An investigation of the impact of NFT's on the Modern Art Market

by

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Declaration

I, Timothy Mwesigwa, declare that this thesis is composed of my original work, it contains no material previously published or written by another person except where due reference has been made in the text. This thesis is submitted to the University of Cape Town for the Masters of Philosophy in Financial Technology degree.

Signed by candidate

July 31, 2023

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Abstract

The adoption of Non-Fungible Tokens (NFTs) and blockchain technology by the art industry, creates a digital art market. NFTs also change the way artists earn a living from their creations and enable digital asset ownership which impacts any potential digital art owners. This thesis reviews the available academic literature on the impact of NFTs on three elements of the art industry; it's structure, it's creators and it's consumers. I find that the history of the art market determined its modern structure, which is divided between primary and secondary markets, each market dealing directly and indirectly for art with original artists, respectively. NFTs foster disintermediation in the secondary art market, made of traditional intermediaries like art dealers, by enabling a more efficient copyright management mechanism on the blockchain. Additionally, because NFTs enable unique digital identification of digital art, they create a new market for digital assets which extend the structure of the art market to encompass the digital realm. However, the current legislation concerning digital property is structured in a way which favours licencing models which do not enable full ownership of digital files. The hybrid nature of NFTs transactions, which have elements of both sales and licensing agreements, creates the main challenge policy-makers face to craft regulation applicable to NFT transactions. Common law plays a crucial role in this process by balancing digital contracting and property rights which ultimately affects investment in digital property. NFTs also enable the implementation of novel funding models for artists on the blockchain. These include fractional equity in art and the efficient payment resale royalties, which are previously put forward through the Artist's contract, but only practically achieved using NFTs, smart contracts and tokenisation on the blockchain. This thesis lays the foundation for subsequent studies to explore other substantial segments of the NFT market, especially the collectables and gaming segments.

Keywords: Non Fungible Tokens; Digital Art; Blockchain; Digital Assets; Art Market

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I would like to thank my supervisor, Associate Professor Co Pierre Georg, for his tremendous support and guidance, throughout the process of not just writing this thesis but also acquiring this degree. I am inspired by the example you continue to set for us; that we have a responsibility to truly change the world for the better. I will carry your wisdom with me forever.

To my parents and my lovely siblings, your love, warmth and prayers carry me everywhere I go.

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And last, but not least, to all the friends I made during my stay in Cape Town, you all made this degree an adventure of a lifetime and I will never forget the times we shared.

A luta continua; victoria ascerta.

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1. Introduction

Non-Fungible Tokens (NFTs) are a new type of digital asset that has recently gained significant traction within the art industry. Their name suggests that NFTs are unique digital commodities such as artworks or assets (J. Fairfield 2021). The benefits for the art industry are manifold. First, they provide a new way for artists to monetise their work. Second, they can help to reduce the friction between buyers and sellers of art. Lastly, perhaps most importantly, they encourage investment in digital art by pioneering scarcity in this medium and enabling novel equity models which ensure mutually beneficial value distribution between artists and art owners.

This thesis reviews the available academic literature on the impact of NFTs on the art industry. I am interested in how NFTs affect digital artists and prospective art owners and the shifts these changes have on the art market structure. This thesis begins by assessing the historical context of the art market and shows how this history influenced the modern art market's structural formation. I then introduce NFTs and blockchain technology and show what changes the adoption of this technology presents within the contemporary art market structure. The most notable change is the ability for scarcity within the digital art medium, which creates the opportunity for NFT art to be an alternative investment, like physical art. Consequently, this thesis then reviews the literature on the legal and infrastructural factors which empower the dissemination of digital property rights to NFT art owners, who stand to gain from the value gains that could accrue to their digital art purchases. I also examine the role of Common law in structuring these property rights. This thesis concludes with the benefits that will accrue to artists, mainly through the facilitation of fractional equity and the payment of resale royalties to artists. This is achieved through the implementation of tokenisation, smart contracts and the use of NFTs on the blockchain. Even though this literature review considers a multitude of publicly available research on the subject on Non- Fungible Tokens and Digital art, Figure 1.1 provides a snap shot of the papers which make up the bedrock of this analysis, spanning the five key areas of interest for this thesis.

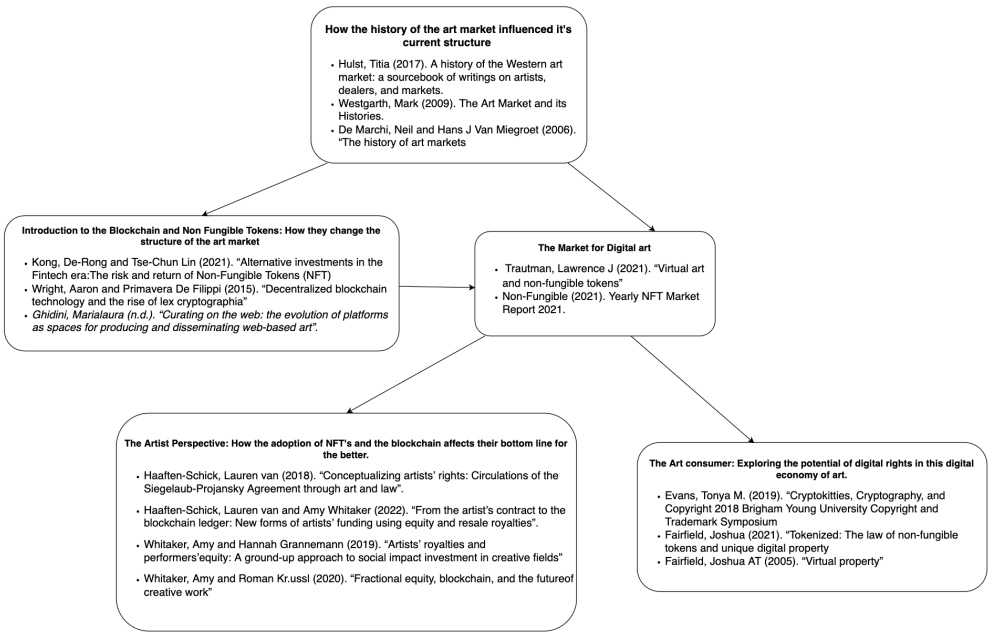

Figure 1.1: The thesis in a snapshot: The major pieces of reviewed literature spanning the five key areas on the impact of NFT's on the Modern Art Market (Source: Author)

Following this section of the chapter is the necessary background to this investigation, followed by the research objective, research aims, the significance of this thesis, and its limitations. This chapter concludes with an outline of the rest of the thesis.

1.1 Background

Before considering how the advent of NFTs disrupts the art market structure, it is crucial to highlight its current structure. Modern art comprises primary and secondary markets (Hulst 2017). The primary market creates art sold directly to art consumers and innovates creative artistic methods and trends, which are principally responsible for its expansion. The trade of art dealerships originated from the secondary market, where the resale and collecting of art occur. It expanded throughout the Renaissance merchant cities (Westgarth 2009) to the modern-day art market, which is worth over $65 billion today (McAndrew 2021). Chapter 2 of this thesis delves into more detail as to how the art market's history influenced the formation of its current structure.

The NFT art industry, including digital art and other collectables, continues to experience significant growth outside the $65 billion worldwide art market (McAndrew 2021). From $4.6 million in 2019 to over $11 billion in 2021 (Non-Fungible 2021), sales revenue in this market increased significantly. This accomplishment is a result of

blockchain technology's growing general usage. It is relevant to this thesis as a tool for digital artists to sell their digital art and for collectors to efficiently exchange these novel digital assets.

Before the blockchain, new approaches to producing, modifying, and disseminating art were made possible by the peer-to-peer aspect of the internet, also known as Web Version 2.0 (Ghidini 2019). The drawback of this technology was how easily and widely distributed identical artworks were without permission. The internet is now transitioning to a decentralised, blockchain-based form known as Web Version 3.0 (Grech, Sood, and Ariño 2021). However, it is essential to comprehend the development of the internet from its first form, known as Web 1.0, to Web 2.0, and eventually to Web 3.0, to understand the influence this would have on the creative world (Evans 2019).

According to Patel (2013), Web 1.0 is a centrally controlled information model which provides information to consumers to interact with passively. Web 2.0, on the other hand, is decentralised and comprises many client-server models, enabling the consumer to become a creator, but features information silos that empower the owners of these information silos as monopolies. Therefore, the innovation of Web 3.0 is a distributed internet, without any centralised intermediaries, which enables the consumer to produce and control their information and the value associated with it. Blockchain technology, which powers this new internet, combines peer-to-peer networks and cryptographic algorithms with decentralised consensus mechanisms and distributed data storage. The blockchain represents an alternative data storage structure that synchronises a single data record across multiple nodes that form the blockchain's network.

The blockchain enables the use of NFTs. An NFT is a cryptographically verifiable token, which is unique and immutable, representing a digital or physical item on the blockchain (Regner, Urbach, and Schweizer 2019). The NFT innovation occurred in 2017 when Dieter Shirley, who also created Crypto Kitties[1], introduced the ERC[2]-721 standard, enabling the creation of unique Ethereum Tokens (Entriken et al. 2018). NFT's create the possibility of verifying digital asset ownership, allowing the creators and owners of the original piece of digital artwork to prove and transfer ownership of these assets. This standard also enables the tracking and transfer of ownership of these NFTs.

[1] CryptoKitties is an online game where users can collect, breed and trade virtual cats for real currency. All the virtual cats within the game are digital tokens similar to Bitcoin but individually unique because they are created using the ERC-721 token standard on the Ethereum blockchain.

[2] ERC, or Ethereum Request for Comments, is referred to by this abbreviation. ERCs are application-level standards for the Ethereum blockchain and can include formats for libraries and packages, name registries, and more.

Chapter 3 of this thesis provides more detailed context into the development of the blockchain and NFTs. In contrast, chapter 4 considers the development of digital art and mainly explores the NFT market in depth.

Since this thesis focuses on the art industry and NFTs facilitating the transfer of digital art assets, it is worth exploring the implications of this innovation on the underlying copyright of these artworks. Copyright is incredibly profitable, with copyright-intensive industries collecting revenues exceeding 2 trillion annually (Siwek 2020). However, digital creators still only receive a small proportion of the earned revenue. With barely any influence over exploiting their creations, the lion's share of profit and power is retained by intermediaries. It is also incredibly challenging for good faith potential licensees to licence copyrighted works since the cost of identifying the original creator is high. This high cost is because it is easy to copy and distribute digital creations (Savelyev 2018). The blockchain resolves this issue, particularly for digital artists, because of its decentralised nature, which eliminates exploitative intermediaries. Chapter 3 of this thesis further explores the relationship between copyright and crypto native assets.

A legal framework that permits the ownership of entirely digital property is a crucial issue that will determine whether or not there is a healthy future market for NFT art (Trautman 2021). However, given its current status, it is urgent for governments worldwide to update the legal framework of digital property ownership. All digital property, such as music, audiobooks, and eBooks, are centrally held and made available under a licencing scheme regulating any legal conflicts involving these asset classes. Customers of digital media do not own the items they purchase from services like Amazon and iTunes. This precedent suggests that NFT owners cannot truly possess the NFT digital art they acquire unless the law is changed. The clear distinction of the rights that embody the ownership of NFTs will be fundamental in determining the future of their viability in the modern free market. This distinction applies when distinguishing between intellectual property and digital property since any intellectual property claims would pose a challenge to NFTs being viable collectable art. Chapter 5 of this thesis considers the development of digital property rights, particularly to enable more efficient investment and trade within digital art markets.

