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Critical Factors and Trends in NFT Technology Innovations

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Abstract: Non-fungible token (NFT) products are important for industrial applications. In recent years, they have rapidly gained importance in the field of blockchain combined with metaverse. The concept of NFTs has developed gradually, as many industries have begun using NFTs creatively to raise new business innovation opportunities in entrepreneurship. However, few studies have been conducted analyzing critical features of NFTs for success, trends, and challenges in NFT products. In this study, group discussions, case analysis methods, and the OpenSea database were used to analyze fashion trends among NFT products. A mixed method was used in this study. Quantitative and qualitative data derived from the questionnaire and group discussions were analyzed using the case study method, and the actual historical trading data of NFT products obtained from the OpenSea platform were analyzed. This study analyzed NFT products, fashion characteristics, and trends in NFT artwork. The opportunities and challenges of NFT applications and sustainable NFTs are discussed in this study. Our research results show that the most attractive NFT product types are collectible digital works and creative artworks. The critical design characteristics are lovely (cute), beautiful, and interesting. We recommend that NFT makers use the above-mentioned characteristics to create NFT artworks with special design characteristics to increase NFT values. The advantage of NFTs is that makers can freely create their works through the NFT platform, which can decrease the limitations of traditional methods such as the need for venues, exhibition setup costs, and intermediaries' commissions. The major challenges of current NFT applications include usability challenges, security and privacy issues, and governance considerations. We believe that our research results can provide useful directions and strategies for future researchers, makers, and ventures seeking to develop NFT applications. Our research results, such as identifying the critical design factors and current trends in NFTs, can provide guidelines for art design and innovation education. In addition, this study discusses the applications of NFTs in sustainable education, which can provide benefits for sustainable educational development to meet the goal of quality education in SDG4.

Keywords: non-fungible token; NFT marketplace; NFT fashion trend analysis; entrepreneurship innovation; maker; sustainability; sustainable education

Citation: Wu, C.-H.; Liu, C.-Y.; Weng, T.-S. Critical Factors and Trends in NFT Technology Innovations. *Sustainability* **2023**, *15*, 7573. https://doi.org/10.3390/su15097573

Academic Editor: Fabrizio D'Ascenzo

Received: 9 April 2023
Revised: 19 April 2023
Accepted: 25 April 2023
Published: 5 May 2023

1. Introduction

Non-fungible token (NFT) products are important for industrial applications. In recent years, they have rapidly gained importance in the field of blockchain. An NFT is a non-fungible token that marks each product sold, and is a unit on a blockchain digital ledger. Each token represents unique digital data. By early 2021, NFTs had become the first application of blockchain technology to reach clear public prominence, providing a tradeable right to digital assets such as images, music, videos, and virtual creations.

The NFT concept has developed gradually as many industries have begun using NFT creatively to raise new business innovation opportunities in entrepreneurship. However, few studies have been conducted to analyze the advantages and disadvantages of different marketplaces for NFTs and trends in NFT products.

NFT transactions can ensure that the ownership of digital assets is recorded in smart contracts on a blockchain [1–3]. Therefore, NFTs are a form of currency used in trade in the Metaverse [4]. As the data of each token are unique, people have assurances with respect to products such as paintings, sound recordings, and videos purchased on the internet. As a result of the gradual development of NFTs, many makers have begun to create new innovations in entrepreneurship through the creative process of creating NFTs. NFTs provide artists and creators with a better way to make a living while changing how we buy, sell, and relate to art [2]. One of the characteristics of NFTs is "non-homogeneity", which provides the buyer with unique digital data, a feature that gives people a guarantee of the purchase of all products. Therefore, the sale of an artwork is one of the most critical aspects of NFTs, and different trading platforms such as OpenSea, OurSong, and Mintable have emerged in the marketplace. These platforms provide a channel for sellers to protect their work and allow them to do their best.

The current NFT research topic is new and has various and interesting research topics that are worth exploring. Previous studies have analyzed market trends, trade networks, and visual features of NFTs. Visual features are good indicator of NFT prices [5]. Wu and Liu [6] reviewed the educational applications of NFTs and discussed their sustainability applications. Qin et al. [4] used a systematic review to provide an overview and evaluation of opportunities and challenges in the NFT market. Sestino et al. [7] discussed which issues were popular around NFTs; they found that intellectual property, lifestyles, and entertainment were widely discussed, along with business opportunities. Wang and Wang [8] discussed the impact of NFTs on the job market for artists today. Few studies have analyzed the advantages and disadvantages of different marketplaces for NFT and the trends in NFT products. Therefore, the present study discusses these aspects.

Although online artwork is the main NFT application, the possible research topics are diverse. Intellectual property, lifestyles, education [6], and entertainment are potential NFT applications that are widely discussed along with business opportunities [7]. However, several research gaps with respect to NFTs need to be investigated. Few studies have analyzed the advantages and disadvantages of different marketplaces for NFT and the trends in NFT products [8]. In addition, it is important to understand what the critical design characteristics and trends of successful NFT artworks are. However, the opportunities and challenges of NFT applications remain unclear.

