2020 to 2021 especially in the art market through unprecedented sale events in auction houses and art galleries. This pure digital asset could shape the constraints in the art market, revolutionize art investments and offer new possibilities for artists and investors.

This thesis will investigate the literature surrounding the influence of NFTs on investment choices in the art market. Further, an online survey tested the connection between the interest and willingness to invest in both markets and follows a quantitative approach. The researcher managed to collect responses from 81 participants. The data outcome showed that NFTs have an impact on investment choices regarding successful NFT traders who also invest their money into physical artwork. Moreover, the data outcome revealed that there is no statistical significance between the interest and investment choices between the NFT and art market in general. Furthermore, the study found that gender has no influence in regard to NFT trading and that NFT traders do not prefer to purchase art through online institutions rather than physical institutions.

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1 Introduction

The aim of the following chapter is to, first, introduce the central topic of this thesis by summarizing the relevant background information needed to enhance maximal understanding of the lead and purpose of this thesis. Second, to highlight possible causes of the rising attention of non-fungible tokens and their importance in several markets, especially in the art market. Finally, the study aim, research questions and the research design will be presented and explained.

1.1 Background

Non-fungible tokens (NFTs) are digital pure assets that can be created, bought, and sold through, for example, the Ethereum Blockchain (Nadini et al., 2021). In comparison to fungible tokens such as the cryptocurrency Bitcoin, non-fungible tokens are not interchangeable and it is not possible to divide them into smaller shares (Franceschet, 2021). Through its peer-to-peer network, the technology of blockchain offers validation for transactions (Chen, 2018) and NFTs can be traded without any third parties. Additionally, so-called smart contracts, which are created at the top of a blockchain, fulfill certain functionalities. When certain actions are fulfilled, like the transaction from one wallet to another in order to buy an NFT, the transaction is verified by the blockchain and through the underlying smart contract is automatically executed without any third party (Wilson et al., 2021).

The first blockchain on which it was possible to implement applications for decentralized finance (DeFi) and non-fungible tokens (NFTs) was the Ethereum blockchain, but now there are different blockchains which allow the performance of NFTs (Lounge, 2020). In contrast to fungible digital assets or coins like Bitcoin, NFTs are created with a unique code which is incorporated into the blockchain and therefore distinctive. The creator, the previous buyer and the seller are all included in this code and stored on the blockchain. This makes every NFT code completely unique.

The origins of NFTs go back to 2013 along with the previously-mentioned Ethereum blockchain project, created by a team of web developers under the lead of Vitalik

Buterin (Chen, 2018). By 2015 every developer could transform any asset into a digital asset in the form of a token on the Ethereum blockchain. Later, in 2021, non-fungible tokens gained a lot of attention through remarkable sales events in the art market.

1.2 Relevance of the Topic

This subchapter aims to present certain events which may be responsible for the rising attention of NFTs, especially in 2021. NFTs influence many industries and will most likely shape them. Hence, NFTs in the art market are considered crypto art and represent the third-ever use case of blockchain in the art industry (Franceschet, 2021). Please note that these events are only a few examples and will be discussed in the literature review.

1.2.1 Sales Events

In March 2021 an NFT created by the artist Beeple with the title “Everydays: The First 5000 Days” was sold for USD 69.3 million by the auction house Christie’s (Kugler, 2021). Furthermore, a Larva Labs-created digital asset with the name “CryptoPunk” was sold as an NFT for about USD 7.5 million through the virtual asset secondary market auction platform OpenSea (Kong & Lin, 2021). While these are only two examples of remarkable sale events regarding NFTs, it is essential to look at the total volume generated in the NFT market in order to understand the surprising rise of NFTs. The total volume of NFTs traded in 2020 was USD 94.9 million and rose to 24.9 billion in 2021, which attracted much attention and led to massive investments (Howcroft, 2022).

1.3 Purpose of the Thesis

The primary purpose of this bachelor thesis is to investigate the impact of NFTs on investment choices in the art market. There are a few papers concentrating on investment choices and trying to figure out if this investment is reliable or not. But very little literature focuses on the spillover effects of non-fungible tokens on investment choices in the physical art market. It is important to understand these influences to give a better understanding of how this new product will behave in certain markets and shape them. In this paper I will focus on these spillover effects on the art market. Furthermore, I will explore the possible connection with investment

choices, in both NFTs and physical artworks. These research gaps lead to the central question of this paper:

Research Question: How do NFTs impact investment choices in the art market?

To give an answer to this question, firstly, this thesis will focus on research that has already been undertaken concerning this topic. Secondly, a quantitative approach has been taken under consideration and an online survey has been conducted of 80 participants. The online survey outcome will help to understand the possible impact of NFTs on investment choices in the art market and test the hypotheses resulting from the literature review.

Accordingly, this thesis is divided into six parts.

The first part of this thesis is the Introduction. In this part the aim is to summarize the background information necessary to understand and be able to follow the lead of this paper. Furthermore, the relevance and timeliness of this topic is highlighted and illustrated through several important events.

The second part is the Literature Overview, which gives a broad overview of the research explored on this topic. This part includes possible causes for the rising price development and attention of NFTs, the impact on the art market in general, and how this new technology may influence this market. The next subsection of this part aims to summarize research which focuses on how NFTs may function as possible investments in the art market. The Literature Overview will give a short survey of research on NFT traders and conclude with the resulting research hypotheses.

The third part of this bachelor's thesis is the Methodology section. In this section I will demonstrate the research method used for this paper and explain its accuracy of use in this context. Additionally, this section aims to demonstrate the survey development, explain questions asked to the participants of this survey and finally describe the target audience and how I successfully reached out to appropriate candidates.

The fourth part of this thesis is the Data Analysis. This part aims to summarize the empirical part of this thesis, starting with the sample characteristics, then followed by

the impact of NFTs on investment choices in the art market of the participants surveyed.

The fifth part is the Discussion section. The purpose of this section is to discuss the results of the data analysis. Moreover, the Discussion section will examine the effect of the survey outcome on the hypotheses. The final part will outline limitations of this research and concludes the thesis.

2 Literature Overview

The following chapter gives an overview of the literature research on this topic and is divided into four parts. The first part includes certain events to give a better understanding of the rising attention of non-fungible tokens and possible causes. The second part focuses on the technology of blockchain and its influences on the art market. The third part will describe possible spillover effects and investment opportunities of NFTs in the art market. Finally, the literature review will focus on NFT traders and if there is a possible connection to the art market, in both interest and willingness to invest.

Through several events, non-fungible tokens raised a lot of attention in 2021. Therefore, most of the literature addressing the world of NFTs was published in 2021. A few research papers are from 2017 to 2020, which highlighted the great new opportunities for both, investors, and artists. There is only little research done on non-fungible tokens in correlation with the traditional art market, how it influences price developments and investment opportunities, and shapes the art market.

2.1 Price Development and Rising Attention on NFTs

In this subsection of the thesis an overview of important events will be presented to provide an understanding of why non-fungible tokens gained attention in 2021 especially among investors, artists, and cryptocurrency fans. The aim is to present several examples in different industries in order to show the impact as a whole but will focus later on the art market.

2.1.1 Sales Events

First, in March 2021, at an online auction organized by Christie's, one of the biggest auction houses of the world, an NFT created by the artist Mike Winkelmann (known as Beeple) with the title "Everydays: The First 5000 Days" was sold for USD 69.3 million (Kugler, 2021). The artist was rather unknown before this remarkable event. Later, the artist managed to sell a physical artwork accompanied by an NFT with the title "Human One" through Christie's for USD 28.9 million (Christie's, 2022).

Second, in 2017 the New York-based software company Larva Labs created 10,000 digital images with the name “CryptoPunks” (Whitaker, 2019). These CryptoPunks, all 24x24 pixel images and through an algorithm completely unique in their appearance, can be categorized in five themes (Alien, Ape, Zombie, Female, and Male). These images are linked to 10,000 unique tokens, and their code with their proof of ownership is embedded in the Ethereum blockchain (Kong & Lin, 2021). What started in 2017 with a small number of interested people who bought these CryptoPunks began to grow in popularity from 2020 to 2021. According to the research by Kong and Lin (2021) more than 50% of the total primary and secondary sales of CryptoPunks were executed between the year 2020 to 2021. These people started to trade these NFTs and managed to sell them with high profits through the secondary market platform OpenSea. To give an example: The total volume traded of all NFTs in the collection CryptoPunks on the NFT secondary market platform OpenSea is about 880,800,000 ETH, which is approximately USD 3.09 billion (OpenSea, 2022). But CryptoPunks started suddenly to emerge not only on secondary market platforms but also in traditional auction houses. In May 2021 the auction house Christie’s sold a CryptoPunk collection of nine NFTs for USD 16.962 million. This was also the very first time an NFT collection was offered for sale next to masterpieces of well-known artists like Jean-Michel Basquiat and Andy Warhol (Franceschet, 2021). In June 2021, Sotheby’s, another auction house which is famous for its auctions in the traditional art field, sold one single CryptoPunk for USD 11.8 million (Sotheby’s, 2021) and a whole collection of 101 NFTs from another famous NFT collection with the title “Bored Ape Yacht Club” for USD 24.4 million (Vidal-Tomás, 2022).