Chapter 6 of this thesis then turns attention to the artists' perspective, particularly how they benefit from using blockchain technology and NFTs in the art market. The difficulty for artists nowadays is that they must rely on the income from the initial sales of their creations, which often occur before it has gained much of their worth. This limits

the revenue from these prospective future sales (Haaften-Schick and Whitaker 2022). This reliance results from the difficulties in determining the future worth of any artwork due to the high degree of information asymmetry connected with art transactions (Caves 2003), which makes it challenging to negotiate both the present and potential future profits from art sales. The structure of resale royalties in art transactions and the prospect of artists keeping a portion of the equity in their work are two contemporary legislative and scholarly approaches to resolving this problem (Whitaker and Kräussl 2020). These solutions originate from the Artist's contract, a novel contract to resolve this funding issue for traditional artists.

For various reasons, the Artist's contract is a hotly debated topic in art, law, and economics. According to some art law literature, it gives artists some degree of agency in a market for fine art that is unfairly slanted (M. E. Price and A. B. Price 1971). In addition, the Artists' Contract permits artists to carve out more advantageous rights than the law could grant them (C. G. Bradley and Frye 2018). However, the Artist's Contract is challenging to enforce, particularly for artists without the necessary funding to effectively track resales (Feldman and Weil (1974) and Vickers (1979)). In addition to allowing artists to receive resale royalties, this contract also gives them the right to veto exhibitions and receive income from sales of their works. The most well-known clause, however, allows artists to claim 15% of the increased value upon transfer of ownership.

The blockchain enables the realisation of new funding models for artists by solving the technical hurdles of resale royalties and enabling fractional equity in art. However, evaluating the practical effect this shift will have on artists' capacity to participate and profit in the upside of their work is critical. According (Duncan MacDonald-Korth 2018) [3], the sentiment artists have is hopeful that this will lead to a fairer, transparent and more equitable market. The possibility of the dystopian alternative of a re-centralised market riddled with economic rent is also a possible outcome of this technological shift toward blockchain technology (MacDonald-Korth, Lehdonvirta, and Meyer 2018).

The objective of the Artist's contract is to transform the mechanism of value transfer within the art market in favour of artists. The blockchain provides practical means through which its terms are achievable, using smart contracts and NFTs to achieve its objectives of paying resale royalties to artists effectively. The blockchain also enables these resale royalties to become property rights, allowing artists to trade fractional

[3] DACS- Design and Artists Copyright Society is rights management organisation which collects and distributes royalties to visual artists in the United Kingdom.

equity in their work (Whitaker 2014). This status enables the possibility of cooperative structures which facilitate pooled risk management techniques for the benefit of artists (Whitaker 2021). Chapter 6 of this thesis delves into more detail about how the blockchain implements the Artist's contract to the benefit of artists.

1.2 Research objective and aims

The main objective of this thesis is to review the academic literature on the effects of NFTs on the art market, with a focus on digital art. Consequently, this thesis shows how NFTs affect the current structure of the art market, as well as the viewpoints of potential art owners and artists in the context of NFT adoption. For prospective art owners, digital property rights to their NFTs are paramount, alongside existing copyright law and intellectual property rights. The perspective of artists is concerned with how NFTs can contribute to improving their earning potential. Given this objective and aims, this thesis addresses the following research questions;

Research Question 1: *How did the historical context of the modern art market contribute to its structure and significance today?*
Research Question 2: *How does the adoption of NFTs, enabled by the adoption of blockchain technology, affect the current structure of the modern art market?*
Research Question 3: *What are the legal and regulatory infrastructural factors that remain to be addressed to empower digital property rights to NFT art?*
Research Question 4: *How does the current structuring of common law affect the formation of digital property rights for NFT owners?*
Research Question 5: *How does the adoption of NFTs affect artists: Exploring Novel funding models of Fractional Equity and Resale royalties based on the Artist's contract.*

1.3 Significance

This thesis contributes to the literature by providing a holistic perspective on the effect NFTs have on the digital art industry and the future of digital property ownership. The legal and regulatory considerations necessary to establish robust digital property rights for digital art can prove helpful in formulating policy on other forms of digital property, including digital identities, strengthened by the advent of blockchain technology.

1.4 Limitations

There are some ways in which this thesis is limited, and subsequent research can build upon its findings. Firstly, the scope of this investigation is limited to digital art, which forms only a portion of the NFT market, dominated by the Collectables and Gaming segments. Subsequent studies should focus on further dissecting the influence NFTs have on these industries to gain an even greater understanding of NFTs.

Secondly, due to the non-empirical nature of this thesis, its findings have subjective applicability to the NFT industry. Particularly when considering the Artist's perspective, even though the blockchain implements resale royalties and fractional equity, there are potentially more profitable funding mechanisms that can benefit artists. Therefore more investigations are required to dissect further how NFTs can benefit artists.

The limited research experience of the author of this thesis is an additional factor limiting this thesis's impact. Mainly because of the legal aspects of this thesis, which are crucial in establishing the rationale of property rights, future studies by established legal academics could provide a more detailed perspective which will further augment the findings in this thesis.

1.5 Thesis outline

The remaining chapters of this thesis tackle the earlier posed research questions in five chapters. Chapter 2 provides a brief historical overview of the art market to determine the influence of the historical context of the art market in the formation of its current modern structure. Chapter 3 then follows by introducing blockchain technology and NFTs. This chapter responds to the second research question by elaborating on the disintermediation of the secondary art market by creating the possibility to profitably earn from digital art, which was previously not the case. Chapter 4 provides an introduction to the digital art market. It also addresses the third research question by highlighting the need for a legal distinction between digital property and intellectual property to allow NFT owners to have equal rights to owners of traditional works of art. Chapter 5 turns attention to the art consumer and a detailed overview of digital property rights and addresses the fourth research question by detailing the role of common law in forming these rights. Chapter 6 then provides the Artist's perspective by considering novel artist funding models through fractional equity and resale royalties enabled through the blockchain.

2. The historical trajectory of the art market up to the modern age.

This section of this thesis details the evolution of the modern Western art market from the Renaissance period, reviewing the monumental milestones that pushed it forward from its European origins to the international stage it occupies today.

It is essential to note as an assumption that even though the evolution detailed is from the perspective of Western European art, this thesis recognises the possible existence of a thriving art market in other parts of the world. However, the vast literature on the evolution of the Western European art market, compared to the different regions, and its influence on the formation of the modern art market is the primary motivation for retracing its origins as the proxy representation of the contemporary art market.

2.1 Renaissance to 18th Century

It is during the European Renaissance period, that the art market developed a notable structure, which spurred it's exponential growth. This is despite the existence of an art market in the period of Ancient Greece and Rome. Therefore, the Renaissance is a monumental artistic period in human history (Minniti 2015).Historically, the art market structure has comprised primary and secondary markets (Hulst 2017). The primary market, which produces art directly sold to art consumers, was also closely associated with the innovation of artistic techniques and the evolution of trends, contributing to its growth. The secondary market, in which the resale and collection of art occur, grew throughout the Renaissance merchant cities, and it was from it that the trade of art dealerships was birthed (Westgarth 2009). It is, however, crucial to further explore these market segments in more detail to fully appreciate their contribution to the growth of the modern art market.

2.1.1 The emergence of the primary markets

The primary art market's origins began in Florence, which was prolific in the artistic innovation commonly associated with the Renaissance (De Marchi 1995). The extensive collection of various artists, including painters and sculptors, made the area prime for the art market's development. Most of the paintings from Florence were assigned commissions competitively selected from ideas presented by different artists. These pieces graced churches, wealthy households and public buildings and marked the beginning of the primary market, as artists dealt directly with prospective clients without intermediaries (Hulst 2017).

At the turn of the 15th Century, Bruges in Belgium was the commercial centre in Northern Europe, attracting merchants and various artisans to its annual fairs for trade (Martens 1999). These annual fairs had a particular exhibition gallery of luxury commodities, referred to as the pand, to which painters contributed art (Thompson 2011). The enormous masses of merchants, of a multinational make-up, flocking Bruges from all over Europe implied that demand outstripped the supply of products and increased exportation.

A crucial differentiating factor between Bruges and Florence was the competition between oil painters, watercolour painters and miniaturists for market share in Bruges. Due to these artists' varied techniques and pricing, the Bruges market provided a more dynamic market than Florence (De Marchi and Van Miegroet 2006), primarily driven by the earlier referred pand system.

The city of Antwerp, which inherited this pand system, succeeded Bruges as the commercial trading centre of the Renaissance period due to factors including the monopoly it held over the Portuguese import of spices coupled with the natural and political factors which contributed to the decline of Bruges (Ewing 1990). The art market in Antwerp benefitted significantly from the open trade regulations of the city, leading to the development of the most important art market of the Renaissance period, which was the pand of the Church of Our lady (Hulst 2017). This pand was granted a monopoly over the sale of art in Antwerp and allowed to remain open throughout the year, unlike other pands, which only opened during trade fairs.

Even after Antwerp began to decline as the 16th Century drew to its end, the city's contribution to the evolution of the art market was of considerable importance (Blondé and Van Damme 2010). Art dealers eventually evolved from trading in the original pands

to exporting to new markets, including Amsterdam, Paris, Madrid, and the Americas (Morgner 2014). This degree of expansion of the art trade eventually culminated in the secondary market's establishment.

2.1.2 The establishment of secondary markets

The formation of the European secondary art market resulted from second-hand traders in 16th Century Europe, whose trade specialised in goods purchased from estate sales, part of which comprised art (Minniti 2015). It is worth noting that although these traders did not wholly specialise in art dealerships, this is the first instance in which the trading art did not directly involve the artists who created it. This trade spanned from Italy by the Rigattieri traders to the Bone men in Britain and the Oudecleerkopers in Holland (De Marchi and Van Miegroet 2006).

The Dutch oudecleerkopers, in particular, established the Orphan Chamber in Amsterdam, which auctioned off paintings part of the estates of deceased Holland citizens to raise money for their orphaned children (Montias 2002). These auctions proved to be an effective means to trade goods, and as the economic power of Amsterdam gathered steam, it replaced Antwerp as the commercial centre of Northern Europe. These factors spurred the growth of these art auctions. They increased the need for regulation due to the increased infiltration of the Amsterdam market by low-quality works of art, further tainted by their questionable provenance (Minniti 2015). The consequence of this infiltration was a reduction in the value of the entirety of the Amsterdam art market, aptly exemplifying the harmful effects of information asymmetry in markets (Akerlof 1978).

The Dutch merchants, in response, created a trusted high-end market, overseen by a specialised class of art dealers, ensuring the quality of the artwork in their market (De Marchi 1995). This increased regulation facilitated the growth of the art trade up to 18th Century Paris, which saw the rise in influence of François Gersaint, the first modern art dealer in history (De Marchi and Van Miegroet 2006). François introduced the ascending price auction devoid of side sales to the Parisian market, an notable innovation at that time. He also added printed catalogues to art sales, enabling potential buyers to establish an emotional attachment to the art, a novel concept in artwork valuation.

2.2 The 19th Century to the Modern Art Market of today

The Parisian influence over the art market maintained strength through the 19th Century (Robertson 2005). The Paris Salon, a publicly funded art exhibition by the Académie des Beaux-Arts, retained a monopoly over the marketing and evaluation of Parisian art (Minniti 2015). This annual exhibition showcased the most promising artists from this Academy and was considered an indicator of the success of any featured artists. However, the conservative nature of the Paris Salon left most of the artistic and technical innovations of the time, most notably the impressionists, unrepresented (Etro, Marchesi, and Stepanova 2020). At this point in history, Paul Durand-Ruel (1831-1922) enters the picture, marking the beginning of the era of the impressionists.