This study aims to analyze the critical design features for successful NFTs, types of NFT artwork sold, and their sales status in order to understand the current trends in online artwork popularity. The aim of this study is to meet the fourth United Nations Sustainable Development Goal (SDG4): Quality Education, which is defined as to 'ensure inclusive and equitable quality education and promote lifelong learning opportunities for all' [9,10]. These research contributions include several perspectives. First, this study uses a mixed methodology to investigate critical design factors and trends for NFT products. Second, the most favored design factors are examined and proposed for art education. Third, the most favored types of NFT products are proposed for artists and innovators. Finally, the current trends and challenges are discussed in this study. Our research results on critical design factors and trends can provide guidelines for art design and innovation education. In addition, this study discusses applications of NFTs in sustainable education, which has benefits for sustainable education development to meet the goal of quality education in SDG4.

The structure of this paper on NFTs (non-fungible tokens) begins with an introduction that provides background information on NFTs, a research question or problem statement, and a brief overview of the paper's structure. The literature review section summarizes existing research on NFTs and identifies gaps in the literature. The methodology section describes the research design, data collection methods, and data analysis procedures used in this study. The results section presents our findings. The discussion section interprets the results, compares them with previous research, and draws implications for practice and

policy. Finally, the conclusion summarizes the study's main findings and limitations, and provides recommendations for future research.

2. Literature Review

2.1. NFT Concepts and Features

NFTs are a unique digital identifier based on blockchain technology. NFT technology is used to record/certify the ownership and authenticity of digital assets, which makes each item unique and irreplaceable [6,11,12]. When a piece of data is traded in the blockchain world, it is made available to everyone through a public ledger to let them know who bought the product, the price, and the data source. This information constitutes a "block" of several nodes [13]. When many people add data to generate this block, it constitutes a "blockchain". The use of blockchain technology makes each NFT a unique set of numbers that cannot be easily modified once recorded. Thus, NFTs provide transparent and irreplaceable proof of transactions [3,13].

An NFT is a decentralized application that enjoys the benefits of an open book that contains seven attributes: verifiability, transparent execution, validity, tamper-resistance, availability, atomicity, and tradability [4]. We discuss these attributes in this section. Verifiability: NFT data and ownership can be publicly verified. Transparent execution: NFT activities that include mining, purchasing, and selling are open and transparent. Availability: in the NFT system, the issuance of an NFT and transactions involving it can always be available to be sold or bought without interruption. Tamper-resistance: NFT data are permanently archived after a transaction record is generated, and transaction confirmation cannot be manipulated again. Usability: each NFT has the most up-to-date, user-friendly, and clear ownership information. Atomicity: transactional NFTs can be completed in an atomic, consistent, isolated, and durable transaction, and NFTs can operate in the same shared-execution state. Tradability: each NFT and its corresponding product can be exchanged and traded arbitrarily.

An Atomic NFT is a standard for NFTs that makes interchangeable in all compatible applications. The Atomic NFT standard can be used to tokenize and create digital tokens to be bought, sold, or auctioned through a marketplace. Users and developers can use networks such as the Arweave network to store Atomic NFTs with their contract and asset information (NFT token and metadata) together and make the data permanently available worldwide [14]. Atomicity provides tradability of every NFT and its corresponding product for arbitrary exchange and formal trading [15–17].

2.2. NFT Opportunities and Applications

With the rise of NFTs, many different industries have begun to create new business opportunities in the online world. The following are examples from the gaming and art industries. Several crypto games, such as CryptoKitties, Meebits, and Axie Infinity, exist online. The most important feature is the breeding mechanism [4]. In CrytpoKitties, for example, players can breed their purchased cats by raising them with various organs such as eyes, mouths, and tails. The different organs are then divided into normal and rare based on their chance of appearance. This game mechanism motivates many people to join the game. Another attractive game feature is that it provides ownership records of in-game items [4]. NFTs provide an ownership record of the items they represent, meaning that equipment and props obtained in the game can follow the player and no longer fluctuate with the server. NFTs have influenced the development of the animation industry as well. For example, FOX began creating NFTs for the animated program "The Simpsons", along with new broadcast material on the blockchain. FOX believes that this will help to promote and sell content through NFTs and allow fans to connect directly to the company's animated content [11]. NFTs have attracted wide attention and have considerable potential in the intellectual property domain [18] as well as in innovation related to digital assets such as games, media, and arts [19,20].

The biggest problem in traditional art is that there are few places to display artwork; because art is not displayed, it is overlooked, and its price does not rise. Even artwork published on social networks incurs charges from platforms for advertising and intermediary fees when the artwork is sold [4]. Another problem is that in traditional art when a work is sold it is no longer eligible for royalties. The emergence of NFTs has changed the current plight of creators by combining the digital presentation of artwork with the ability to receive royalties for resale.