However, not only in the art sector were NFTs created and sold for astonishing prices. Twitter CEO Jack Dorsey transformed his very first Twitter short message into an NFT and sold it for USD 3 million in March 2021 (Kong & Lin, 2021). Another successful example of implementing NFTs in an industry is the sports sector. The National Basketball Association (NBA) created small videos with basketball players’ actions, called NBA Top Shots, and transformed them into NFTs. From October 2020, the point in time where these NBA Top Shots were offered for sale, their total volume traded now is worth over USD 710 million (Wilson et al., 2021).

To get a better understanding of the rapid growth of the NFT market in total we take a closer look at the total volume generated. In December 2020 the total estimated sale volume of NFTs was USD 12 million and surprisingly broke out to USD 340 million within two months in February 2021 (Wang et al., 2021). According to Frank (2021) with high transaction volume the NFT market generated over USD 2 billion in the first quarter of 2021. Finally, summarizing the year 2021 according to Howcroft (2022), the NFT total volume traded was USD 24.9 billion. In comparison to the year 2020 with USD 94.9 million this is a significant rise in volume.

2.1.2 Possible Causes

But how is the price of NFTs driven? What were the causes for this market to get discovered in the past year?

Non-fungible tokens are digital pure assets with a certified ownership through smart contracts on the Ethereum blockchain (Dowling, 2022). To buy, sell or create a non-fungible token, you must convert traditional currency into a cryptocurrency. The value of the non-fungible token is expressed in this cryptocurrency, and if the value of this cryptocurrency is rising, so is the value of the NFT and vice versa (Wilson et al., 2021). According to Dowling (2022), an influence on cryptocurrency prices therefore may have an influence on NFT prices, but the study found out that these markets behave quite differently with low influence on each other.

Another factor which may have led to an increase in the NFT market is the situation of the COVID-19 pandemic and the market crash in March 2020 (Aharon & Demir, 2021). A recent study by Aharon and Demir (2021) discovered the interconnectedness between NFTs and Ethereum on one hand and traditional financial assets like gold, bonds, and equities on the other. They found out that, surprisingly, the cryptocurrency Ether, which is directly linked to the blockchain Ethereum as well as directly to the value of NFTs, declined whereas NFTs showed an opposite trend during the COVID-19 pandemic (Aharon & Demir, 2021). Further, during normal times with no pandemic, NFTs act on the one hand as a signal for investment risks and are not reliable in their return on investment. But on the other hand, during the market crash in March 2020, NFTs converted their role into investment opportunities with high

returns and are considered as hedging benefits for an investment portfolio (Aharon & Demir, 2021).

Finally, according to Wang et al. (2021) the attention on NFTs is also enhanced through virtual projects like the web3 or the metaverse. The metaverse is a virtual shared world and offer a digital playground for people who want to experience social activities in a 3D-digital world through technologies like AR and VR (Wang et al., 2021). People who join these networks can experience activities like playing crypto games with other virtual participants (Vidal-Tomás, 2022), displaying digital art or trading with digital assets like property, crypto art, and video clips, to name a few (Wang et al., 2021). But the metaverse is not just a virtual world where everyone can play games with each other; rather, it offers a whole new ecosystem for a virtual economy where people are able to work and generate money (Wang et al., 2021). Through the combination of social networks, the gaming industry and blockchain technology, so-called crypto games with possibility to earn money in virtual worlds started to emerge, gained much popularity and will expand in the near future (Vidal-Tomás, 2022). Every real asset gets digital in the virtual world and people have the possibility to trade with assets as NFTs (Wang et al., 2021).

2.2 NFTs and Blockchain Technology Shaping the Art Market

How do NFTs and the blockchain technology shape the art market? This new product attracts new customers and auction houses and art galleries already reacting to it. First, the technology of blockchain could lead to a groundbreaking structural and institutional change through its transparency in the art market (Franceschet, 2021). Second, the implementation of blockchain could revolutionize the way we invest in art and allows fractionalization of artwork like shares (Lotti, 2019; Whitaker, 2019).

2.2.1 The Role of Blockchain

The blockchain consists of so-called blocks. Each block has data stored which is encrypted with a generic code forming the “digital ledger” (Chen, 2018). The information of a non-fungible token, including the number of reproductions (copies or scarcity), the owner who currently possesses the digital asset and the recorded provenance (data of all previous buyers and sellers), is stored on this “digital ledger” and verified by the blockchain (Wilson et al., 2021).

The blockchain is decentralized, meaning it does not run on one single computer. Instead, the blockchain is spread through thousands of computers, running simultaneous and constantly verifying every new block on the blockchain. This allows non-fungible tokens to be traded like cryptocurrencies (Marella et al., 2020). As with cryptocurrencies, the term decentralization is very important. Through blockchain technology and smart contracts NFTs, became a decentralized option to sell, buy and trade art without the authenticity of a third party, such as galleries or auction houses (Lotti, 2019). NFTs offer automatic proven authenticity, and therefore people are able to trade with each other without of institutional structures only verified by the blockchain (Bourron, 2021). The authors Gefen and Pavlou (2011) highlighted the fact that institutional structures play a major role when it comes to the authenticity of transactions with other buyers and sellers. The security system of a blockchain replaces this institutional structure, and therefore NFTs could shape the financialization of art projects and revolutionize the current structures and constraints of third parties, such as galleries and auction houses of the art market (Lotti, 2019).

The role of blockchain and the first implementation of its technology in the art industry goes back to 2018. The auction house Christie's offered for sale an art collection of the American corporate executive and art collector Barney A. Ebsworth. This collection offering was executed in cooperation with the technology software provider Artory, which used a blockchain solution to record and store all the information about the auction and future price developments of this collection (Franceschet, 2021).

2.2.2 Fractionalization of Artworks

Moreover, the technology of blockchain allows the fractionalization of one single artwork, which offers the possibility for multiple people or institutions to share the ownership of this artwork (Whitaker, 2019). The second use case of implementing the technology of blockchain in the art market was in 2018 when the decentralized art gallery Maecenas converted artworks into certificated smaller shares (Lotti, 2019; Whitaker, 2019). Maecenas purchased a work by the well-known pop artist Andy Warhol with the title "14 Small Electric Chairs" and split the ownership of the artwork into several parts. Additionally, the gallery transformed these parts of ownership into tokens and offered these as ART tokens for sale. Through the distribution of these ART

tokens the gallery managed to sell them for USD 1.7 million which is 31.5% of USD 5.6 million – the original price of the physical artwork by Warhol (Franceschet, 2021). Owners of these ART tokens, similar to traditional shares, have the possibility to earn a small percentage if the price of the artwork rises. Maecenas attracts people who want to invest in physical artwork but often cannot afford to buy the whole painting. Therefore, one important question needs to be answered: Is there a correlation between interest in NFT technology and physical artworks? Do NFT traders want to buy physical artwork when tokens make it easier to invest online?

2.2.3 Transparency in the Art Market

Transparency in the art market is a touchy subject. The total volume traded in the art market in 2018 was USD 67 billion and 50% of it was accounted for by auction houses (Charlin & Cifuentes, 2020). The price ranges of artwork sold are very broad and often not transparent enough to make them comprehensible for the overwhelming majority of people (Prieto-Rodriguez & Vecco, 2021). Prices in the art market are often so abstract that when it comes to auctions of paintings of very liquid and popular artists, auction houses estimate the price and guarantee the consigner (technical language in this area for seller) a price which is guaranteed by the next auction. The auction house, of course, charges a fee for this guarantee and in case of a lower reached price must pay the difference. The institution, in this case the auction house, controls the guarantee of the artwork sold. According to the research of Charlin and Cifuentes (2020) these art specialists, who are working for auction houses are, with a ratio of 1:13 between the pre-sale estimate and the final hammer price, almost always right in their predictions. Which leads to the ethical issue concerning the price transparency, and the question of who really benefits from this construct. It is limited only to the very rich and people who are in possession of this insider information about estimates and certain price history of artworks (Charlin & Cifuentes, 2020).