2.2.1 The Era of the impressionists and Art in North America

Durand-Ruel's influence on the impressionists' era began when he met Monet and Pissarro during his time in London while fleeing the ongoing war between France and Prussia (Zarobell 2015). Being an art gallery owner in London and Paris, he began employing the strategy of displaying the works of relatively unknown impressionist painters, alongside the work of well-established artists, spurring the avant-garde of Parisian art (Goldwater 1940). When this war ended, Durand returned to Paris with a focus on promoting all the Impressionist artists of the time. He was the first art dealer to employ the technique of purchasing all an individual artist's work in bulk, essentially guaranteeing a monopoly over any future proceeds from the collection's increase in valuation (Minniti 2015) . He also played an enormous role in the exportation of the Impressionist movement to North America, which had an untapped art market. At this point, Sir Joseph Duveen(1869-1939) emerges as a crucial figure in establishing the North American art market.

Duveen was an art dealer of the Duveen Brothers firm, established in London with branches in New York and Paris. He had amassed his fortune brokering the lucrative trade of the Old Masters between declining dynasties of the European aristocracy and the newly minted American billionaires (Secrest 2005). His focus on a few highly wealthy clients for the art he dealt with, in contrast to spending efforts to expand his clientele, differentiated him from the competing art dealers of his time (Minniti 2015). His clientele's combined art collection, comprising noteworthy figures such as J.P Morgan,

William Hearst and John D. Rockefeller, paved the way for opening America's most important art museums to date.

2.2.2 The age of the Auction houses and the art market boom

By the 20th Century, the Parisian art market still reigned supreme, captivating primarily due to the influence of the Impressionist movement (Robertson 2005). However, the second world war outbreak largely curtailed the art market's growth in London and Paris due to the attacks from the Nazi troops (Gilbert 2014). Consequently, many leading art dealers relocated to New York, which replaced Paris as the world's new art capital.

The 1970s then ushered in the perception of art as an alternative investment, with Sotheby's advising the 40m pound investment by the British Rail Pension fund in art (Vogel 1995). This investment ignited a boom in the art market, heralded by Asian investors, and spanned the 1980s and 1990s, leading to some significant paintings including works by van Gogh and the old English Masters, doubling in price and retailing just under 100 million pounds (Elsworth 1990). Unfortunately, a scandal unveiled in 2000 involving Sotheby's and Christie's, where the auction houses were allegedly involved in price-fixing, leading to incurring fines totalling $512 million, is partly responsible for this boom (Blumenthal and Ralph 2000). The adverse effects this scandal had on the public perception of the impartiality of auction houses have contributed to the re-emergence of art fairs, where prospective buyers feel more assured of the transparency in the choice of the artworks of interest to them.

2.2.3 The Global art Market today

Despite this controversy, the global art market remains resilient and continues to develop even further. In fact, despite facing its most severe recession in a decade in 2020, the art market strongly bounced back in 2021 (McAndrew 2021). The aggregated revenue from selling antiques and art through dealerships and auction houses like Christie's and Sotheby's is $65 billion. This figure represents a 29% increase from 2020 and surpasses pre-pandemic sales figures of 2019 (McAndrew 2021). In addition to the earlier referred primary and secondary market segments, the art market constitutes art dealers, auction houses and collectors. These three key players played varying and symbiotic roles in the primary and secondary markets and continued to grow in 2021. However, outside the $65 billion global art market, the Non-Fungible Token(NFT) art market which includes digital art and other collectables, also continues to experience substantial growth. Sales revenue sharply rose from $4.6 million in 2019 to over $11 billion in 2021 (Non-Fungible

2021). This feat is due to the continued mainstream adoption of the use of blockchain technology, particularly as a means through which digital artists also now have a chance to profitably participate in the art market.

2.3 Conclusion

The main objective of this chapter is to answer the first research question; "How did the historical context of the art market contribute to its structure and significance today?". Accordingly, as explored in this chapter, the art market's history indicates that it has distinct primary and secondary markets, which deal directly with artists for their work and intermediaries such as collectors to trade artwork on Artist's behalf. This system has enabled the art market to expand rapidly from the Renaissance period in Ancient Greece and Rome to 19th Century Paris, where we see the rise of the Paris Salon, to the current North American capital New York City, where the Impressionist movement begins. Today, the art market continues to grow strong, with a total market valuation of $ 65 billion, with various actors including art dealers, auction houses such as Christies and Sotheby's participating in both the primary and secondary markets. However, the possibility that the introduction of NFTs to the art sphere could be the dawn of a new age in the art world worth exploring. To fully understand the weight of this innovation, it is crucial to understand the fundamental technology fuelling it, which is the objective of the next chapter.

3. How the blockchain is shifting the structure of modern art: The Digital Art Market.

This chapter of the thesis introduces blockchain technology, specifically NFTs and how this technology propagates the new wave of digital art. This chapter also considers the relationship between copyright and native crypto assets to its effect on traditional museums, artists and potential art owners. This section concludes by considering the costs and risks associated with NFTs, all to tackle the second research question; "How does the adoption of NFTs, enabled by blockchain technology, affect the current structure of the art market?".

3.1 The origins of the Ethereum Blockchain

Since the 1990s, the concept of the blockchain has existed but only became a mainstream technology after Satoshi Nakamoto created Bitcoin. Bitcoin is an electronic peer-to-peer payment system secured by cryptographic proof, which can, in essence, replace transaction verification by a third party (Kong and Lin 2021). In 2009, when Bitcoin emerged, it ultimately kickstarted the worldwide frenzy surrounding cryptocurrencies and blockchain-based applications.

Even though Bitcoin(BTC) is the most valuable cryptocurrency, its blockchain is limited to currency transactions due to the restricted nature of its structure (Porat et al. 2017). In 2013, Vitalik Buterin proposed Ethereum, later released in 2015, and its native cryptocurrency, Ether, was birthed. Ethereum was the next step in the evolution of blockchain technology, which provided a platform that could go beyond serving as a digital currency platform and enable the execution and operation of complex and specialized applications (Buterin 2014). Cryptocurrencies like Ether, Bitcoin, and Tether are fungible digital tokens, implying that each token is equal to others in value within

the same group of Bitcoin tokens (Kong and Lin 2021). Most transactions on the Ethereum blockchain depend on computer programs, termed "smart contracts", which execute under pre-specified conditions (Luu et al. n.d.). Smart contracts play the role of a trusted third party, mitigating the risk of information asymmetry and bolstering consumer welfare by promoting market entry and competition. The ERC-20 is the primary standard established on the Ethereum blockchain, as part of smart contracts, to facilitate interoperability (Rahimian and Clark 2021). However, June 2017 saw the debut of CryptoKitties, which sparked the innovation of the ERC 721 standard, enabling the creation of Unique digital tokens, commonly referred to as Non Fungible tokens (NFTs). ERC 721 smart contracts facilitate efficient trading of NFTs since each unique token is identifiable with its own token identity within this smart contract.

3.2 What the blockchain offers for art, and how it does it?

Preceding the blockchain, the peer-to-peer nature of the internet, commonly referred to as Web Version 2.0, brought about novel ways of creating, adapting, and distributing artwork (Ghidini 2019). The downside of this technology was the easy widespread distribution of unauthorized copies of the same artwork. Web 3.0 is a version of the internet with some blockchain-based elements that can allow for decentralized digital asset ownership, which is a potential solution to the distribution of these unauthorized digital works of art (Grech, Sood, and Ariño 2021). Nevertheless, to understand the impact this will have on the art world, it is crucial to understand the evolution of the internet from its original form, dubbed Web 1.0, to Web 2.0 and finally to Web 3.0 (Evans 2019).

Web 1.0 is a centrally controlled information model which provides information to consumers to interact with passively. Web 2.0, on the other hand, is decentralised and comprises many client-server models, enabling the consumer to become a creator, but features information silos that empower the owners of these information silos as monopolies (Patel 2013). Therefore, the innovation of Web 3.0 is a distributed internet, without any centralised intermediaries, which empowers the consumer to produce and control their information and the value associated with it (Patel 2013). Blockchain technology, which powers this new internet, combines peer-to-peer networks, and cryptographic algorithms paired with decentralised consensus mechanisms and distributed data storage. The blockchain represents an alternative data storage structure that synchronises a single

data record across multiple nodes that form the blockchain's network.

Before the invention of the blockchain, centralised third parties were essential to coordinating individual activity online. These third parties helped verify that data was tamperproof and ensured that an event subject to the agreement between two individuals had occurred (Wright and De Filippi 2015). This problem is resolved by a blockchain using a probabilistic approach, which enforces the transparency of information travelling over a computer network, verified by solving mathematical problems at a substantial computational cost (Nakamoto 2008). Thus, the integrity of databases improved by increasing the difficulty of corrupting the database by any possible attackers unless they own most of the network's computational power.

Therefore, a blockchain is a chronological database of transactions verified and recorded by the nodes on the blockchain's network (Sultan, Ruhi, and Lakhani 2018) . Public permissionless blockchains are the foundation of Web 3.0 primarily due to four factors. Firstly, they consist of consensus protocols that ensure the agreement between participants on the actual state of the ledger, which bolsters the trust between actors who, in most instances, are strangers. Secondly, they are immutable, ensuring the integrity of their information store. A third characteristic is that the transaction on blockchains is independent of any third party. Lastly, they are unlimited to geographical boundaries since they do not depend on any third party, implying censorship resistance (Wright and De Filippi 2015).

The computer nodes on the blockchain network verify the transactions which occur before broadcasting them onto the blockchain based on the rules of the blockchain protocol. The blockchain's consensus protocol groups the verified transactions into blocks at a predetermined rate (Baliga 2017). These blocks are added to the distributed ledger by nodes on the network called miners, who compete amongst themselves to solve a cryptographic puzzle. Solving this puzzle first allows them to mine the block, which is then added to a blockchain. As a consequence, the miner claims a block reward in the form of cryptocurrency. The blocks are linked by their hashes since every subsequent block references the block's hash previously mined. Hashing is a process which involves the grouping of a set of digital data, which are transactions on the blockchain, into a single alphanumeric string called a hash (Konashevych and Poblet n.d.). It uniquely identifies the source of this data and is immutable.

3.2.1 How do NFTs come into the picture?

An NFT is a cryptographically verifiable token, which is unique and immutable, representing a digital or physical item on the blockchain (Regner, Urbach, and Schweizer 2019). The NFT innovation occurred in 2017 when Dieter Shirley, who also created CryptoKitties, introduced the ERC 721 standard, enabling the creation of Unique Ethereum Tokens (Entriken et al. 2018). NFTs create the possibility of verifying digital asset ownership, enabling the creators and owners of the original piece of digital artwork to prove and transfer ownership of these assets. This standard also enables the tracking and transfer of ownership of these Non-Fungible Tokens.

NFTs are revolutionizing how creators make a living. They are changing how the world buys, sells and relates to art because they introduce scarcity for natively digital art (Kugler 2021). The museum sector has begun exploration of the potential within crypto collectables. The Uffizi Gallery is the first major museum to profit from selling an NFT linked to an image of one of its Michelangelo masterpieces, "Doni Tondo", selling for 170000 USD (Artnet 2021). The Hermitage museum also announced plans to roll out NFT sales for famous pieces within its collection, including works by Leonardo Da Vinci and Van Gogh (Kishkovsky 2021).It is worth considering if NFTs provide an alternative revenue opportunity for Museums, considering their already present image licensing revenue streams.