To summarize, the emergence of NFTs has led to a profound change in how people play and enjoy games, display artwork, trade assets and virtual property on the internet [4], and profit through multiple channels and methods. A large number of artworks are sold on the internet through NFTs on several selling platforms that have emerged in quick succession, creating a new wave of enthusiasm.

2.3. Analysis of NFT Art Trading Platforms

OpenSea, one of the earliest NFT trading platforms, is currently among the largest in the world. Here, buyers can browse numerous artworks, such as paintings, music, games, and various other products [21–23].

OurSong is a popular NFT marketplace in Taiwan because of its Chinese user interface and Google Play's online store download feature [24]. The NFTs in OurSong are called Vibe. Because OurSong collectors are concerned about interoperability, withdrawal fees, decentralization, and environmental protection, various blockchains are offered to allow collectors more choices in choosing the most suitable blockchain solution according to their needs and concerns [25].

Mintable is an emerging NFT marketplace that provides creators and collectors to build digital collections of art, photography, music, and other NFTs. Compared to the above two platforms, its most important feature is that it offers gas-free minting. This is called the no-gas-fee function, which allows creators who want to avoid fees for creating NFTs [26]. Recently, Mintable announced the receipt of investment from the NBA Dallas Mavericks owner and billionaire Mark Cuban, which shows the current importance of Mintable and its future importance for the sale of NFTs [27].

From the above, it can be seen that various platforms have different characteristics; therefore, choosing the right platform is one of the critical issues in selling. Another important issue is how to adjust the products to be sold according to market trends and sell them successfully. This study examines the importance of NFTs in the current metaverse and different trading platforms for NFTs, as well as the steps and features of different trading platforms. Current trends in the art product market are incorporated in the study as well.

2.4. Conclusion of Literature Review

This literature review has explored the emerging phenomenon of NFTs and their possible impacts on various industries in three sections. In the first section, "Understanding NFTs", we have provided a comprehensive overview of NFTs, including their definition, characteristics, and technology. The second section, "NFT opportunity and applications", examined the potential business opportunities created by NFTs in industries such as gaming, art, and animation. Finally, in the third section, "Analysis of NFT art trading platform", we reviewed different NFT trading platforms, including OpenSea, OurSong, and Mintable, along with their unique features. By synthesizing the findings from these three sections, this review offers valuable insights into the potential of NFTs and their implications for various industries, as well as practical considerations for creators and buyers who wish to engage in NFT transactions.

3. Research Design and Methodology

This study used mixed research methods to analyze various perspectives on NFT artworks. Mixed methods research is an approach that combines qualitative and quantitative

data collection and analysis within a single study [28,29]. Similar research method designs have been supported in previous studies of NFT topics [6,30]. The types of data analyzed in this study included quantitative data analysis (questionnaire data and historical transaction data) and qualitative data analysis (group discussion and case study). Collecting as much data as possible is necessary in the initial stage of research or when there is insufficient data verification. Mixed methods research combines the clarity of quantitative counts with the nuance of qualitative reflections to enrich research needs and extract more relevant information [31]. Therefore, better oriented information can be excavated to enrich the research needs.

This study analyzes two types of NFT cases: successful NFT cases listed in the top most favored NFTs based on transaction data from the OpenSea platform, and favored NFT cases collected from a questionnaire survey of participants who have taken NFT-related courses and are familiar with NFT products. The first part of the study used a case study to analyze the NFT creation process and compare NFT platforms. In the second part, participants were asked to fill out information on their favorite NFT artworks and provide reasons for their choices. The reasons were then analyzed for keywords and the favorite NFT artworks were categorized according to the major NFT categories on the platform. Text data were organized for keyword analysis and word cloud analysis to depict the features and fashion style of the NFTs. The most favored NFT artworks collected from the survey were used to analyze the relationship between favored NFT products and price. The open-ended questions asked for the name of the NFT product, its link, its price, and the respondent's opinions about why the NFT is successful.

For NFT trend analysis, we utilized historical price and transaction data on NFTs from the OpenSea platform, one of the most popular NFT platforms, to identify related trends. Due to its leading and renowned status, the analysis only used historical transaction data from the OpenSea platform to increase data representation.

Finally, this study conducted a group discussion to collect the critical features and factors related to successful NFT products. The participants were randomly classified into focus groups to conduct a 30-min group discussions. In the focus group discussions, participants discussed the reasons behind their favorite NFT artworks and explored successful NFT industry applications in order to brainstorm ideas. The research was conducted after teaching NFT concepts and NFT platform introduction in an electronic marketing class in 2022/1. All data collection was anonymous in keeping with research ethics principles. The research methods adopted in this study are illustrated in Figure 1.

This study explored personal preferences for NFT products by categorizing them according to various categories of objects on OpenSea, such as art, collectibles, domain names, music, photography, sports, trading cards, utilities, and virtual worlds. Critical design factors were identified through responses to open-ended questions in a questionnaire. A case study with historical transaction data was used to understand the current trends in NFT products and to analyze the impact of diverse types of artworks on prices and features. A total of 33 participants with digital content and technology/design backgrounds participated in our survey, which included a questionnaire used to analyze customers' favorite types of NFT products and the reasons for their likes. In the group discussion method, 33 individuals were randomly distributed into ten discussion groups of two to three individuals each to analyze the reasons for the success of the products and to explore whether the characteristics of the products that individuals preferred matched the current trends in the art product market.