The art market, similar to the NFT market, deals with unique assets and its value is specified by demand and collectors' taste. Only limited information about artwork sold at auction houses and galleries is available to the public, which makes it difficult to understand certain constraints on how prices are made which fit to the demand (Prieto-Rodriguez & Vecco, 2021). Therefore, considering art as investment is for many people untransparent and not reliable. The CEO of artnet, Jacob Pabst,

recognized this problematic case concerning transparency in the art market and started to set up a website, which displays, with all the data available from auctions, the developing price of artworks by artists. Furthermore, a website's algorithm shows a trend towards the future development of artists, taking into account all prices reached at auction houses, number of solo and group exhibitions, and number of participated art fairs and biennales (Coslor, 2016). Past sale prices would lead to more transparency in the market, which leads to higher trust and more willingness to invest in this market (Coslor, 2016). In contrast to the general art market, the technology of NFTs offers this transparency of previous sale prices and has it automatically implemented in its blockchain, which is not controlled by any third party and therefore completely authentic (Bourron, 2021).

2.2.4 Auction Houses and the New Type of Buyer

How do NFTs influence the general art market? Like many businesses the top three auction houses, namely Christie's, Sotheby's and Phillips, had to close their doors in spring 2020 due to the COVID-19 pandemic and postpone their scheduled auctions around the globe (Bourron, 2021). After huge losses in this time period of the pandemic, online auctions were implemented as the key to secure the business and cash flow. The total volume of online auctions rose from USD 126 million in 2019 to over USD 1 billion in 2020. But traditional customers of auction houses tend not to like to buy and sell online only. As a result, online sales could barely minimize the loss during the pandemic. Therefore, auction houses started to concentrate on the sources of new wealth coming out of the pandemic, crypto investors (Bourron, 2021). Auction houses started to work with cross-media artists like Beeple to create and sell artwork, which seem to fit in this industry perfectly. Artwork which combines artwork with blockchain technology in form of a non-fungible token. Christie's was not the only auction house which offered NFTs for sale in 2021. In April 2021 the auction house Sotheby's offered their own NFT collection with the name "PAK Collection" for auction, which generated USD 16 million, and the auction house Phillips generated USD 4 million with the so-called "MDJ multiplied NFT" collection (Bourron, 2021). This is all possibly because auction houses are confronted with a new type of buyer. In contrast to the more traditional customers of auction houses, these new buyers,

namely crypto millionaires, are considered as online only and generated their money with cryptocurrencies (Bourron, 2021).

2.2.5 Benefits for NFT Creators

NFTs offer new possibilities not only for auction houses and galleries; they are beneficial for creators and artists as well. First, the creators of NFTs are able to keep their ownership. In other words, these non-fungible tokens make it possible to not only generate money in primary sales; through regulated resale royalties the creator is involved with a small percentage in every resale of his created NFT (Bourron, 2021; Whitaker, 2019). This is possible through the technology of smart contracts. Every detail concerning the creator, ownership rights, and reselling history of an NFT is described in the smart contract and stored on the blockchain. The creator do not have to take any action the smart contract is automatically executed and the creator receives its resale percentage (Bourron, 2021). Which is a major difference between these platforms and traditional secondary markets for artworks.

Second, another major advantage for creators is that they are not limited to distribution in comparison to a physical distribution. Especially when comparing to the physical art market creators of such NFTs can easily sell their digital assets without any limitations concerning geographically aspects. What often causes high costs in the physical art market are delivery and shipping costs of the goods in combination with insurances which cover potential damages of the artworks. In contrast, for NFTs they creators do not have to pay any delivery costs, and they are confronted neither with packaging nor delivery troubles (Bourron, 2021).

2.3 NFTs as Investment in the Art Market

Furthermore, in order to discuss NFTs as potential investment it is important to look at the risk and return of investments in the NFT market.

According to a study by Kong and Lin (2021) who discovered the possible return on investments of NFTs, the average monthly return of trading with NFTs is between 6.10% and 44.11%. Further, similar to the study by Aharon and Demir (2021), a positive connection between the price development of NFTs and an increased demand for alternative investments could be observed by the authors. But also taking

under consideration that, with about 44.35% to 74.57%, the standard deviation of such investments is one of the highest (Kong & Lin, 2021). Thus, it is important to look at trading platforms on which NFTs are created, bought, and sold. But first in order to discuss NFTs as potential investment in general it is essential to highlight possible challenges regarding this financial digital asset.

2.3.1 Challenges Concerning NFT Trading

Through this research on this topic several challenges regarding NFT investments could be observed. First, one sustainable factor, discussed by the authors Wilson et al. (2021), is the environmental impact of creating, selling and buying NFT. As earlier mentioned, for creating, selling, or buying an NFT a certain so-called “gas fee” has to be paid in compensation for the verification process of the underlying peer-to-peer network by a blockchain. For this process, many computers are involved for verification and therefore consume a lot of energy similar to cryptocurrency transactions. For example, the artist Joanie Lemercier cancelled his NFT creation process after investigating how much energy consumption is needed to produce one NFT (Lemercier, 2021). Hence, it has been said that there are a few projects of reducing the environmental impact of creating NFTs by changing the blockchain and reducing its validation process (Wilson et al., 2021).

Second, the authors Chalmers et al. (2022) discussed challenges regarding potential frauds in the NFT market. The origin of content of an NFT is often not comprehensible for the buyer if the NFT’s content is owned by the NFT creator and if the creator is allowed to sell this NFT. Hence, there are already fraud cases of people who sell art or music as NFTs but do not hold any rights to do so (Chalmers et al., 2022). The NFTs copyright offered by a creator for sale must belong to the creator and only then he is allowed to sell this NFT legally. Further, if the NFT gets sold to another person, the ownership of the NFT gets transferred to the buyer and the new owner holds the right to sell the NFT. The owner’s right is limited, as similar to physical artwork, it does not automatically allow the owner to display the NFT to the larger public or reproducing it (Mendis, 2021).

Similar to the observed problem regarding cryptocurrencies by the authors Pennec et al. (2021), wash trading can be considered as another potential threat for investing in

NFTs (Chalmers et al., 2022). Wash trading is the scenario of two closely related parties which trade a certain asset, in this case an NFT, more often in order to stimulate a higher price and demand of the asset. The goal is to catch other parties' interest and trigger an involvement of these parties in the trade. A few cases concerning wash trading in the NFT market could already be observed. For example, in October 2021 an Ethereum address transferred a CryptoPunk to another address. In the next step the address sold the CryptoPunk for 124,457 Ether – in other words about USD 532 million. The money was borrowed from three different sources, including Compound, and in order to pay the trade, the money was transferred back to the seller and so was the CryptoPunk. Due to the astonishing price of USD 532 million paid for one NFT, the seller tried to offer this NFT for more than USD 1 billion but failed to find a new buyer (Baker, 2022; Chalmers et al., 2022). Finally, a non-fungible token is considered a unique alternative asset, which makes it – unlike traditional financial assets – difficult to define in monetary terms and value (Kong & Lin, 2021). Hence, the pricing of an NFT can be seen as abstract as it is in the art market, which may bring some uncertainty to investors (Kong & Lin, 2021).

2.3.2 NFT Market Platforms

On secondary market platforms like OpenSea.io or Foundation, people can easily create, buy, and sell NFTs (Kugler, 2019). The technical process of creating an NFT on these platforms is rather simple. First, the creator or artist uploads the medium of choice in order to turn it into a digital asset. Second, title, description, meta tags, price can be added and linked to the medium. After paying a transaction cost, known as a gas fee, on the Ethereum blockchain, the NFT is minted (technical language for creating a digital coin) and can now be offered for auction or sale (OpenSea, n.d.). Other marketplaces where it is possible to trade NFTs include mintable.app and Rarible.

2.3.3 NFT Collections

NFTs created and offered for sale on these secondary market platforms are organized in collections (Nadini et al., 2021). A study by Nadini et al., (2021) examined over 6.1 million trades in order to find out relevant information about NFT traders and successful NFT collections. The study highlighted that those successful collections

include several NFTs which are often graphically similar to each other in order to recognize the provenience of these NFTs. Some famous and successful examples of NFT collection are, for example, Crypto Punks, Chubbie and Wrapped Punks. They are simple in their appearance and often only include pixels and few colors. According to Nadini et al. (2021) these collections are separated into six different categories: art NFTs, collectible NFTs, gaming-related NFTs, metaverse NFTs, utility NFTs and non-categorizable NFTs, which are considered as “others.” Regarding of the total weight of these collection within the NFT market, the authors Nadini et al. (2021) found out that before 2018 the NFT market was dominated primarily by art-related NFTs, especially by the “CryptoKitties” collection. CryptoKitties are cartoon animated cats which through an algorithm are a completely uniquely designed digital collectible assets (Whitaker, 2019). They were created in 2017 by the company Dabber Labs with the special functionality of reproduction. Each cat is unique; if one person owns two of them, they can reproduce digitally, meaning a third CryptoKitty will be created (Whitaker, 2019). After 2018 further NFT categories started to emerge (Nadini et al., 2021) and between 2019 and 2020, the three categories – art-related NFTs, gaming-related NFTs and metaverse-related NFTs – accounted for 90% of the total volume exchanged in the NFT market. After several auction sale events in 2020 art-related NFTs alone were responsible for 71% of the total volume traded in the NFT market till mid-July 2020 and after July 2020 the categories games-related NFTs with 44% and collectible NFTs with 38% of the total volume dominated the market (Nadini et al., 2021).