3.3 Monetising Museum Images: NFTs, Image licensing and copyright

Museums risk losing image licensing revenue if they are to consider participating within the NFT space seriously. In the context of intellectual property rights, transactions of crypto assets resemble real-world art transactions unless explicitly stipulated (Valeonti et al. 2021). According to US Copyright law, purchasing a physical painting only grants the buyer ownership over the physical art piece (Swack 1997). The copyright and its associated commercial rights remain with the artist unless explicitly agreed upon in writing (Carty and Hodkinson 1989). It is also worth noting that even though laws are different in every country, copyright law arguably shares similarities across various countries and regions (Evans 2019).

3.3.1 The relationship between copyright and Creative crypto assets

Copyright is incredibly profitable, with copyright-intensive industries collecting revenues exceeding 2 trillion annually (Siwek 2020). However, even after successfully clinching music, book and even movie deals, the creators still only receive a small proportion of the earned revenue and barely any influence over the exploitation of their creations, with the lion's share of profit and power retained by intermediaries. It is also incredibly challenging for good faith potential licensees to licence copyrighted works since the cost of identifying the original creator is high because of how easy it is to copy and distribute digital creations, which creates a problem of orphan works [1] (Savelyev 2018).

The blockchain creates a solution to this problem by enabling the immutable registration and proof of ownership of authorised copies and the seamless transfer of digital assets (Swan 2015). Previously marginalised digital creators can now have streamlined access to and payment from their transactions related to their creations through this enabled digital scarcity. The blockchain, at its core, is designed to provide an immutable, censorship-resistant digital identity that substantially slashes the friction involved in licensing digital work and empowers the artists and owners to restrict unauthorised use (Savirimuthu 2019).

3.4 Criticism and Debates

Firstly, blockchain-based transactions require high gas fees to be processed by blockchain node operators who play a pivotal role in the functioning of a blockchain (Thurman 2020). These nodes maintain distributed copies of the blockchain, which also involves updating it with new transactions on the network. The security of crypto wallets and the keys that grant access to them are also worth considering. Blockchain platforms like Binance serve as custodial wallets, which benefit customers without any blockchain technological background (Abramova et al. n.d.). They are accommodating in situations requiring account retrieval as well as password recovery. However, these users do not own their crypto assets stored in these custodial wallets. The providers' infrastructure is a single point of failure that exposes the custodial wallet holders to substantial risk. Additionally, should the custodial wallet provider face bankruptcy, solvency issues could arise since the crypto assets' ownership is not clearly defined. Another risk to consider for the owners of crypto assets is how guaranteed their access to the digital assets represented

[1] A copyrighted work with unidentified or unreachable rightsholders is known as an orphan work.

by their NFTs is (Abramova et al. n.d.). Given how difficult it is to ensure the storage of these assets in perpetuity, owners of these digital assets always face the risk that they could be deleted or become inaccessible at a certain point. Additionally, in many cases, the digital artwork that the NFT represents is stored off-chain (Lance and Sean 2021). Therefore, this digital file could be modified without the owner's permission, compromising its originality and ultimately its value to its owner. Lastly, even as popular NFT marketplaces such as OpenSea have strict policies against copy-minting - when an NFT is created with the intention to confuse users into believing it is original work (OpenSea 2020), it doesn't resolve the threat to NFT owners and the market as a whole.

The ubiquitous anonymity on the blockchain suits it to attract bad players who can easily defraud unsuspecting buyers. The latest and most infamous amongst many others involves FTX - a bankrupt cryptocurrency exchange whose former top management including Sam Bankman Fried, is under investigation for fraud and mismanagement, costing its investors up to $ 1 Billion in losses (Vandevelde 2023). In addition to these risks, no specific copyright policy currently prevails over NFT sales. The environmental concerns surrounding NFT mining also pose a reputational risk to embracing NFTs.

3.4.1 The silent crash

From a macro perspective, analysts' examination of the NFT market shows signs of an impending "silent crash", marked by continuously reducing floor prices across NFT marketplaces (Valeonti et al. 2021). On March 25 2021, the daily average NFT value was slashed by over 85%, shifting from $19 million to $3 million (Thurman 2020). There are plenty of speculations about the explanations to justify this drop, among these being; that a natural short-term correction of the market given the price appreciation at the beginning of 2021 was unsustainable. Another explanation pointed to speculative crypto investors who had offloaded their collectables after holding them only for a few days.

3.5 Conclusion

Preceding the innovation and subsequent adoption of blockchain technology and particularly NFTs, the potential for a future of digital art was slim to non-existent. This limitation is due to the ease with which digital files could be distributed across the internet without the Artist's permission and, most importantly, payment since all these digital files were utterly indistinguishable from each other. However, because NFTs power the creation and secure transfer of individual digital files, they enable a digital art market since now it is possible to create scarcity even in the digital realm. More

so, NFTs create more efficient ways to administer copyright management for digital and physical artwork, potentially shifting how artists, potential art owners and art collectors interact in the art market. Because of the blockchain's innately transparent and decentralised nature, it has disintermediating effects, especially in the secondary art market, since it can enable artists to deal directly with clients for their art more efficiently.

Therefore, to tackle the second research question: "How does the adoption of NFTs enabled by blockchain technology affect the current structure of the art market?", NFTs introduce digital art as an alternative medium for artists because of its increased potential in commercial value. Additionally, NFTs potentially foster disintermediation within the secondary art market, traditionally comprised of intermediaries like art dealers, since they enable a more efficient copyright management mechanism on the blockchain. This study now turns attention to the development of the digital art market, which is the focus of chapter 4.

4. The Digital Art Market.

On March 11, 2021, the landmark purchase of Beeple's "Everyday- The First 5000 Days" for $69million by Metekovan spurred shockwaves among art buyers, creatives and investors, making them more alert to the mass of potential within the market for digital art (Trautman 2021). Because of NFTs, the digital art industry is embraced by Christie's and Sotheby's, among other traditional art dealers. The main force driving this industry's surging influence is the growing demand for the creation of individual ownership of digital assets. This section of this chapter dives deeper into the NFT market to further understand digital art. This chapter then focuses on the law of digital property, which is vital for the continued growth of the NFT sector. It then concludes by looking into the future of digital property.

4.1 The Market for Digital Art?

According to the Non-Fungible 2021 report , the NFT market also consists of the following segments:

- **Digital Art**- This is a broad market segment which consists of NFTs created on artistic marketplaces[1], from individual collections of artists or a generative art algorithm.
- **Collectables**-This market segment includes digital avatars, videos, photos and other creations for collection as part of an online community. An example of this is the NBA Top shot[2]
- **Gaming**-These NFTs are digital elements like skins and equipment used in video games and role-playing games such as Axie Infinity, where players mint NFTs of axies, which are pets used to play the game [3].
- **Utilities**-These NFTs have various uses, which range from website domains to

[1]Examples of these include but aren't limited to Rarible and Open Sea

[2]NBA Top shot is a collection of the best moments in the National Basket Association(NBA) competition, in the form of tokenized videos which are collectable by their community of fans worldwide.

[3]Axie Infinity's whitepaper provides more detailed information about the gameplay and the Axie Infinity Universe.

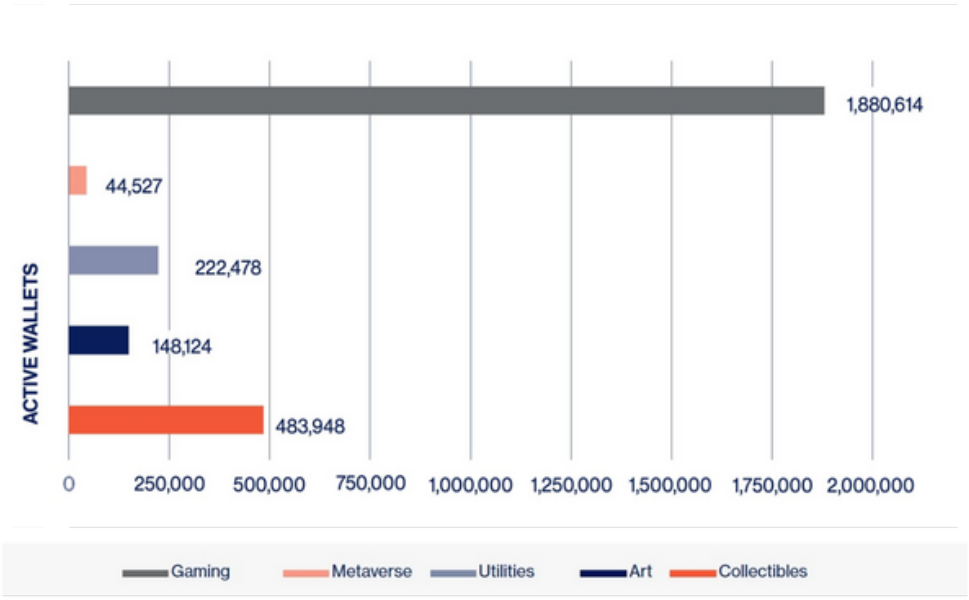

Figure 4.1: Number of Active wallets on the Ethereum blockchain grouped according to segments in the NFT Market by 2021 (Source: Non-Fungible (2021))

digital identities and wallets. An example is Ethereum Name Service which allows users to own a domain to build decentralised websites on.

- **Metaverses**-The NFTs in metaverses are titles to digital real estate located in interconnected digital worlds such as Decentraland[4].

4.1.1 Performance per segment

Firstly, to provide a holistic overview of the NFT market, its 2021 performance is aggregated across these various segments. The performance indicators utilised for this analysis include; the number of active wallets in each segment, the volume of recorded sales and the volume of traded dollars.

4.1.1.1 Gaming

This is the leading segment in the NFT market in terms of overall activity, as indicated by figures 4.1 and 4.3, in terms of both number of sales and active wallets. The NFT gaming segement recorded more than 15 million sales and 1.5 million active wallets, which indicates strong asset liquidity within it. This liquidity can be attributed to the nature of blockchain games, that require constant updates to the digital equipment used to play them.

[4]Decentraland is just one of many virtual worlds created on the blockchain to enable virtual land ownership.