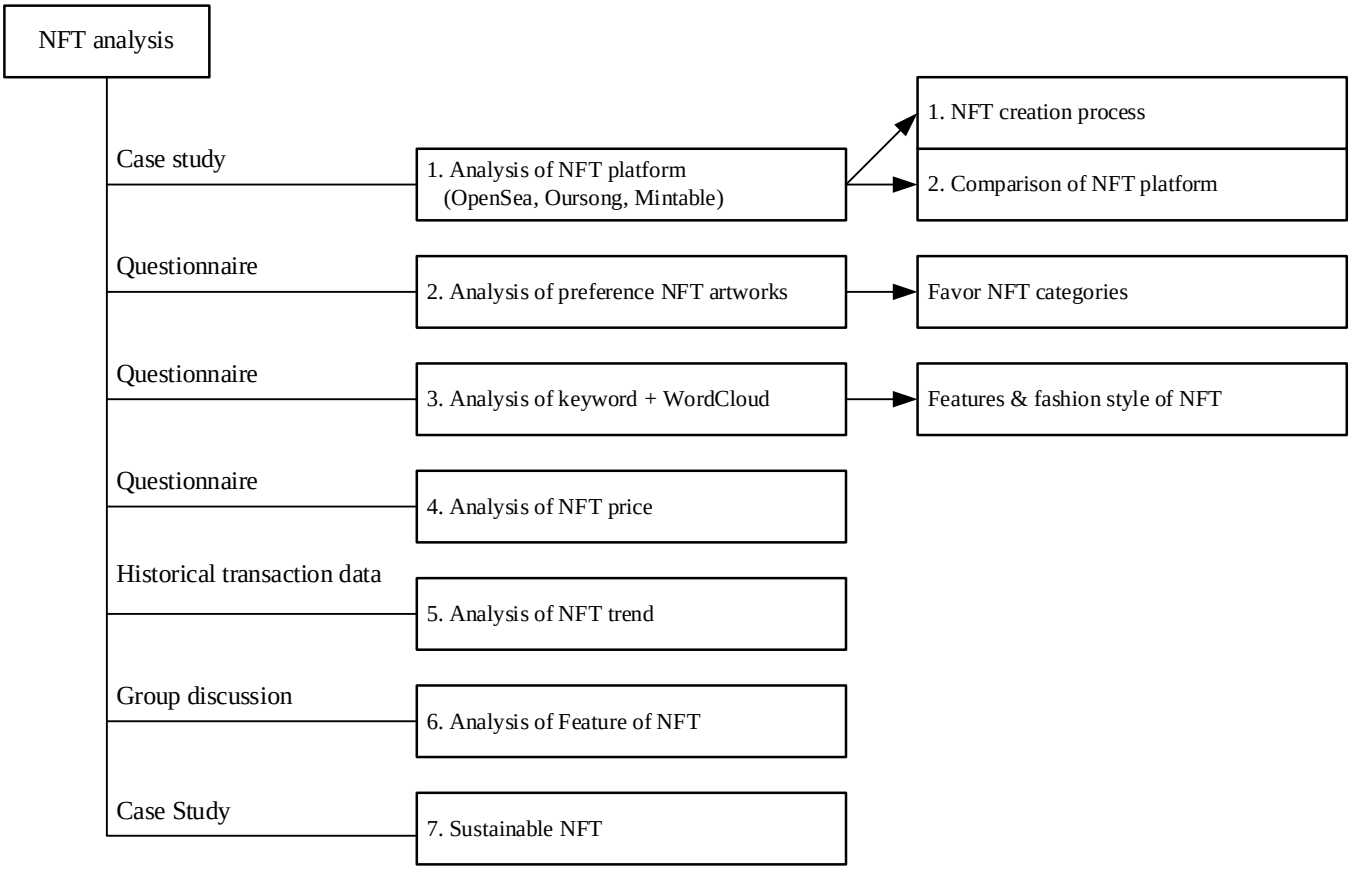


Figure 1. Research methods used in this study.

4. Research Results

This section comprises seven analyses of NFTs: 1. Trading platforms; 2. Preference Analysis of NFT artworks; 3. Keyword Analysis of gender preference for NFT features; 4. Price Analysis of differences between males and females in NFT preferences; 5. Trend Analysis of successful NFT products; 6. Feature Analysis of successful NFT products; and 7. Sustainability Analysis of NFT applications.

4.1. Analysis of NFT Trading Platforms (OpenSea, OurSong, Mintable)

The setup of each NFT trading platform involves several steps. The following section describes the steps taken to create each of the three NFT trading platforms.