2.3.4 NFT Traders

To highlight the importance of collections for NFT traders, the study by Nadini et al. (2021) discovered the behavior of NFT investors and traders and found out that most of the successful traders are specialized traders. In other words, these specialized traders are experts within a single collection, like the CryptoPunk or CryptoKitties collection mentioned above, and tend to stay in their collection with their investments. Another important point is that the top 10% of all NFT investors are responsible for 85% of all transactions performed on secondary market platforms. Additionally, these top NFT investors tend not only to stay within their collection of choice to invest, it seems they only trade with investors in their league (Nadini et al.,

2021). But who are these traders? It must be mentioned that in this market a huge gender gap exists. The authors Sharma et al. (2022) conducted a study of 15 NFT creators and collectors; 13 participants were male and only two females. This would underline recent claims by CoinDesk, an investment and cryptocurrency-focused online newspaper, which found out that at least 77% of money invested in NFTs goes to male creators and traders (Scholten et al., 2019a). Furthermore, the authors Francisco et al. (2022) conducted a study about crypto gaming in the Philippines and asked participants about their perception of playing such games. 75% of the 176 questioned participants were male. To sum up, it seems that most of the NFT traders and creators are male, and gender plays a role when it comes to trading with NFTs. Later in this thesis, the researcher will conduct a survey to find out if this argument is valid or not.

2.4 Hypothesis

Through the literature review done on this topic, the researcher arrived at the following hypotheses:

H0a: There is no correlation between the interest in NFTs and the interest in the general art market.

H1a: There is a correlation between the interest in NFTs and the interest in the general art market.

H0b: People who are investing in NFTs are not investing in physical artworks.

H1b: People who are investing in NFTs are also investing in physical artworks.

H0c: People who are successful in NFT trading do not invest their money in the physical art market.

H1c: People who are successful in NFT trading also invest their money in the physical art market.

H0d: NFT traders who are interested in art do not invest in physical art online.

H1d: NFT traders who are interested in art do invest in physical art online.

H0e: There is a correlation between gender and NFT trading.

H1e: There is no correlation between gender and NFT trading.

3 Methodology

The following chapter will present the methodology used for this thesis. First, the chapter will introduce the applied research design. Second, survey development will be explained. In addition, this chapter includes a short description of how the data will be analyzed.

3.1 Research Design

The focus of this bachelor thesis is to get a better and deeper understanding of the impact of non-fungible tokens on investment choices in the art market. For every research an appropriate research design is necessary to collect and analyze the primary data needed. For this research, a quantitative method was chosen to the extent of the secondary data summarized in the Literature Overview section. A quantitative research strategy is applicable for the purpose of this research, because through numerical data it is possible to show a trend toward the research questions of this thesis. Additionally, the researcher picked a survey for gathering primary data because the outcome is reliable and a quick method for collecting information from multiple respondents in an efficient and timely manner. Further, the option of spreading a survey online was chosen because otherwise it would be rather difficult to reach out to appropriate participants physically. Therefore, it is possible to send the established questionnaire directly to NFT creators and traders through online portals and NFT forums (e.g., discord.com, reddit.com and twitter.com). For this thesis potential discussion forums which could fit perfectly to the research aim will be found on the before mentioned websites, people will be informed about the purpose of this bachelor thesis and all potential privacy concerns will be clarified. To provide answers for the research question in this bachelor thesis an online survey with 80 participants will be conducted.

3.2 Survey Development

The online survey was established to better understand the impact of non-fungible tokens on investment choices in the art market. First, the fundament of this topic was already summarized in the Literature Overview chapter. Second, the researcher's aim

is now to collect as much primary data needed to answer the research questions and decide whether the hypotheses can be accepted or rejected.

The online survey is divided into three parts. It is organized in simple true or false questions, multiple-choice questions, and Likert-scale questions. Through the 5-point Likert scale, participants can indicate to what extent they agree or disagree with the statement developed by the researcher. Additionally, the middle option, "neither agree nor disagree," tries to help the questioned person to indicate that they haven't thought about it yet and therefore have no opinion on it to enhance a fluent response.

First, after a short overview on what to expect in the survey, participants will be asked to indicate their age, gender, and nationality. The first part will concentrate specifically on NFT trading including frequency and total volume of trades. Because the researcher is aware that asking about money generated from trades is a rather sensitive question and some participants may not want to indicate any price ranges of their trades, this question is voluntary and can be marked as "no indication."

The second part of the questionnaire aims to find out about the participants' interest in the art market. Further, if they already made investments in physical artwork similar to their investments in NFTs. The price ranges in the questionnaire for total volume traded in the NFT market and total money spend or sold on physical artwork are exact the same in order to enhance a better comparability between respondents' investments in these two markets.

The third and last part of the survey tries to find out if there are any connections and similarities between investment choices in NFTs and physical artwork. First, the participants will be asked about their opinion if NFTs have a positive impact on the physical art market. Second, in order to interpret direct influences of NFTs on the art market, the respondents have to specify if they became more aware of the general art market through trading with NFTs and if they link any potential investment opportunities in the general art market through remarkable sale events of NFTs. Finally, at the end of the survey, the survey contributors will be asked whether the want to buy a NFT or physical artwork for their next investment.

3.3 Data Collection

The study was developed to get a better understanding of the impact of non-fungible tokens on investment choices in the art market. A minimum of 80 completed surveys is the set goal for this research. Therefore, about 300 participants will be contacted to participate in the online survey. The survey will be distributed through direct channels like NFT-concentrated panel discussions on Discord, Twitter and Reddit to reach participants who are actively trading with NFTs and are interested in the general art market. The survey will be conducted in English and created through the application Google Forms. The online survey was created and ready to spread out to the participants by March 2022 to have enough time to distribute, gather and in the last step to evaluate the findings.

3.4 Data Analysis

Furthermore, statistical analysis will be prepared in the statistical software JAMOVI to test the hypotheses through certain tests. This analysis helps the researcher to find out more about the influence of the independent variable to the dependent variable. In the last step the researcher can reject or accept the hypotheses. Further, Microsoft Excel was used to prepare some graphs and tables to enhance clarity and to present the data collected in a clearly arranged way.

3.5 Data Ethics

Concerning the data ethics, every participant had to confirm at the beginning of the survey that they voluntarily answer every question of the questionnaire. Additionally, the researcher informed the participants about their privacy and that the only purpose of this collected primary data is to analyze it for this bachelor thesis and that it will not be shared with any third parties. Further, sensitive questions such as “Please indicate the range of which your profit is” were marked as voluntary and participants who did not want to indicate any price ranges had the possibility to click on no indication.

3.5.1 Introduction Part

At the beginning of the survey, the participants got a quick overview of what to expect and got clarified about certain privacy aspects of the survey. The introductory part was as follows:

"Dear Participants,

My name is Laurids Walkensteiner. I am currently a student at MODUL University in Vienna and writing my Bachelor Thesis. Let me thank you in advance for spending five minutes of your time to help my Bachelor Thesis develop a strong statement on how NFTs impact investment choices in the art market.

The survey is divided in three short sections. The first begins with few personal questions, followed by NFT-related questions. The second will focus on interest and investments in the art market. The final section will examine a possible correlation between these two markets. Although there are a few sensitive questions, I want to highlight that the survey is completely anonymous, and all answers collected will only be used in this Bachelor Thesis and will not be shared with any third parties. I kindly ask you to answer all the questions truthfully."

4 Data Results and Analysis

Additional to the Literature Overview the primary data was collected to round up the research on this topic. The online survey established on Google Forms in March 2022 was spread through specialized NFT trading discussion forums on twitter.com, reddit.com and discord.com and in mid-April reached the desired number of participants. In total the number of respondents is 81.

In order to answer the before posed research question (*How do NFTs impact investment choices in the art market?*) as well as the corresponding hypotheses H1 – H5. The following chapter concentrates on the summary and analysis of the survey outcomes. Thus, the data obtained is tested and evaluated statistically with the statistical software JAMOV. First, the sample characteristics are elaborated and serve as basis for stated evidence. Second, the possible correlation between the interest in the NFT market and the interest in the art market as well as the according investment choices are elaborated. Finally, it is examined whether NFT traders are investing in physical art and if gender has an influence in NFT trading.