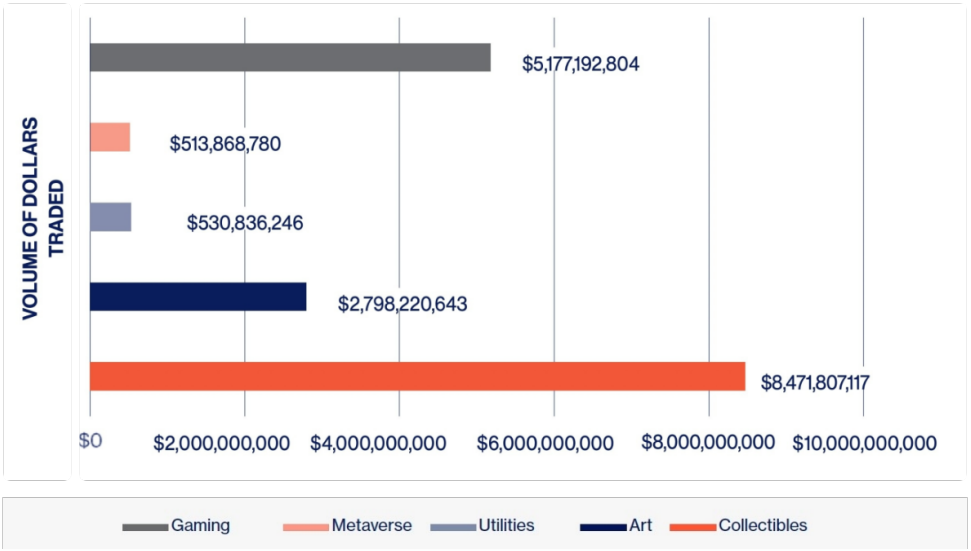

Figure 4.2: Volume of dollar revenue on the Ethereum blockchain grouped according to segments in the NFT Market by 2021 (Source: Non-Fungible (2021))

4.1.1.2 Collectables

According to Figure 4.1, almost 500,000 NFT wallets interacted with a Collectables project, making it the second most active NFT market segment. Additionally, as shown in Figure 4.2, the collectables segment is dominant in market size, with over 8 billion dollars traded in 2021, which accounts for more than 50% of the whole NFT market's volume of dollar revenue.

4.1.1.3 Art

Figures 4.2 and 4.3 indicate that the NFT art segment was the third overall category in terms of volume of dollar revenue and individual sales, even though it arguably receives the most media attention out of the 5 NFT market segments in this analysis.

4.1.1.4 Metaverse

The NFT Metaverse segment remains relatively small, accounting for only 500 million dollars in market share and trailing in the number of active wallets and sales volume, as indicated in Figures 4.1and 4.2, respectively.

4.1.1.5 Utilities

Figures 4.1 and 4.3 indicate the NFT utilities market share of 3% and a relatively higher proportion of active wallets relative to the dollar sales volume.

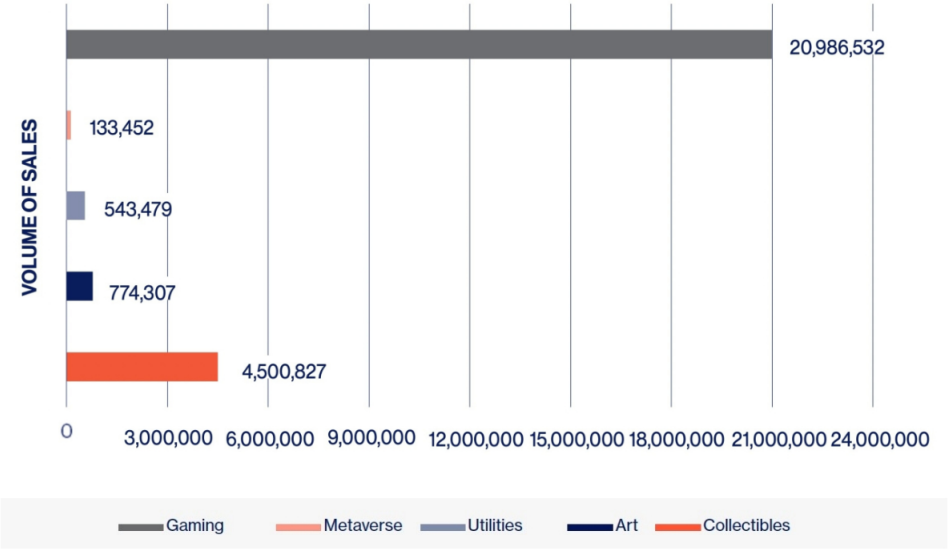

Figure 4.3: Volume of individual NFT sales on the Ethereum blockchain grouped according to segments in the NFT Market by 2021 (Source:Non-Fungible (2021))

4.1.2 Retention Rate and Market Liquidity

The market analysis also considers the indicators of retention and liquidity across the NFT market segments. The liquidity rate indicates the circulation of tokens within a specific segment. It is the ratio of tokens traded at least once to the total number of tokens within that segment. Conversely, the retention rate reflects the degree of loyalty a community has for a specific NFT project. The retention rate results from tracking the number of active accounts interacting with a particular NFT project. As seen in figure 4.4 , the collectables segment has a low retention rate and a high liquidity rate, which is consistent with the resale-intentioned nature of the tokens in this segment. Art NFTs exhibit the highest degree of retention and the highest degree of liquidity, which also makes sense considering the speculative nature of most NFT art investors.

4.1.3 The volume of NFTs in circulation per segment

As illustrated by figure 4.5, the volume of NFTs in the 2021 market is primarily driven by the Gaming and Collectibles, while the Art NFT segment is producing the lowest volume of NFT issues. The popularity of the game Axie Infinity, which resulted in the creation of 8 million NFTs throughout 2021, significantly contributed to the gaming segment's colossal growth.

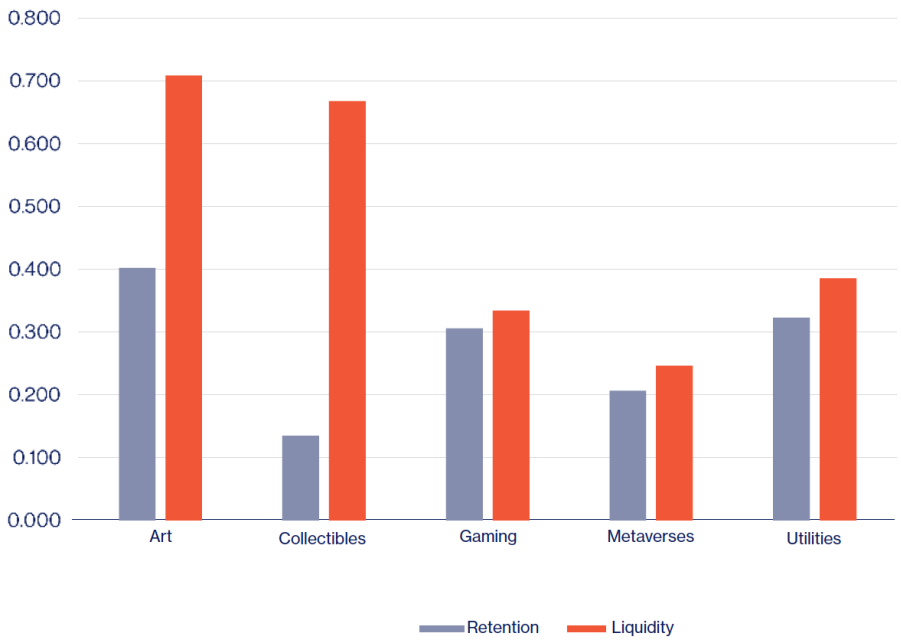

Figure 4.4: NFT Retention and Liquidity on the Ethereum blockchain grouped according to segments in the NFT Market by 2021(Source: Non-Fungible (2021))

4.1.4 Primary and Secondary Markets

Another essential variable to consider when evaluating the NFT market is the breakdown between the primary and secondary NFT segments along both volumes of traded dollars and actual sales. The primary market is constituted by the initial sales of tokens, while the secondary market constitutes transactions on tokens issued in the primary market. As demonstrated by figure 4.6, the behaviour exhibited by the NFT market indicates that most tokens traded on the primary market appreciate the secondary market. However, the primary market accounts for over half of the sales volume and substantially less of the actual revenue. This discrepancy is indicative of the speculative nature of the NFT market on tokens already in circulation compared to newly minted tokens.

4.1.5 Cryptocurrencies and NFTs

The Non-Fungible 2021 NFT market report considers a variety of cryptocurrencies in its analysis. However, Ether remains the most utilised currency in NFT transactions. Given this, it is crucial to consider the influence the value of Ether has on the price of NFTs.

4.1.5.1 Average price of NFTs

As shown in figure 4.7, according to the price data from 2021 on the average price of NFTs and Ether, there is an evident difference in the trend both variables follow. The

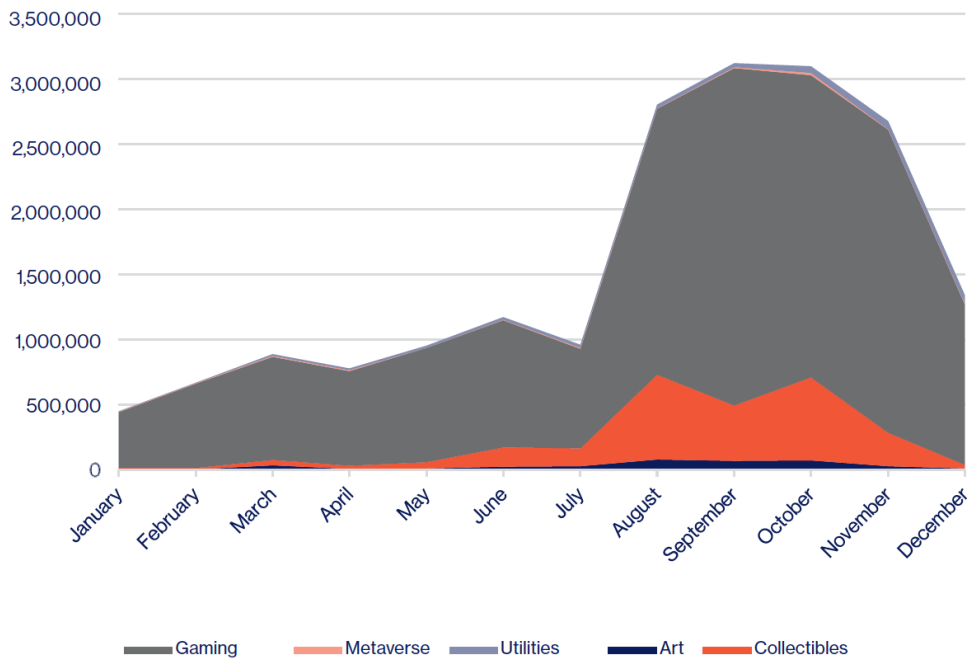

Figure 4.5: Volume of NFTs in circulation on the Ethereum blockchain grouped according to the segments in the NFT Market by 2021(Source:Non-Fungible (2021))

August/September peak in the NFT market, unrelated to the ETH price during that period, further cements this observation. This continued independence of the NFT and cryptocurrency markets indicates the growing maturity of the NFT industry.

4.1.5.2 Impact of the price of gas on the volume of sales

The impact of gas prices on the volume of NFT sales is the final indicator considered, given how embedded it is in the transaction process of NFTs. Gas measures the degree of computation effort required to carry out transactions like NFT purchases and sales on the blockchain. At times, because the gas price is higher than the value of the NFT a user wishes to buy, it discourages the sale of low-value NFTs. As depicted in figure 4.8 , the peak period within the NFT market in 2021 occurs when the price is at its lowest, and as it rises in the third quarter of 2021, this negatively impacts the volume of sales on the Ethereum blockchain. Even though this indicator mostly affects low-price NFTs because they represent most of the transactions occurring, it is relevant to consider.