4.1.1. MetaMask Wallets

MetaMask, known as Little Fox, is a cryptocurrency wallet that is commonly used when setting up a trading platform because of its many advantages. MetaMask can support multiple operating systems, including iOS, Android, and different browsers. Moreover, the wallet is easily recognizable owing to its small fox logo. It can download plugin packages directly using a browser. It can access many decentralized exchanges (DEX) and pledge platforms for trading, cryptocurrency exchange, and Chinese language services. In addition, MetaMask provides users with three functions: (1) saving, sending, and receiving payments; (2) interacting with blockchain applications; and (3) collecting NFTs. Owing to these services and to its user-friendly and comfortable features, MetaMask is one of the most popular Ethereum wallets. The process of creating a MetaMask wallet is presented schematically in Figure 2.

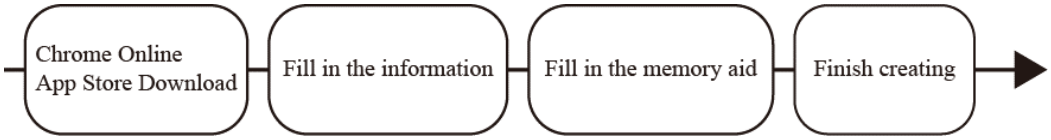


Figure 2. The process of creating a Metamask wallet.

A more detailed description of this process is provided as follows. The first step in setting up the platform is to create a MetaMask wallet. This is done by downloading the MetaMask plugin from the Chrome App Store. The app automatically opens when the download is complete. After entering the MetaMask interface, the command "Create Wallet" is selected, which causes a window to pop up for the user to agree to enter the creation data, enter the password, and check the terms of use. By selecting the option "Create" and, when the process is finished, going to the next page, the user finds the memory aid, which consists of twelve words in English in a particular order. These words are to be imported to all devices that support MetaMask, which may be added in the future, and open the cryptocurrency wallet [32]. The words are written down and typed. Pressing the confirmation button completes the MetaMask creation process. When the new NFT platform is created, as described in the next section, MetaMask is selected from the wallet and "Next" is selected to connect it with the platform.

4.1.2. Steps in Creating a New NFT on the OpenSea Platform

OpenSea offers many different ways to store wallets such as Metamask, Coinbase Wallet, Wallet Connect, and Fortmatic. However, Metamask is recommended because it is the earliest and most popular open-source cryptocurrency wallet. A schematic representation of the process of creating an NFT on the OpenSea platform is shown in Figure 3.

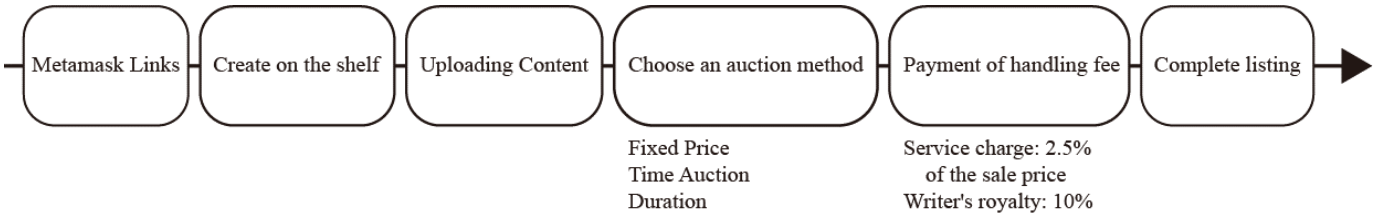


Figure 3. OpenSea NFT creation process.

The following is a detailed description of this process. First, "Create" is selected on the top of the OpenSea home page, then files to be sold, such as jpg, png, and mp4 files, are uploaded and a name is entered for the NFT item. Then, "Create" is selected at the bottom to complete the upload. OpenSea offers a customizable royalty rate for creators that is currently limited to 10%. These royalties allow the artist to take a certain amount of revenue from the resale of each NFT work, ensuring that the artist can make a profit after their creation is completed. In addition to the selling price and royalties, the artist may choose the selling method, such as a fixed price or auction. The artist may choose "timed auction", and, further, under that, can choose between "selling to the highest bidder" and "selling at a reduced price". A "duration", that is, a deadline, may be set by the artist for the sale of the item. The artist must assess the current trends in the market to ensure that their products are sold quickly and to avoid payment of handling fees that the platform charges if the product is not sold. The handling fee may cause the artist to lose money. Before the sale occurs, it is crucial to have funds in the wallet to pay the handling fee.

4.1.3. Steps in Creating a New NFT on the OurSong Platform

The process of creating an NFT on the OpenSong platform is illustrated in Figure 4. First, the user must install the OurSong application to enter the OurSong platform. On entering the platform, "Register" is selected to create an account. Vibe name, artwork, cover

photo, direct purchase price, and other information are entered, and the right type of Vibe is selected to complete the uploading process. As in the case of OpenSea, users are required to pay in advance to complete shelves. The current types of vibration are classified as follows: (1) NFT without an orderly number, and (2) NFT with an orderly number. An NFT without an orderly number indicates that the NFT artwork can be reproduced unlimited times. In contrast, an NFT with an orderly number of NFTs can sell a limited number of NFTs. The creator can select whether the Vibe is to be minted in various blockchains such as BEP, ERC, and TT.