4.1 Sample Characteristics

First, the participants were asked to answer a few personal questions regarding their gender, age, and continent of origin in order to present the demographics of the sample in the survey. As shown in Table 1, 93.8% of the respondents marked male as their gender and only 6.2% were female.

Gender	Frequency	Percent
Male	76	93,8%
Female	5	6,2%
Total	81	100%

Table 1 Gender Distribution of the Sample

Second, the respondents were all under 61 years old, with the age group 18-30 years, at 67.9%, representing the majority of the participants. Further, 25.93% of the respondents marked 31-45 years as their age group, only 3.7% were under 18 years

old and 2.47% between 46-60 years. Table 2 gives an overview about the distribution of age groups within the sample.

Age	Frequency	Percent
<18	3	3,7%
18-30	55	67,9%
31-45	21	25,9%
46-60	2	2,5%
>61	0	0,0%
Total	81	100,0%

Table 2 Age Distribution of the Sample

Third, with regard to the country of origin of the respondents, they were from seven continents. Most of the respondents came from Europe with 38.3%, followed by Asia with 24.7%, North America with 13.6%, Australia with 12.3%, South America with 7.4%. Africa was marked by 3.7% of the respondents. Solely Antarctica was marked by nobody as their continent of origin. All percentages and distribution of continent of origin are shown in Table 3.

Continent	Frequency	Percent
Africa	3	3,7%
Antarctica	0	0,0%
Asia	20	24,7%
Australia	10	12,3%
Europe	31	38,3%
North America	11	13,6%
South America	6	7,4%
Total	81	100,0%

Table 3 Continent of Origin of the Sample

Furthermore, the survey participants were asked to indicate how many NFTs they have bought or sold. As shown table 4, the majority of 56.8% had traded at least 5

NFTs. Followed by 23.5% of the participants who indicated that they had traded with more than 20 NFTs and 13.6% traded with 6 to 10 NFTs.

NFT traded	Frequency	Percent
1	20	24.7%
2 to 5	26	32.1%
6 to 10	11	13.6%
11 to 20	5	6.1%
more than 20	19	23.5%
total	81	100%

Table 4 Overview of Sample: Total NFTs traded

After conducting the spectrum of how many NFTs were traded, the participants were asked if they generated profit from trading. The result showed that 66.7% of the sample managed to achieve a profit through NFT trading and 33.3% did not. In order to get into more detail, participants had to indicate their profit range which is shown in table 5. The largest group of 32.1% did not indicate their range of profit. Also, 29.6% achieved less than USD 1000 in profit, followed by 13.6% in a range of USD 2001 to 5000. 8.6% managed to turn their trading into a profit range of USD 1001 to 2000. 7.4% generated USD 5001 to 10,000. Finally, the category of “more than 10,000” were marked by 8.6% of the survey participants.

Range	Frequency	Percent
< 1000	24	29.6%
1001 to 2000	7	8.6%
2001 to 5000	11	13.6%
5001 to 10000	6	7.4%
> 10000	7	8.6%
no indication	26	32.1%
total	81	100%

Table 5 Overview of Sample: Total Volume of NFTs traded in Dollar

Additional to NFT investments, the survey asked if the participants ever bought or sold a physical artwork and to indicate how much money they have spent on physical artwork. The same price ranges were used as for the indication of NFT profits. An overview is presented table 6 which shows a similar trend to NFT profits. The majority of 61.7% already purchased or sold a physical artwork while 38.3% did not. Again, the largest group of 38.3% did not indicate any price range in which they have spent money on physical artwork. 27.2% already bought physical artwork which was worth USD 1000 or less. Followed by 9.9% of the answers indicated a range between USD 2001 to 5000 and 8.6% for the ranges USD 1001 to 2000 and USD 5001 to 10000. Finally, 7.4% claimed that they have spent more than USD 10000 on physical artwork.

Range	Frequency	Percent
< 1000	22	27.2%
1001 to 2000	7	8.6%
2001 to 5000	8	9.9%
5001 to 10000	7	8.6%
> 10000	6	7.4%
no indication	31	38.3%
total	81	100%

Table 6 Overview of Sample: Total Volume of Physical Artwork traded in Dollar

In this survey the participants were asked to rate several statements on a 5-point Likert scale between totally agree (1) and totally disagree (5). The statements in the survey were written in text format; therefore, it was necessary to transform them into numeric data in order to calculate them and present them as graphs presented in this chapter. An overview of the transformation of the text format into numeric data can be observed in Table 7.

Rating of the statement in the survey (Text format)	Transformed numeric value of the rating
Totally agree	1
Agree	2
Neither agree nor disagree	3
Disagree	4
Totally disagree	5

Table 7 Transformation of Text Format into Numeric Data

4.2 NFT and Art Market in Correlation

First and foremost, the questionnaire asked whether the participants had ever bought or sold an NFT in order to suspend irrelevant candidates. Those respondents who answered 'yes' to the question can be assumed to be interested in trading NFTs. In addition, the participants had to rate their interest in the NFT market using a 5-point Likert scale (1= totally agree; 2= agree; 3=neither agree nor disagree; 4= disagree; 5= totally disagree). The histogram in figure 1 illustrates the distribution of the participants' responses and represents the entire sample. The interest in the NFT seems to be rather high since the distribution is higher for lower values. With the mean of 2.17, interest can be evidenced as rather high, close to the value of 2 on the Likert scale, which indicates "agree". A Shapiro Wilk test was performed to check if the data is normally distributed or not. The result shows, similar to the histogram in figure 1, that the data is not normally distributed with a p-value of less than 0.05.

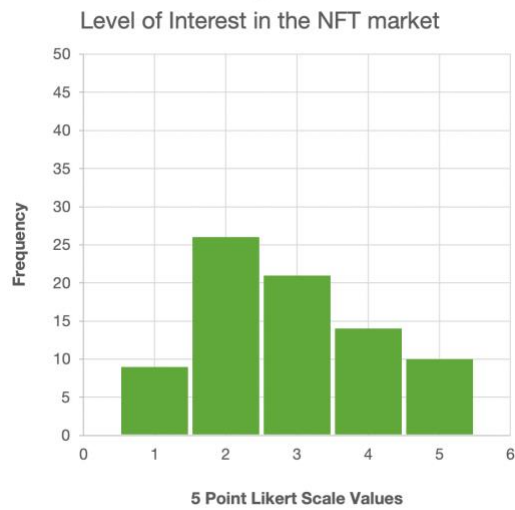


Figure 1 Histogram: Level of Interest in NFT Market

To compare interest in both markets, the second part of the survey asked candidates to rate their interest in the art market on a 5-point Likert scale and whether they were interested in the art market before the rise of NFTs. The distribution of the responses to the 5-point Likert scale question is visualized in the histogram in figure 2. Additionally, a Shapiro Wilk test was performed to test the data if it is normally distributed or not. The outcome of this test acknowledged a non-normality of the data with a p-value of less than 0.05. The outcome demonstrates that the respondents' interest in the art market is generally rather positive (lower Likert scale values). Most interviewees answered “agree”(= 2 on the Likert scale), resulting in a mean of 2.85 out of 5, which shows that most respondents have a relatively high interest in the art market, as the mean of 2.85 is closest to the statement “agree” on the Likert scale. Compared to the mean score of interest in NFTs (= 2.17), however this indicates a lower level of interest.

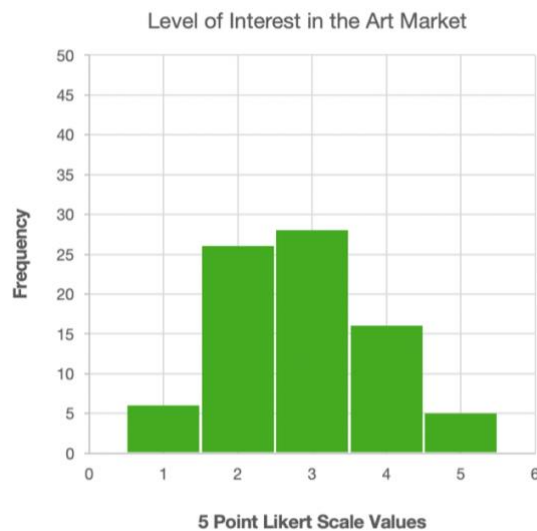


Figure 2 Histogram: Level of Interest in the Art Market

The yes/no question about the interest before and after the advent of NFTs revealed the following. The data analysis revealed that 67.9 % of the participants were already interested in the art market before the introduction of NFTs. While for 32.1 % of the participants the art market was not relevant before the NFT hype.