4.2 Law of Digital Property

A critical factor on which the possibility of a thriving future NFT art market depends is a legal structure to enable the ownership of fully digital property (Trautman 2021). How-

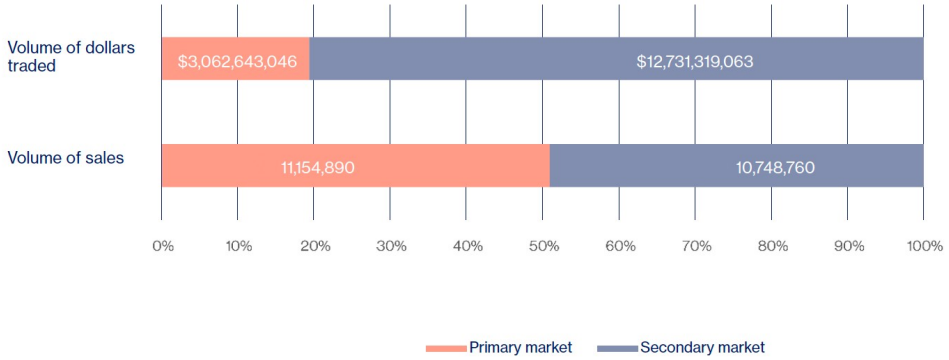

Figure 4.6: Volume of Dollars Traded and Volume of Individual NFT sales on the Ethereum blockchain (Source:Non-Fungible (2021))

ever, the current legal structure of digital property ownership requires an urgent overhaul given its current state. All forms of digital property, including music, audiobooks and ebooks, are centrally owned and distributed via a licensing model, which governs any disputes in such asset types.

Consumers of digital media like iTunes music and Amazon ebooks do not own the content they pay for. Without any transformation of the legislation, this sets a precedent that implies one cannot truly own valuable NFT digital art purchased. NFTs create the opportunity for a shift in this legal precedent, leading to a new legal framework of ownership rights to digital assets. The ownership of any asset entails a bundle of rights, which empower the owner with an absolute authority to use, exclude the use of the asset from others, and transfer ownership as one wishes, among other privileges (J. Fairfield 2021). These rights distinguish ownership attained through a sales transaction from licensing or merely renting. Furthermore, they are meaningless without the owner of these rights being able to exercise them fully. In this context, the owner's right to earn from ownership is relevant. The value of digital art depends significantly on how the transferable ownership of this value is. Therefore, the difference between a sale and a license has three aspects. Firstly, whether the transaction is referred to as a sale is crucial, with sale generally implied when risk transfers from one agent to another. The second aspect is whether a license granted limits the licensee from transferring ownership of the said asset. The last aspect is related to whether the license in question imposed other restrictions on the employment of the asset by its owner/ licensee. The constraints embedded in the conditions applicable to the purchase of NFTs are not free from the sale/license differentiation because of the hybrid nature of NFT transactions, whose dynamics lend themselves traits tied to both being a sale and license transaction (Trautman 2021). These constraints affect the ability to profit from the appreciation of

Figure 4.7: Graph indicating price movement of average NFT price and the Value of 1 ETH in 2021(Source:Non-Fungible (2021))

an NFT piece's value, the applicable transfer fees, and the transferability of the NFT itself, among other rights.

4.2.1 The Future of Digital Property

The clear distinction of the rights that embody the ownership of NFTs is fundamental in determining the future of their viability in the modern free market. This distinction applies when distinguishing between intellectual property and digital property since any intellectual property claims would pose a challenge to NFT's being viable collectable art. Investors in the NFT space are interested in benefitting from any potential uprise in the value of their purchased digital art files. Currently, online property is plagued by the overextension of intellectual property rights, as highlighted by the licensing structure adopted by both Kindle and iTunes. Customers essentially do not fully own the books or music which they purchase. There is a substantial incentive for this not to be the case for NFTs given their inherent potential to rise in value. NFTs have the potential to usher in a new age of digital property rights by transforming the legal paradigm of property ownership, enabling the ownership of digital assets in a similar way we own our physical items, which is very exciting.

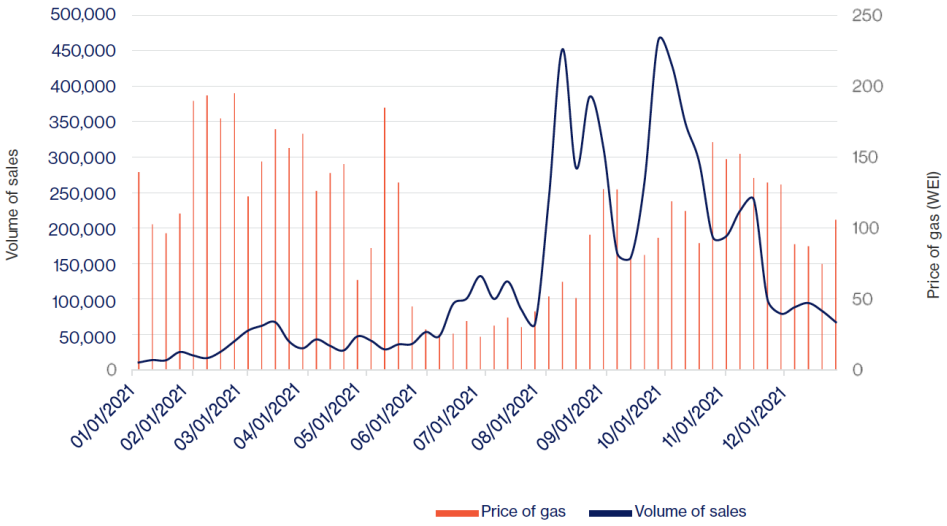

Figure 4.8: Graph depicting the relationship between gas price and volume of NFT sales on the Ethereum blockchain in 2021 (Source: Non-Fungible (2021))

4.3 Conclusion

According to the overview of the NFT market provided earlier in this chapter, there is a growing potential within the NFT space, with the segments of Collectables, Gaming and Art showing the most promise across the various performance indicators considered. The third research question: "What are the legal and regulatory infrastructural factors that remain to be addressed to empower the digital rights to digital property?" addresses how this potential can further be developed. Consequently, as this chapter shows, the current legislation related to existing digital property favours licencing models which do not enable full ownership of digital files. Therefore, the legal infrastructure must adapt to the ownership of unique digital assets like NFTs. The specific factors to be addressed concern creating legislation applicable to the unique hybrid nature of NFTs, which have characteristics of both sales and licensing agreements. The hybrid nature of these transactions is a crucial challenge regulators face in creating applicable policies for NFT transactions. Chapter 5 builds onto this further by delving into the literature on creating digital property rights and highlighting the role of common law in forming these rights.

5. Overview of Digital Property Rights

As alluded to in chapter 4, intellectual property rights tend to overextend to digital property, in a manner which limits the ownership of digital property like digital art. But because not all digital property is the same, the crucial differentiating factor is the degree of rivalrous-ness various forms of digital property have, which creates the possibility for it to be regulated a manner similar to real world property. Think Beeple's digital art regulated like a real life Van Gogh painting.

This chapter of the thesis begins with an explanation of rivalrous-ness in the context of digital property. This chapter then considers the similarities between real-world property and some forms of digital property like NFTs, followed by an analysis of common law's role in forming digital property rights. It concludes by highlighting the typical arguments challenging the existence of digital property rights and some available responses to these challenges.

5.1 What role does rivalrous-ness play in differentiating various forms of digital property?

Intellectual property rights protect intellectual property primarily because it is non-rivalrous (Muzaka 2011). Non-rivalrous nature implies that one person's use of a given thing does not impede another's consumption ability (J. A. Fairfield 2005). Therefore, intellectual property rights foster continued creative interest in the non-rivalrous property, since these rights enable the creators to profit from their investment of time and energy in these creative pursuits.

In the context of digital creations, an important distinction can be drawn depending on their degree of non-rivalrous-ness. Computer code is non-rivalrous and benefits from the protection provided by intellectual property rights (J. A. Fairfield 2005). However, digital property, including domain names, websites, and necessary for this thesis, digital

tokens and digital worlds, quickly falls within a rivalrous characterisation since the entity with ownership can prevent their use by others. Arguably, Non-Fungible Tokens fall under this category, considering that the token belongs to one address, and clear association and ownership is established and broadcasted on the blockchain.

Furthermore, the rivalrousness of consumption should not be mistaken for exclusivity or derivation. Exclusionary regulation can protect many forms of non-rivalrous digital property. However, this regulation's enforcement cost is substantially lower for rivalrous goods. It is crucial to have a robust framework on digital property rights because, similar to how the common law of property facilitates the proper allocation of resources, a digital property framework will enable the appropriate utilisation of Digital property (Trautman 2021). Additionally, digital property rights reduce search costs when property sale transactions occur. They allow for a specific and limited number of property types to be designated and searched for (Merrill and Smith 2000).

Digital property rights will also be crucial in enabling the internet to transform into a multidimensional digital environment enabling digital property markets to function efficiently. These rights also foster the equilibrium of the law, as it is adapted to fit within different contexts (C. Bradley and Froomkin 2004).Within the system of common law, which has transformed over time to account for various factors, the law of contract and the law of property balance each other out. The law of contract enables parties to achieve unique outcomes through trade. In contrast, property law restricts parties' burdens, by limiting the liquidity of lucratively valuable resources through a contract (C. Bradley and Froomkin 2004). Essentially, property rights protect parties from unfair contractual terms.

5.2 What is digital property?

5.2.1 What traits does digital property share with real-world property?

There are three properties which digital property shares with real-world property; persistence, rivalrous-ness and interconnectivity (Hamari 2009). Most property created with written code is non-rivalrous, implying that one individual's use does not restrain another person from fully taking advantage of this property. This non-rivalrous nature facilitates the easy distribution of perfect copies at almost zero cost (Posner 2000). However, not all code is non-rivalrous, as this characteristic can be embedded within the design of the

code, enabling only authorised individuals to gain access to the privileges associated with that particular code.

In addition to rivalrous-ness, code can have a persistent nature, another feature of real-world property. Persistence refers to the continued existence of an object past its creation (J. A. Fairfield 2005). For instance, in the natural world context, a carpenter makes a wooden table once and afterwards, it will continue to exist. Code is also persistent since it can be stored on different machines and does not cease to exist if appropriately stored after its creation. Real-world objects are also interconnected and can affect each other's existence. The value of an entertainment website goes beyond its owner being able to control and oversee it to the other people who interact and experience it with the owner's consent.

5.2.2 Does an NFT qualify to be categorized as digital property?

A Non-fungible token is a unique unit of digital information securely encoded onto a blockchain and is not exchangeable for another digital asset (non-fungible). An NFT is rivalrous since only one particular address can claim ownership over it. It is also persistent since the record of its existence on the blockchain is immutable and everlasting. Lastly, an NFT is interconnected, given that it is transferable across blockchains.

5.3 Common law of property and how it will affect new forms of digital property rights.

5.3.1 How property law fosters the effective allocation of resources as technology improves?

The progression of technology creates new ways to utilise resources, creating new property interests in resources. Demsetz (1983) defines these property interests with the harms and benefits their existence brought about. Properly allocating these interests is one of the main objectives of property law. Technology determines how property law is formulated because it provides new ways to internalise any harmful externalities due to these new property interests. However, this only successfully pans out if the gains from internalisation outweigh the costs.

5.3.2 What internalisation is necessary for the context of online property?

Property law curtails the tragedy of commons, which occurs when resource users are not personally liable for the cost of overuse, incentivising the careless use of resources (J. A. Fairfield 2005). An example of this is when pastoral communities are granted communal land for their animals to graze on. This land usually tends to be over exploited, compared to land owned by individual farmers, who use it more strategically when grazing their livestock.

In the case of digital property, however, the issue is reversed because users can easily exclude each other from a specific online resource; by employing the use of firewalls and passwords. Therefore, the problem to be addressed by property theory of digital property, is a tragedy of anti-commons. When several parties have exclusive ownership of a particular resource, developing it is increasingly expensive because they limit each other from the productive use of the resource in question, which leads to fragmentation.