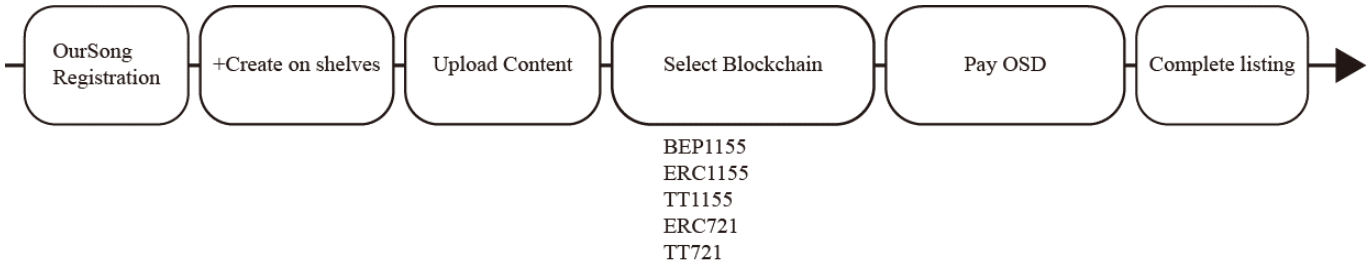


Figure 4. Process of creating an NFT on OurSong.

The cryptocurrency used on the OurSong platform is called OSD, and the exchange rate between OSD and USD (US Dollars) is approximately 1 to 1. The BEP is released by Binance Smart Chain (BSC). BSC is known as Coinan in Chinese. Coinan is at the top of the world in terms of virtual currency trading by volume. Because of the advantages of supporting multiple cryptocurrencies and the low handling fee, a large number of players choose Coinan to trade; however, its drawback is high OSD. The ERC is "Ether BlockChain" in Chinese and Ethereum in English. The information regarding the 285 ERC can be accessed on OpenSea, allowing users of ERC to view their Vibe on the OpenSea platform. However, the high minting cost is a disadvantage of ERC. In addition, the mining consensus mechanism is more energy-intensive when minting NFTs, which is arguably not environmentally friendly. The ThunderCore Token (TT) is fast, high-performance, decentralized, scalable, inexpensive, safe, and dependable. Its advantages include low cost, fast casting, and a lack of environmental problems. Therefore, TT is the cheapest of the three alternatives; see Table 1 below.

Table 1. Analysis of OurSong Vibe Type.

	BSC	**ERC**	**TT**
Withdrawal fee	Medium	High	Low
Interoperability	Medium	High	Low
Supported currency	Diverse	Single	Single
Green environment	Medium	Low	High
Link to OpenSea	No	Yes	No

4.1.4. Steps in Creating a New NFT on the Mintable Platform

Figure 5 shows the creation process for the Mintable platform. The user enters the Mintable website and signs up, fills in the relevant information, clicks "Create Account", then links it to a MetaMask wallet, presses sign, and returns to Mintable. The user logs in again to complete the creation process. To create a new mint item, the user selects an item and enters the type, subcategory, name, profile, etc. Subsequently, a suitable fixed-price or limited-time auction may be chosen. Finally, the user signs into the Metamask wallet to complete uploading the work. Mintable is an emerging NFT trading platform. Its greatest advantage is that it does not require any handling fees to put works up for sale. This allows newcomers or sellers who lack capital to put their work up for sale for free. However, this feature makes Mintable less popular than OpenSea and OurSong. Therefore, the gas fees are cheaper than on the OpenSea platform.

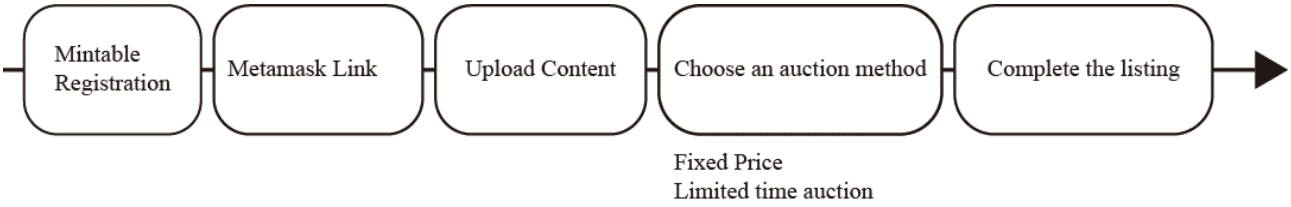


Figure 5. Mintable creation process.