To test whether there is an existing correlation between the interest in the NFT market and the art market and in order to be able to answer hypothesis H1a a correlation matrix was used. This test was chosen because it provides information about the relationship between two metrically scaled variables. The survey questions regarding the level of interest in the two markets were opposed and resulted in a p-value of 0.378. This p-value is higher than the alpha value of 0.05 or the significance level of 5% ($0.378 > 0.05$), resulting in H_0 not being rejected, which implies that there is no statistically significant correlation between participants' interest in the NFT market and the art market.

Considering the Pearson's r value, which in this case is slightly negative (-0.099) and the variables therefore trend in opposite directions. Theoretically, this means that if the value of one variable increases, the value of the other variable decreases. However, the correlation coefficient should always be interpreted in relation to the context. Thus, a higher interest in the NFT market does not necessarily translate into

a lower interest in the art market and vice versa. However, the Pearson's correlation shows no significant correlation between interest in the NFT market and interest in the art market ($r = -0.099$; $N = 81$).

4.3 Relationship among Investment Choices

The following paragraphs focus on a possible relationship between investment choices in the NFT market and the art market. To examine participants' opinion about the reliability of both investments the participants of the online survey were asked whether they consider NFTs and physical artworks to be reliable investments. These statements were again rated on a 5-point Likert scale, ranging from 1= totally agree; 2= agree; 3=neither agree nor disagree; 4= disagree to 5= totally disagree.

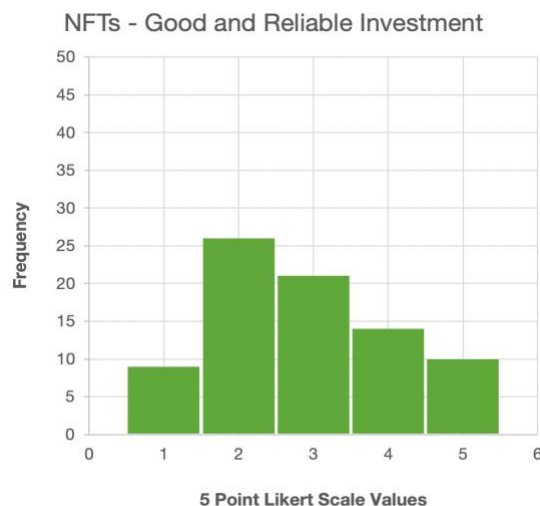


Figure 3 Histogram: Opinion on Reliability of NFT Investments

Figure 3 shows the distribution of responses on the reliability of NFTs. It seems that opinions on this topic are rather divergent, with 12.5% of participants stating that NFTs are not a reliable investment and totally disagree, 17.5% seeing NFTs as rather unreliable and disagree, 26.3% having a neutral opinion, 32.5% thinking NFTs are rather reliable and agree, and 11.3% thinking NFTs are a reliable investment and totally agree. This results in a mean value of 2.88, which implies that the opinion on the reliability of this investment opportunity can be interpreted as slightly positive but

rather neutral, as the value tends towards 3, which means “neither agree nor disagree”.

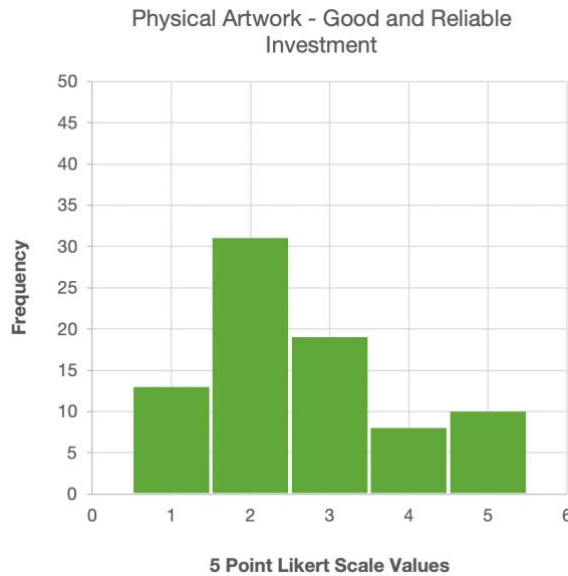


Figure 4 Histogram: Opinion on Reliability of Physical Art Investments

The histogram in Figure 4 illustrates the distribution of responses to the question about physical art as a reliable investment. As with NFTs, opinions differ on the reliability of the investment. Nevertheless, physical artworks seem to be more reliable for the respondents than NFTs, as the mean score is 2.64, which is lower than the mean score of NFTs (2.88) and more in the trend of lower values.

To determine whether people who invest in NFTs also invest in physical art, the question was asked whether participants had bought or sold an NFT or a physical artwork. These questions were contrasted in a contingency table, since the table shows sample values in relation to two different variables. The test revealed that 60% of participants who invest in NFTs also invest in physical artworks. However, the resulting p-value of 0.428 is not statistically significant at an alpha level of 0.05 ($p = 0.428 > 0.05$), thus the null hypothesis is not rejected. This means that there is no statistical significance that participants who invest in NFTs also invest in physical artworks. Additionally, the final question of the survey asked the participants if they would more likely buy an NFT or a physical artwork for their next investment. The majority of the respondents (80.2%) stated that they will buy an NFT for their next

investment rather than a physical artwork which was marked by 19.8% of the participants.

To answer hypothesis H1c respondents were asked whether they had made a profit from NFT trading and whether they had ever traded physical artworks. The analysis revealed that 66.7 % of the respondents generated profits with NFT trading, while 33.3 % had not yet made a profit. In addition, when asked if NFT traders have ever bought or sold a physical artwork, 61.7% of participants stated that they had.

Furthermore, the willingness to invest in physical artwork was examined using a 5-point Likert scale. Figure 5 points out that the majority of the interviewees (60.5%) are willing to invest in the art market by buying a physical artwork in the next 1 to 2 years. The resulting mean score of the sample regarding this question is 2.47 which is between “agree” and “neither agree nor disagree” which indicates an overall willingness to invest.

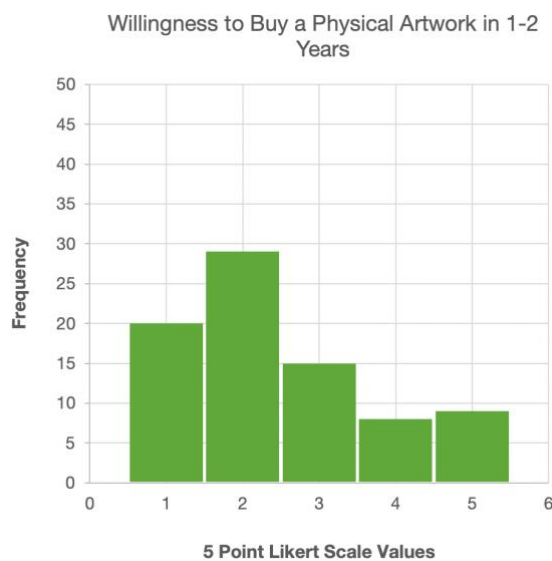


Figure 5 Histogram: Willingness to Buy a Physical Artwork in 1-2 Years

To finally answer hypothesis H1c that is, whether NFT traders who are successful in their trade also invest their money in physical artworks, a Chi-Square test was conducted. The purpose is to determine whether a difference between the observed data and the expected data is due to a relationship between the variables or due to

chance. A contingency table was created comparing the two questions of whether they had made a profit from NFT trading and whether they had ever traded physical artworks. It should be noted that the expected data for participants generating profit by trading NFTs and participants dealing physical art (33.3 participants) is lower than the observed data, which amounts to 38 participants. This indicates that successful NFT traders also invest in physical artworks, as evidenced by the resulting p-value of 0.024. With this p-value (0.024), H_0 is rejected ($p = 0.024 < 0.05$), hence it can be said that people who are successful in NFT trading also invest their money in the physical art market. Considering the Cramer's V, which provides information about the statistical correlation between two or more nominally scaled variables and lies between 0 and 1, a moderate correlation can be determined. In this case, the Cramer's V is 0.25 and thus lies in the moderate range of coherence.

4.4 Online vs Offline Investments by NFT Traders

The following section examines whether NFT traders who are interested in the art market are more likely to buy physical art online or offline. Through this, the hypothesis will be answered.