Resource fragmentation occurs when contracts concerning a specific resource render third-party buyers unable to productively use it, primarily because of the high costs of finding information about the resource and negotiating the transfer of ownership Demsetz (1983). For instance, a customer interested in purchasing a digital artwork which has been developed, used and even owned on various sites on the internet, can incur substantial costs tracking down its historical record. Even though tracking digital provenance is made easier and cheaper through the blockchain, majority of the internet doesn't need to have this functionality and therefore lacks it. The coordination of this process would therefore be more efficient with the availability of robust digital property rights. However, before then, other potential customers are discouraged from investing in digital property because of this cost.

5.3.3 How do anti-commons apply in the context of the internet?

The literature available on the fragmentation of the internet behind passwords establishes that this fragmentation reduces the amount of information available to the remaining user base of the internet. Given the inherent network effects of the internet, this implies unfairness if an entity benefits from a wide readership without contributing to the information commons of the internet (Merrill and Smith 2000). This fragmentation is not necessarily inefficient unless it results in an allocation of rights of exclusion which

incentivises holding out and leads to the complete exclusion of the productive use of the resource, rendering these fragmented rights less useful.

5.4 How does Digital Property become fragmented?

5.4.1 Defining what is vertical interest in digital property?

It is essential to define what inefficient fragmentation would encompass by establishing what unit of digital property needs to remain unencumbered to ensure efficient trading. According to J. A. Fairfield (2005), these rights are called vertical rights, characterised by a valuable and tradeable bundle of rights. On the contrary, a horizontal right is cross-cutting and not individually applicable but could prevent the productive use of a vertical right. The property theory surrounding online property formulates around a chattel-based online property. This theory limits the rights of an owner to her firewall, and beyond it, no rights apply to the rest of cyberspace, which implies that the owner's rights are specific to the system to which it is connected (Bellia 2004). An alternative theory allows owners to retain the rights to their digital assets, regardless of the intellectual property underlying the platforms on which this property resides.

5.4.2 How contracts currently stand in the way of digital property rights

Access to digital environments is granted only after interested participants sign contracts with these environments' intellectual property rights holders. After entering into these agreements, users forego any property interests in creations made within these digital environments, granting a right to exclude the intellectual property rights owner against any emerging digital property rights. A closer look at end-user agreement of World of WarCraft (W.O.W 2022) explains the position of its intellectual property owners, which allows them to control all the content in the digital world. However, this agreement also claims ownership of the creations of this digital environment's users, which overextends the intellectual property rights to the point of limiting the formation of new digital property rights. The co-existence of property law alongside contract law is to create a balance that incentivises the efficient use of resources (J. A. Fairfield 2005). However, the clear overreach of End-user agreements, many of which are similar to the World of Warcraft kind, indicates an existing vacuum in digital property rights, only remediable through digital property law.

5.5 What are the challenges to the existence of Digital Property rights, and what are the appropriate responses to them?

The most common criticism against the establishment of digital property rights is their intangible nature (J. A. Fairfield 2005). However, because the legal establishment of property rights is separate from tangibility, interests and rights in intangible assets like timeshares, airspace, bank accounts numbers and even personal characteristics exist. The existence of property rights resolves inefficiencies by creating allocation systems which remain applicable even in an online digital setting. Moreso, essential aspects of a real-world property are; rivalrous-ness, persistence, and interconnectivity.

An additional argument against the necessity of a robust theory of digital property is that contracts can efficiently allocate a digital resource's benefits and costs between potential digital property owners and the custodians of the digital environments in which their assets are created and found (J. A. Fairfield 2005). However, it is essential to realise that contractual agreements are only concerned with resource allocation between parties to the contract. At the same time, property law establishes an equilibrium between the benefits of personal transactions created by contractual means and the search costs borne by third parties interested in gaining ownership of these resources.

Another critical challenge to digital property rights relates to freedom of speech. The primary concern is that the establishment of digital property rights will lead to the privatisation of the internet, which could curtail the discussion of specific topics on some privately-owned platforms (J. A. Fairfield 2005). However, the genuine threat to free speech lies in the degree of control private entities can exercise over the flow of internet traffic, which is more applicable to owners of physical infrastructure. The degree to which digital property owners would curtail free speech is comparable to the right one has to privacy in their property.

5.6 Conclusion

This chapter's objective is to dissect further the nuances involved in forming digital property rights like NFTs. It is particularly relevant that there is a distinction between these digital property rights to rivalrous assets created through computer code and intellectual property rights to non-rivalrous assets created with code. Therefore this section of the

thesis considers the properties that digital property shares with real property, including rivalrous-ness, interconnectedness and persistence.

Given this, the literature reviewed in this chapter further posits that real-world property regulation could resemble digital property. However, common law establishes a balance between property rights and contractual authority. This chapter shows that property rights facilitate a more efficient allocation of resources, particularly relevant to digital property. This advantage is possible by reducing the fragmentation of digital property due to inefficient contracting. Consequently, this chapter addresses the fourth research question: "How does the current structuring of common law affect the formation of digital property rights?". It addresses this by detailing how, through common law, contracting and property rights are coordinated to ensure an efficient resource allocation, directly affecting investment in digital property.

The formation of digital property rights enables a future where NFT art investors are more assured about their assets. However, another perspective relevant to this thesis is how artists are affected by the adoption of NFTs. Chapter 6 of this thesis considers how the blockchain and NFT's create novel funding means for artists.

6. The Artist perspective: New forms of artist funding through fractional equity and resale royalties

Resale royalties and fractional equity within art preceded the existence of the blockchain and were initially put forward in the Artist's contract. This unique kind of contract is established with provisions which empower artists' through the economic value of their work. Therefore, the final chapter of this thesis considers how the blockchain brings to life the vision of this contract, especially for digital artists, consequently addressing the final research question of this study: " How does the adoption of blockchain technology affect artists?". This chapter begins with background information on the funding dilemma faced by today's artists. This chapter then considers the conceptual and economic logic of the Artist's contract, which is put forward to resolve this dilemma. It then considers the funding models enabled by the blockchain and concludes with the implications on today's artists.

6.1 The funding dilemma faced by Artist's today: Could the blockchain resolve it?

Today, Artists face the challenge of depending on the income from the primary sales of their work, which usually happens before it gains much of its value, limiting the income from these potential future sales (Haaften-Schick and Whitaker 2022). This dependence derives from the difficulty in establishing the future value of any artwork due to the high degree of information asymmetry associated with art transactions (Caves 2003) which complicates the negotiation of both current and future earnings from art deals. This challenge is currently addressed legislatively through structuring resale royalties in art dealings and discussed academically by considering the possibility of artists retaining a fraction of the equity in their work (Whitaker and Kräussl 2020).

However, establishing resale agreements does not adequately translate into increased earning potential for artists (Office 2013). Both artists and art dealers face constraints in implementing resale agreements due to the prohibitively high administrative costs (Eichhorn 2009). For art buyers, in particular, the logistics of the bureaucratic administration of resale royalties are complicated even further since issuing resale certificates necessitates unravelling the identity of parties to these agreements. However, anonymity is a crucial element of the resale art market.

The blockchain, through self-executing contracts, enables artists to circumvent the limitations associated with contracting and administering resale royalties (Haaften-Schick and Whitaker 2022). While smart contracts remain prone to drafting errors by their human creators, they open up far more robust funding opportunities for artists relative to the existing legislative resale agreements (Hiscox 2020). Using NFTs with smart contracts and tokenisation [1] also facilitates the creation of innovative means of distributing fractional equity and risk within artworks (WIPO 2017), directly improving artists' livelihood.

6.1.1 The conceptual practice and economic logic of the Artist's contract

Resale royalties have a legal mandate in the European Union and the UK and enable artists to receive a proportion of the income from secondary sales of their work. This income is generated at auction or through art dealers (WIPO 2017). In other locations, like the United States, where resale royalties are not legally mandated, artists receive their royalties through private contract ((C. G. Bradley and Frye 2018),(Kee 2019)). This type of contract is most notably proposed by Art Worker's Coalition, an influential art activist group , in its artist's model agreements. These private agreements implement the Artist's contract, formally drafted by New York art dealer Seth Sieglelaub and lawyer Robert Projansky (Haaften-Schick 2018).

The Artist's contract is a heavily contested matter in art, law and economics for myriad reasons. From the perspective of some of the literature in art law, it enables artists a degree of agency in an unfairly skewed art market (M. E. Price and A. B. Price 1971). Additionally, the Artists' contract allows artists to carve out more beneficial rights than the law could afford them(Bradley and Frye, 2018). However, the Artist's contract

[1] Tokenisation refers to the substitution of sensitive data identifiers, which in the case of digital art could be any confidential information concerning the details of artwork that any seller would like to remain undisclosed, with a non sensitive equivalent. In this case tokens represent partial equity in digital art.

is complex to enforce, especially by artists without the requisite resources to adequately monitor resales (Feldman and Weil (1974), Vickers (1979)). Besides enabling artists to receive resale royalties, the terms of this contract allow rights to veto exhibitions in addition to rights to receive exhibition income. However, the term which garners the most attention enables artists to claim 15% of the appreciated value of on transfer of ownership.

Consequently, legal mandates or private arrangements like the Artist's contract establish crucial profit-sharing rights. However, legal scholars do not have an explicit consensus on whether contracts effectively secure these rights (Glucksman 1982). Additionally, it is unclear if the option of the legal mandate tilts the bargaining power more in favor of artists (Schten 2017). Both mechanisms are perceived to benefit mostly artists who are already established and provide unique "welfare benefits" to artists (Rub (2014) and Merryman (1992)).

Similarly, the literature on art economics criticizes resale royalties on the theoretical dampening effect they have on the art market since they increase the prices of a price-elastic good. Contrary to this, empirical evidence championed by Banternghansa and Graddy (2011) does not indicate the presence of this market-dampening effect attributable to resale royalties. Legislatively mandated resale royalties have improved artists' earnings across the various art market segments in the UK. In 2018, The Design and Artists Copyright Society (DACS), which collects and redistributes resale royalties in the UK, disbursed 18 million pounds to artists, including 10.5 million pounds worth of resale royalties (WIPO 2017) . This payment exceeds income disbursed by the Arts Council of England in grant support to artists in the UK (Whitaker and Grannemann 2019). A study by Kustin and Co, an art economics firm, also indicates that if the US had adopted a similar EU policy on resale royalties, 8423 artists within the global auction market qualified to earn resale royalties. Of these artists, 6918 have price points between 3000 Euros and 50000 Euros (Kawashima 2008). This effect is especially beneficial to artists whose pieces garner lower prices, given the 12500 Euros limit on resale royalties.

Kawashima (2008) also argues that resale royalties beneficially impact the diverse aspects of the art market beyond central points like New York. Artists who previously faced colonial disenfranchisement benefit from resale royalties, an example being the Australian aboriginal artists who saw a windfall in royalty payments after Australia legally mandated resale royalties (WIPO 2017).

The Artist's contract symbolizes artists' rights, given its layered history of use and

application in the public discourse related to art. Despite this being the case, it has only been adopted by a few artists, among these being Han Haacke, who has used it since 1971, in a manner that is more conceptual than it is economical (Eichhorn 2009). Of the 35 of Han Haake's works brought to auction, only 3 of those sold include the application of the Artist's contract in their listings (Haaften-Schick n.d.). The scarce records available on art sold with the Artists' contract indicate that this is a common occurrence, which shows that the inclusion of this contract in an art listing affects their commercial potential. In the case of Han Haake, his priority was to preserve the right to refuse future exhibitions as an act of economic resistance.