4.1.5. Analysis of NFT Platforms

OpenSea has the advantage of having the largest number and variety of NFTs, but currently, there is no Chinese version of the service, and it only accepts cryptocurrency payments. Therefore, the threshold for using OpenSea is higher and more complicated for novices. OurSong provides a variety of blockchains so that people can have multiple choices, but the advantages and disadvantages of different blockchains differ. Binance Smart Chain (BSC) and ThunderCore (TT Chain) are more environmentally friendly than ERC, but the ecosystem is not as complete as ERC. The biggest advantage of Mintable is that there is no transaction fee, but at the same time, it is a new platform. A comparison of the features of NFT platforms is presented in Table 2.

Table 2. Comparison of features in various NFT platforms.

	OpenSea	**OurSong**	**Mintable**
Need a link to Metamask wallet?	Yes	No	Yes
Need to register an account?	No	Yes	Yes
Have unlimited time bids?	Yes	None	Yes
Can set market opening time?	No	Yes	No
Historical records of trading?	Yes	Yes	Yes
Interactive functions	None	Yes, can create a community	None
Accepted types of NFT	Images, videos, audio, 3D models, etc.		
Blockchains	Ethereum, Polygon, Klatyn	Ethereum, Binance, ThunderCore	Ethereum
Gas fee	Ethereum service fee + royalty fee (service fee: 2.5% of the sale. royalty fee: 10%)	Transaction fee (differs depending on the type of OSD)	None
NFT Name	NFT	Vibe	NFT
Pay the gas fee by Credit card	No	Yes	Free

4.2. Preference Analysis of NFT Artworks

Thirty-three questionnaires were administered in this study, and 33 questionnaires were collected. Of these, two were invalid and 31 were valid. Of the respondents, 17 were female (55%) and 14 were male (45%); 25.8% liked art, 41.9% liked collectibles, 6.46% liked music, 9.68% liked photography, 3.24% liked sports, 6.5% liked utility, and 6.5% liked the virtual world. It is clear that "Collectibles" was the most popular type of artwork; those types not mentioned above are the types of artworks not preferred in the sample (see Table 3).

Table 3. Favorite NFT categories (N = 31).

Category	NFT Name	Number	Sample (%)
Art	LetsWalk, Unnamed Foal, Meta Legends, Azuki, Loveless City Metropass, minuet curio, WonderPal	8	25.8%
Collectibles	Coolman's Universe, Nifty League DEGENs, 3DPunks, THE SHIBOSHIS, Coolman's Universe, Cool Cats NFT, Gutter Rat, Doodles, FANSI, Dark Dorm Neighbors, Orathai Cat, MoodRoller, Reservation Walker Pass	13	41.9%
S Music	Fragile Heart	2	6.46%
Photography	PALETTES OF AOTEAROA, The green symphony Metascapes	3	9.68%
Sports	CRYPTODUNKS	1	3.24%
Utility	Bruteforce, FLUF World: Burrows	2	6.46%
Virtual Worlds	VOXEL WORLDS, Legendary Solar Panel	2	6.46%

4.3. Keyword Analysis of Gender Preference for NFT Features

Keyword analysis was used to analyze the responses to open questions in our survey that sought the reasons for favoring particular NFT artworks. Table 4 presents the results of these analyses. The most favored characteristic of an NFT was that it was lovely (cute). The most popular keyword used to describe NFT artwork was lovely (10), followed by interesting (3) and beautiful (3).

Table 4. Keyword analysis of preference NFT features.

Keyword	Counting	Keyword	Counting
Lovely (cute)	10	Boldly color-coordinated	1
Interesting	3	Designed	1
Beautiful	4	Good sounding	1
Technological	2	Crystal clear	1
Special	2	Helpless	1
Diverse	2	Rare	1
Creative	2	Childish	1
Collectible	1	Dark	1
Distinctive	1	Pixelated	1
Relaxing	1	Funny	1
Interesting	1	Familiar	1
Technical	1	Independent Space	1
Wonderful	1	Inspirational	1
Handsome	1	Easy	1
Smooth	1	Simple	1
Calm	1	Artistic	1
Mysterious	1	Surprising	1

The results showed that women were more concerned about features of NFT artwork that are cute and beautiful. On the other hand, men had a wider range of reasons for liking NFT artwork. These included artworks being funny, interesting, or having a high value that is satisfied when a user interacts with a product or service. The collectibles are characterized by the fact that although each design is different, their roles are mutually consistent, as shown in Table 5. The features of the various categories differ as well. The most popular features in each category are art (lovely, beautiful), collectibles (adorable (cute), special, funny, diverse, interesting, creative), music (good to listen to, wonderful), photography (technical, beautiful, artistic), sports (famous), utility (technology, design), and virtual worlds (lovely, collectible, interesting). The keyword analysis and word cloud analysis of NFT preference features is shown in Table 5 and Figure 6.

Table 5. Keyword analysis of reasons for preference for NFT artworks.