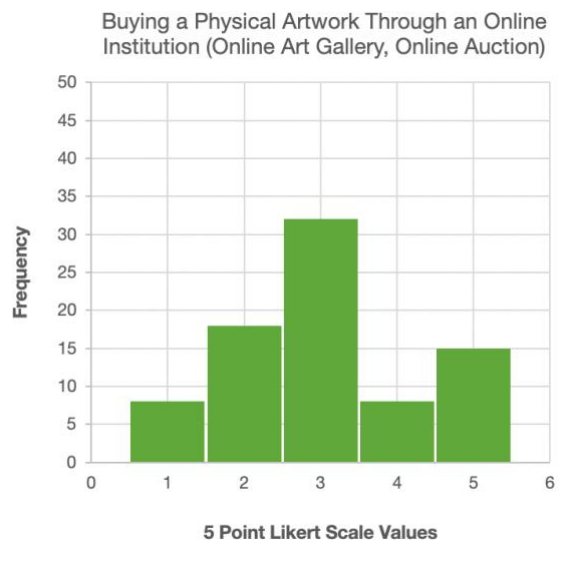


Figure 6 Histogram: Opinion on Buying a Physical Artwork through an Online Institution

For this reason, participants in the online survey were asked to rate on a 5-point Likert scale whether they would prefer to buy a physical artwork online, for example,

through online galleries, online auctions, then through traditional institutions such as physical art galleries or auctions. The analysis shows that 40% have marked their opinion as neutral, 31.3% would be more likely to buy physical art online and 28.8% are rather reluctant to buy physical art online. The mean of 3.05 indicates that the respondents' attitude towards online art purchases is rather neutral, since 3 equals to 'neither agree nor disagree' on the 5-point Likert scale.

In addition, a correlation matrix was used to test whether there is a relationship between NFT traders' interest in the art market and if they are more likely to buy physical art online, thus answering the hypothesis. The performed correlation matrix reveals that with a p-value of 0.081, there is no statistically significant correlation between art-interested NFT dealers and online purchases of physical art ($p = 0.081 > 0.05$). The null hypothesis is therefore not rejected.

This result is underlined by the Pearson's r value, which is negative (-0.195) and thus there is a weak linear relationship ($r = -0.195$; $N = 81$). This means, theoretically, if the value of one variable increases, the value of the other variable decreases. Thus, if interest in the art market increases, this would mean a decrease in interest in buying physical art online. Hence, it can be stated that the interest of NFT traders in the art market has no influence on the type of purchase of physical art.

4.5 Influence of Gender in NFT Trading

The final subsection of the data analysis examines the influence of gender in NFT trading. Therefore, respondents were asked to indicate their gender at the beginning of the survey, subsequently they were asked about their level of interest in NFT trading and if they consider NFTs as reliable investment. To answer the hypothesis an independent sample t-test was conducted on the data obtained from the before-mentioned questions (see chapter X for reference). The tested p-values of the Welch's t test as well as for the Mann-Whitney U test were examined. According to the Mann-Whitney U test, with an p-value of 0.472 for the level of interest in the NFT market, there is no significant evidence that there is an influence in gender. Further, the Welch's t test resulted in a p-value of 0.587 which is again greater than the significant level of 0.05 and therefore it can be stated that gender has no significant influence in the level of interest in the NFT market. In order to round up the statement, a second

statement was tested regarding the reliability of NFT investments. The Welch's t test revealed a p-value (0.363) greater than the significant value of 0.05 as well as the Mann-Whitney U test ($p = 0.2$). To sum up, it seems that according to this survey an influence of gender in NFT trading could not be deducted and therefore the H_0 is not rejected.

5 Findings and Discussion

The following chapter summarizes the findings of the survey conducted and concentrates on the researchers' hypotheses if they can be accepted or rejected. Additionally, the outcome of the performed statistical tests will be discussed to provide possible reasons for the result. The aim of the survey is to test the in the Literature Overview resulting hypotheses on a small population and decide if they are valid for the sample or not. And, in the last step, the research question "How do non-fungible tokens (NFTs) impact investment choices in the art market" will be answered by discussing the outcome of the data conducted.

Table 8 shows an overview of the stated hypotheses, the alternative hypotheses, the resulting p-values of the statistical tests and if the hypotheses are rejected or accepted.

Overview Hypothesis			
	null hypothesis	alternative hypothesis	reject/not reject
1	There is no correlation between the interest in NFTs and the interest in the general art market.	There is a correlation between the interest in NFTs and the interest in the general art market.	$p = 0.378 > 0.05$ not reject
2	People who are investing in NFTs are not investing in physical artwork.	People who are investing in NFTs are also investing in physical artwork.	$p = 0.428 > 0.05$ not reject
3	People who are successful in NFT trading do not invest their money in the physical art market.	People who are successful in NFT trading also invest their money in the physical art market.	$p = 0.024 < 0.05$ reject
4	NFT traders who are interested in art do not invest in physical art online.	NFT traders who are interested in art do invest in physical art online.	$p = 0.081 > 0.05$ not reject
5	There is no correlation between gender and NFT trading.	There is a correlation between gender and NFT trading.	$p < 0.05$ not rejected

Table 8 Overview of the Hypotheses and Outcome of the Statistical Tests

In the previous chapter results and analysis of the quantitative survey data were collected and after the examination of the statistical tests it can be summarized that five out of four hypotheses claimed by the researcher were not statistical relevant and therefore could not be accepted. In order to understand the outcomes and being able to interpret the impact on investment choices in the art market the accepted and rejected hypotheses will be compared to the research in the Literature Overview.

First, regarding to the interest in both markets it seems that a few NFT traders are interested in the art market but most of the participants showed a rather low level of interest. On the one hand, the statistical outcome may underline the fact that NFTs are not only categorized as digital artworks. According to the authors Nadini et al., (2021) they are further categorized in collectibles, gaming-related NFTs, metaverse NFTs, utility NFTs and non-categorizable NFTs. Thus, most of NFT interested people may not directly link NFTs with art and therefore their interest in NFTs has nothing to do with the interest in the general market. On the other hand, throughout the research on this topic presented in the Literature Overview many NFT projects were directly linked to the art market and therefore a connection was assumed.

Second, the next hypothesis regarding to the connection between investments in the NFT and art market could not be accepted. The result showed that a few NFT traders also invest their money in the art market but with a p-value of 0.428 the outcome is not statistical relevant. A possible reason for this could be, as claimed for the first hypothesis, the fact that NFTs are not automatically seen as artwork and therefore people do not think of investing in the general art market. In contrast to the survey outcome the Literature Overview described many use cases of NFT investments related directly to the art market. Traditional auction houses like Sotheby's and Christies offering NFTs for sale and are confronted with people who invest into traditional artworks and people who are investing in NFTs (Bourron, 2021). The decentralized art gallery Maecenas managed to attract investors with their ART Tokens, which is a combination between the technology of NFTs and the artwork of the American pop artist Andy Warhol (Franceschet, 2021). Therefore, the assumption of a correlation between investment choices in both markets was seen as valid.

The third hypotheses: "People who are successful in NFT trading also invest their money in the physical art market" could be accepted and indicates a positive impact of NFTs on investment choices in the art market. Therefore, it seems that NFT traders who are successful in their trading also recognize the great potential of art investments and do not hesitate to invest in this market. Possible reason for this outcome of the survey could be that 67.9% of these NFT traders were interested in the art market and already invested in physical artwork before the rise of NFTs. This underlies the Literature Overviews findings that successful NFT sales are also

connected to the art market. For example, the artwork of the artist Beeple which was sold for USD 69.3 million at Christies' (Kugler, 2021) were followed by a physical artwork of the artist with the name "human one" which was again a huge success and sold for USD 28.9 million, again, at the auction house Christies' (Christies, 2022). The NFT artwork "Everydays: The First 5000 Days" by Mike Winkelmann (Beeple) was bought by Vignesh Sundaresan who is a bitcoin entrepreneur from India (Sundaresan, 2022). Further, the physical artwork "human one" was bought by the Swiss venture capitalist and investor Ryan Zurrer, who also invested in Lava Labs, the company which invented the Crypto Punk NFT collection (Mattei, 2021).

Fourth, the hypothesis H1d claimed that NFT traders who are interested in art want to purchase physical art online. This hypothesis was assumed based on the Literature Overview finding that NFTs are purely traded online through secondary market platform like OpenSea.io or Foundation (Kugler, 2021), were sold through online galleries like Maecenas (Lotti, 2019; Whitaker, 2019) or sold through online auction events in auction houses like Christies', Sotheby's and Phillip's (Bourron, 2021). In the analysis section a potential connection between NFT traders with interest in art and their perception to buy physical art online could be observed but with a p-value of 0.081 the connection is not statistical relevant and therefore not acceptable. A potential reason for this outcome could be the fact that people who are considering buying a physical artwork want to see the artwork in a physical institution first before they buy it. This would mean that there is a significant difference between the way of purchasing an NFT and a physical artwork.