Despite the conceptual rather than economic impact, the Artist's contract provides a firm foundation for establishing technological and scalable funding mechanisms for artists, particularly relevant in the age of blockchain technology. With the introduction of fractional equity in art, enabled through tokenization (Whitaker and Kräussl 2020), resale royalties and equity potentially qualify as property rights within the Coarse theorem (Coase 1960). This qualification makes resale royalties and equity in art even more valuable beyond the point of initial sale due to the reduced transactional cost through the use of the blockchain (Whitaker 2014).

6.2 Funding models and Blockchain technology

The blockchain can herald the shift in the funding mechanisms for artists and art institutions due to its specific characteristics as a self-maintaining, decentralized, and immutable record (Whitaker 2019). Even though the blockchain is usually associated with cryptocurrencies, it is fundamentally a novel registry designed to ensure the trustworthiness and integrity of the information entered into it. The blockchain can therefore solve the registration concerns within the art market, which range from keeping track of sales of artwork to the disbursement of the various associated fees with these transactions (Schneider 2021).

Through the use of tokenization and smart contracts, the transactional costs of micropayments, for royalties, reduce (O'Dair 2018). The simplicity this technology brings to the tracking and payment of royalties makes them a more viable form of revenue for artists. The reduction in transactional cost also facilitates the creation of novel copyright management mechanisms in visual art (Tresise, Goldenfein, and Hunter 2018).

Various blockchain art marketplaces employ provisions drawn from the Artist's

contract, either directly or indirectly. SuperRare, for instance, is a popular platform amongst digital artists, which provides artists with resale royalty between 3% and 10% based on when they joined the platform. Additionally, when Super Rare makes primary market sales, artists retain 85% of the generated revenue (SuperRare 2022). OpenSea also allows NFT artists and creators a 10% resale royalty while its platform retains 2.5% of every transaction made (OpenSea 2022). On Nifty Gateway, artists can set a resale royalty of their choosing, with the platform taking 5% and 30 cents of all secondary sales. The blockchain implements the funding mechanism initially proposed through the Artist's contract. These platforms facilitate the creation of novel risk-sharing and equity financing for artists through autonomous contract design, which is fundamentally game-changing, especially for digital artists (Whitaker and Grannemann 2019).

6.3 The implications blockchain technology will have on artists.

The blockchain enables the realization of new funding models for artists by solving the technical hurdles of resale royalties and enabling fractional equity in art. However, evaluating the practical effect, this shift will have on artists' capacity to participate and profit in the upside of their work when it appreciates after resale is critical.

According to Duncan MacDonald-Korth (2018) digital ledgers could be useful for provenance tracking, tax collection, and art transaction-related transactions in addition to art trading. The report also notes that the technology cannot resolve the conflicts of interest that afflict the art market, but it can provide a framework to lessen them. More so, if digital ledger technologies are successfully adopted, the liquidity and value of the art market are likely to skyrocket, spawning new niche markets like a boom in art-based loans, and integrating art into the financial sector. If properly managed, this financialization of the art industry offers great potential for artists, but it also carries some concerns.

The possibility of the dystopian alternative of a re-centralized market riddled with economic rent is also a possible outcome of this technological shift toward blockchain technology (McAndrew 2021). This is because already established traditional auction houses like Christie's and Soothebey's can leverage their influence over the art market, allowing them to easily adapt NFTs into their product offerings, which can lead to even more artist marginalization.

Additionally, the grey area surrounding the copyright of NFT digital art still requires

clarification. According to the US Copyright Act of 1976, artists retain the copyright even after selling their work. However, there is still ambiguity around whether the buyers of NFTs acquire licenses or property rights. This ambiguity still requires clarification because it is unclear if the exhibition of NFTs by their owners affects the copyright of the original Artist. Even though this is still a developing matter, it is worth noting that smart contract structures enable artists with the ability to specify the rights they transfer to prospective buyers. Blockchains efficiently execute the rights management of such transactions (Whitaker 2019).

It is also worth considering the limitations related to smart contracts. Firstly, smart contracts still have questionable practical enforceability (Werbach 2018). Even though smart contracts provide the advantage of automating the execution of contractual obligations coded into them, they do not address the issues of ambiguity commonly associated with traditional contracts as might be usually assumed (Grimmelmann 2019). Smart contracts are also not suited to dealing with unanticipated contingencies when they arise (Rodrigues 2019). Smart contracts are also subject to intended or unintentional malicious breaching and manipulation, which places parties to these contracts at risk. The immutability of smart contracts, while being advantageous in specific scenarios, imposes an impractical degree of permanence in their terms (Levy 2017). Compared with traditional contracts, mainly when it is necessary to remedy parties for damages caused due to unfair or unreasonable agreements, insisting on the specific performance of clauses renders smart contracts inefficiently rigid compared to legal contracts (Verstraete 2018).

Even as smart contracts have these limitations, blockchain-based funding mechanisms for artists have substantial potential. The initial conceptualization of the Artist's contract aimed to enable artists to trade partial equity in their work, to have the option to rent it out to Museums at a fee, and also receive royalties on their work (Siegelaub and Projansky 1971). However, achieving these objectives through traditional contracts and the art industry norms of that period was difficult. Wilkerson (2012) posits that through smart contracts, artists could receive a portion of museum tickets instead of rental income for their artwork. Tresise, Goldenfein, and Hunter (2018) similarly envisions a future where smart contracts are integrated with point-of-sale systems in museums to allow artists to earn royalties from exhibitions of their work. Whitaker and Grannemann (2019) also argue that the blockchain could enable artists to establish investment trusts, enabling them to pool the risk on their resale royalties, which could provide insurance by diversifying exposure beyond their art catalogs. Essentially, artists will be in a position

to be able to self-fund, a feat that was previously non-existent and is fundamentally disruptive since it enables artists on the fringes to be able to participate in the art market profitably.

6.4 Conclusion

The objective of the Artist's contract is to transform the mechanism of value transfer within the art market in favor of artists. The blockchain provides practical means through which its terms are achievable, using smart contracts and NFTs to achieve its objectives of paying resale royalties to artists realistically. The blockchain also enables these resale royalties to become property rights, allowing artists to trade fractional equity in their work (Whitaker 2014). This status enables the possibility of cooperative structures which facilitate pooled risk management techniques for the benefit of artists (Whitaker 2021).

By implementing these changes, the blockchain enables the transformation of contracting in art, primarily by automating the execution of contractual terms, which radically reduces transaction costs. Fractional equity achieved through resale royalties enables artists to circumvent the "nobody knows" issue in art markets (Caves 2003). This technological feat enables the Artist's contract to have more economical than conceptual impacts, to the benefit of artists, through the blockchain, which has the potential to impact both individual artists and the art community at large.

7. Conclusion

This thesis reviews the available literature on the effects of Non Fungible Tokens(NFTs) on the art industry. To accomplish this, this thesis investigates research questions formulated to establish how the adoption of NFTs affects the modern art market' structure and the effects on the main stakeholders in this market; the artists and prospective art owners. Therefore, this section of this thesis provides a summary of the findings made to answer the earlier posed research questions and concludes with the limitations of this thesis and potential research opportunities to contribute to the body of knowledge on this subject.

7.1 Summary of findings

Research Question 1: *How did the historical context of the modern art market contribute to its structure and significance today?*

Before addressing how the adoption of NFTs changes and affects the art market structure and its stakeholders, it's important to establish what its state is preceding the NFT and blockchain era. The art market's historical context plays a key role in that respect. The history of the modern art market led to the development of its distinct primary and secondary markets, which deal directly with artists for their work and intermediaries such as collectors to trade artwork on the Artist's behalf, respectively. This system is responsible for the rapid growth of the art market from the Renaissance period in Ancient Greece and Rome to 19th Century Paris to its current North American capital New York City. The art market continues to grow strong, with a total market valuation of $65 billion, with various actors including art dealers, and auction houses such as Christie's and Sotheby's participating to varying degrees within the primary and secondary markets.

Research Question 2: *How does the adoption of NFTs, enabled by the adoption of blockchain technology, affect the current structure of the modern art market?*

Outside the $ 65 billion worldwide art market, exists an NFT industry, including digital art and other collectables, which has grown from $4.6 million in 2019 to over $ 11 billion in 2021. NFTs transform the landscape of the modern art market firstly by introducing digital art as an alternative medium for artists because of its increased potential in commercial value. This because NFTs enable scarcity within digital art, which was not previously possible, by enabling the unique identification of digital art. NFTs also foster disintermediation within the secondary art market, made of traditional intermediaries like art dealers, by enabling a more efficient copyright management mechanism on the blockchain.

Research Question 3: *What are the legal and regulatory infrastructural factors that remain to be addressed to empower the digital property rights to NFT art?*

NFTs create the possibility of a digital art market, which inevitably creates digital assets. However, the current legislation concerning digital property favours licencing models which do not enable full ownership of digital files. The specific factors to be addressed concern creating legislation applicable to the unique hybrid nature of NFTs transactions, which have elements of both sales and licensing agreements. The hybrid nature of these transactions is crucial challenge regulators face in creating applicable policies for NFT transactions which are favourable to both artists and prospective art owners.

Research Question 4: *What role does common law play in the formation of digital property rights for NFT owners?*

There's a clear need to create a regulatory infrastructure well adapted to the hybrid nature of NFT transactions. The common law plays a crucial role in this process by balancing contracting and property rights to facilitate efficient resource allocation, which in turn directly affects investment in digital property. Through the common law, the formation of digital property rights enables a future where NFT art investors are more assured about their assets.

Research Question 5: *How does the adoption of NFTs affect artists: Exploring Novel funding models of Fractional Equity and Resale royalties based on the Artist's contract?*

Turning attention to the artist's perspective, the objective of the Artist's contract is to disrupt the mechanism of value transfer within the art market in favour of artists. The

blockchain enables practical implementation of the terms of the Artists' Contract. Using smart contracts and NFTs enables more efficient payment of resale royalties to artists. Through the blockchain, these resale royalties can also become property rights, allowing artists to trade fractional equity in their work, enabling them to benefit from the future rise in its value.

7.2 Limitations and potential research opportunities.

The scope of this thesis is limited in some ways. Firstly, the main focus of this thesis is the effect of NFTs on the art market. However, NFTs are only a recent invention and are mainly applicable to digital art in the art market. Given their short history to date, digital art NFTs form only a small proportion of the art market. In addition to this, as shown by the NFT market overview, digital art itself forms a small proportion of the NFT market as a whole, which is dominated by its collectables and gaming segments. Therefore subsequent studies should focus on further understanding the influence NFTs have on these industries in detail, and explore the trickle-down effects to the art market.

The second scope limitation of this study is attributed to its non-empirical nature. This implies that some of its findings tend to have a more theoretical and subjective applicability to the art industry. This thesis addresses how the adoption of NFTs affects the digital property rights of prospective art owners and the efficiency benefits that come from distributing resale royalties and fractional equity on art transactions using the blockchain. Subsequent studies could therefore augment the findings of this thesis by doing deep dives on established NFT marketplaces like Open Sea, to empirically study the interactions between digital art creators and their customers. This could unlock more insights that could be applied in the legal formulation of digital property rights. This thesis, however, lays the foundation for these subsequent studies to continue to build knowledge on the subject of digital property rights, which become increasingly important as the global economy inches closer to a more digitized future.

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