The last hypothesis claimed that gender has an influence in NFT trading which was not accepted by the statistical test. The test revealed that there is neither a significant difference in gender regarding the level of interest in the NFT market nor the opinion on if NFTs are seen as reliable investment or not. Nevertheless, the survey participants showed a huge gender gap regarding the total number of female participants of 5. This confirms the in the Literature Overview found phenomena that more men tend to create and invest into NFTs than women similar to cryptocurrency investments (Francisco et al., 2022; Scholten et al., 2019). Causes for this gender gap in the survey will be discussed in the Limitation subsection in the Conclusion chapter.

6 Conclusion

The aim of the following chapter is to conclude this thesis. The conclusion is divided into two parts. The first part will highlight limitations of this research and the second part will focus on future research on this topic.

In conclusion, the study revealed that 82.7% of the respondents are interested in the general art market and 67.9% indicated that they were interested in the art market before the rising attention on NFTs. Nevertheless, a statistically significant correlation between interest and investment choices in both markets could not be observed. The survey showed that 60.5% of the respondents want to purchase a physical artwork in the next 1-2 years and 60% of the participants who are investing in NFTs also want to invest in physical art. Further, according to the survey, the statement that successful NFT traders are willing to invest their money in the art market was significant and can be seen as positive impact of NFTs on investment choices in the art market. Moreover, it was assumed that through the fact that NFTs are traded purely online, the traders would prefer to purchase physical art the same way as they buy NFTs. In contrast to the claimed hypothesis, NFTs do not influence the way how such traders want to purchase physical art. Last, gender seem to have no significant influence in NFT trading when the level of interest and reliability of NFT investment was compared and statistically tested between female and male participants. To sum up the Literature Overview and the Result Section, NFTs have an impact on investment choices in the art market.

6.1 Evaluation of Limitations

The study was challenged with several limitations throughout the research in both the Literature Overview and the survey conducted. NFTs gained a lot of attention especially in the art market in 2021; a few academic journals were writing about possible connections between NFTs, and the art market was at the time of writing this thesis still in the peer-reviewing process and could not be used for academic research. In addition, the research was limited regarding the time of observation. Certain influences of the corona pandemic were mentioned in the literature overview. If the corona pandemic was the driving force behind the huge adaptation of NFTs in the art

market remain unclear. Further suggestions for answering this question will be presented in the Future Research subchapter.

Further, the online survey conducted highlighted several limitations. The survey contained the total number of 81 respondents, the number of participants is considered as too small to represent all NFT traders. This could be the result of the rather short time period of two months for collecting the data or the difficulty to find appropriate candidates which were willing to participate in this survey. The survey was further limited to demographic aspects of the sample. According to the participants gender, only five females could be reached as respondents of the survey. This inequality in gender could be due the circumstances that male are considered to be more interested in crypto investments as mentioned in the Literature Overview (Francisco et al., 2022; Scholten et al., 2019a), but also, again due the time constraints and the struggle to find appropriate candidates. A possible solution for this issue will be highlighted in the next subchapter.

Further, the survey dealt with two sensitive questions regarding the profit with NFT trading and the amount spent on physical artwork. 32.1% of the participants did not indicate their range in profit which is a lot in regard to the meaningfulness of the profit generated within the sample size. As well as for the second question regarding the total amount of money spend for physical artworks, 38.3% did not provide a clear answer and marked "no indication" as their response. This could be due the circumstances that some participants may do not remember how much they paid for their artwork or simply did not want to answer it which was the purpose of given the opportunity to mark it as "no indication". Furthermore, in the online survey, participants were asked if they were interested in the art market before the rising attention on NFTs, resulting that 67.9% were interested in the art market before which can be seen as limitation. It can be assumed that the participants interest in the art market was not directly influenced because of the interest in the NFT market. Therefore, it is difficult to interpret how NFTs influences the interest in the art market.

Additionally, it must be added that the possibility of giving wrong answers or simply losing the concentration of answering the question carefully is always given during an online survey.

6.2 Future Research

As mentioned in the previous subsection this research on how NFTs impact investment choices in the art market were limited regarding the time of observing this digital asset and the limited number of participants especially female participants in the survey. In order to provide a deeper insight how non-fungible tokens behave in the art market regarding investment choices, a broader study is suggested. In order to achieve a higher number of participants a certain winning prize could be invented which serve as motivation to fill out the survey. In this case an NFT could be created on OpenSea and every participant who successfully complete the survey will get the chance to win the created NFT. This could be decided through a raffle after the completion of the research. Moreover, it would be interesting to ask the participants about their motivation why they are investing in NFTs and their field of profession to understand the driving forces behind NFT trading. It is important to find out if their profession has something to do with their willingness to invest in this rather uncertain market like the Bitcoin entrepreneur Vignesh Sundaresan (Sundaresan, 2022) or venture capitalist Ryan Zurrer (Mattei, 2021) to answer this question.

Moreover, a longer time period of observing this digital asset is required to understand the long-term impact of NFTs in the art market. Further, to see if this investment is reliable in their return especially in secondary sales. As the Literature Overview highlighted, the most successful NFTs are formed in collections and are multiple times traded like Crypto Punks and Bored Ape Yacht Club (Nadini et al., 2021). One example for a failed secondary sale, is the before mentioned twitter post transformed by twitter CEO Jack Dorsey which was bought for USD 3 million (Kong & Lin, 2021) by Sina Estavi, the CEO of blockchain company Bridge Oracle. Estavi held the NFT for more than one year and then offered it for sale on the secondary market platform OpenSea.io for USD 48 million but the highest bid achieved was approximately USD 12,600 (CBSnews, 2022). This could indicate first doubts about the reliability of NFTs or simply that not every successful sold NFT in the primary market behave well in the secondary market, therefore future research is necessary to get a better understanding of the possible causes for failed secondary market sales.

This thesis highlighted some short-term effects on investment choices in the art market and presented first implementations of NFTs in the art market. Physical artworks get transformed into pure digital assets in order to offer the same artwork digitally for sale. Provenience and proof of ownership will play a huge role when it comes to adapting these physical artworks into the virtual world. It would be interesting to observe the legal issues of NFTs especially regarding the before mentioned adaptation. In addition, as mentioned in the Limitation section the attention on NFTs rose especially in the time of the corona pandemic. It would be interesting to see how this digital asset behave in the art market when the pandemic ends. To sum up, this thesis can be used as foundation for further research on the correlation of investment choices in both the NFT and art market.

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Appendices

Survey Questions:

By clicking this button below, you are giving your consent to participate in this study:

A: Yes

B: No

Please indicate your gender:

A: Female

B: Male

C: Prefer not to say

D: Other

Please indicate your age group:

A: < 18

B: 18 - 30

C: 31 - 45

D: 46 - 60

E: > 60

Where are you from?

A: Africa

B: Antarctica

C: Asia

D: Australia

E: Europe

F: North America

G: South America

Have you ever bought or sold an NFT?

A: Yes

B: No

Please indicate your level of interest in the NFT market.

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

How many NFTs have you bought or sold?

A: 1

B: 2 - 5

C: 6 - 10

D: 11 - 20

E: > 20

Have you generated a profit through trading with NFTs?

A: Yes

B: No

IF YES: Please indicate the range in which your profit is. (in Dollar)

A: less than 1000

B: 1001 - 2000

C: 2001 - 5000

D: 5001 - 10 000

E: > 10 000

F: no indication

Please indicate the purpose for which you trade with NFTs.

A: interest in this technology

B: interest in art

C: investing short term

D: investing long term

E: Other: _____

In my opinion buying a NFT is a good and reliable Investment.

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

Are you interested in the physical art market?

A: Yes

B: No

Please indicate your level of interest in the art market.

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

Were you interested in the physical art market before the rise of NFTs?

A: Yes

B: No

Have you ever bought or sold a physical artwork?

A: Yes

B: No

IF YES: How much did you spend on artwork(s) (in Dollar)?

A: less than 1000

B: 1001 - 2000

C: 2001 - 5000

D: 5001 - 10 000

E: > 10 000

F: no indication

In my opinion buying a physical artwork is a good and reliable Investment.

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

I will buy a physical piece of art in the next 1-2 years.

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

I will rather buy my next physical piece of art online instead through e.g. physical institution (art gallery, auction house, ...)

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

By trading NFTs, I have become more aware of the physical art market.

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

Through trading NFTs, I became aware of potential investment opportunities in the physical art market.

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

NFTs and their technology have a positive impact on the physical art market.

1: Strongly Agree

2: Agree

3: Neither Agree nor Disagree

4: Disagree

5: Strongly Disagree

Would you rather buy a NFT or a physical artwork for your next investment.

A: NFT

B: physical artwork