Category	Male		Female	
	Keyword	**Counting**	**Keyword**	**Counting**
Art	Simple	1	Lovely	3
	Interesting	1	Beautiful	2
			Crystal clear	1
			Technological	1
			Smooth	1
			Good looking	1
			Mysterious	1
Collectibles	Special	2	Adorable	5
	Funny	2	Diverse	2
	Pixelated	1	Interesting	2
	Adorable	1	Creative	2
	Rare	1	Distinctive	1
	Dark	1	Easy	1
	Helpless	1	Inspirational	1
			Creative	1
			Boldly color-coordinated	1
			Childish	1
			Handsome	1
			Surprise	1
Music	Wonderful	1	Good to listen	1
			Relaxing	1
Photography	Technical	1	Artistic	1
	Beautiful	1		
	Calm	1		
Sports	Famous	1		
Utility	Designed	1		
	Technological	1		
	Independent Space	1		
Virtual Worlds	Lovely	1		
	Collected	1		
	Interesting	1		

This study conducted a style analysis of lovely/cute NFT artwork to provide more detailed design guidelines for NFT makers and designers. The research results revealing that the fashion style of lovely/cute NFT products is favored by respondents is summarized in Table 6.

Table 6. Fashion style analysis of lovely NFT artworks.

NFT Type	NFT Name	Type	Pictures
Art	LetsWalk	Videos	
	WonderPal	2D images	
Collectibles	Coolman's Universe	2D images	
	THE SHIBOSHIS	2D images	
	Cool Cats NFT	2D images	
	Doodles	2D images	
	Orathai Cat	3D images	
	MoodRoller	Videos	
Virtual Worlds	[VOXEL WORLDS]	3D images	

(Image Source: https://opensea.io/)(accessed on 22 March 2022).

4.4. Price Analysis of Male and Female Preferences for NFTs

The price statistics derived from the responses to open-ended questions regarding preferred products are shown in Table 7. The ETH prices of preferred NFT products were obtained from the public Opensea platform. Collectibles were the most popular category among both genders, followed by art, while the preferred products in other categories were

few and scattered in their rankings. However, the correlation between ETH and preference was low.

Table 7. Price statistics of participants' preferred NFT products.

Category	Male		Female	
	Name	ETH	Name	ETH
Art	Loveless City Metropass	1.0000	Azuki	9.3000
			LetsWalk	7.5000
			LetsWalk	4.7000
			minuet curio	1.0000
			WonderPal	0.5179
			Meta Legends	0.3678
			Unnamed Foal	0.1220
Collectibles	Gutter Rat	0.9500	Cool Cats NFT	6.5000
	THE SHIBOSHIS	0.6000	Doodles	4.9900
	DEMO	0.5000	3DPunks	0.8000
	Nifty League DEGENs	0.3000	MoodRoller	0.4500
	Dark Dorm Neighbors	0.0150	Coolman's Universe	0.2500
			Reservation Walker Pass	0.2000
			Coolman's Universe	0.1800
			Orathai Cat	0.0100
Music	Fragile Glass Heart	4.0000	Gypsy Heart	1.1110
Photography	PALETTES OF AOTEAROA	5.0000	The green symphony	0.1500
	Metascapes	0.1400		
Sports	CRYPTODUNKS	0.7000		
Utility	FLUF World: Burrows	0.9000		
	Bruteforce	0.0890		
Virtual Worlds	Legendary Solar Panel	39.9500		
	VOXEL WORLDS	0.0200		

Figure 6. Word cloud analysis of NFT features.

4.5. Trend Analysis of Successful NFT Products

For this study, historical transaction records on the OpenSea platform were collected and analyzed, as shown in Table 8. The top NFTs in OpenSea are ranked based on quantity, price, and other statistics. Transaction data were collected for the period from the creation of the OpenSea until 22 March 2022 (all times). The results show that the trending NFT items were art and collectibles. NFT buyers and investors were more inclined to pay for these two types, and sellers could sell these types in greater quantities than the other types.

Table 8. OpenSea Top 10 NFT artworks (all time).

Rank	NFT	Type			
		Art	Collectibles	Trading Cards	Virtual Worlds
1	CryptoPunks	✓	✓		
2	Bored Ape Yacht Club	✓	✓	✓	
3	Mutant Ape Yacht Club	✓	✓	✓	
4	Decentraland				✓
5	Art Blocks Curated	✓			
6	The Sandbox				✓
7	CLONE X-X TAKASHI	✓	✓		
8	Azuki		✓		
9	Rarible	✓			
10	Meebits		✓		
	Total:	6	6	2	2

To depict the short-term trend of successful NFT items, data on top NFTs in OpenSea for 30 days (from 22 February 2022 to 22 March 2022) were collected and analyzed; Table 9 presents the results. The research results show that under the top ten categories there were seven items of the Art type, ten of the Collectible type, four of the Trading Cards type, and none of the Virtual Worlds type. Compared to the entire period covered in this study, collectibles were the most popular trending type of NFT in the final month, and four of the collectibles grew more rapidly in popularity than others in that month.

Table 9. OpenSea Top 10 NFT artworks (last 30 days).

Rank	NFT	Type			
		Art	Collectibles	Trading Cards	Virtual Worlds
1 *	Bored Ape Yacht Club	✓	✓	✓	
2 *	Mutant Ape Yacht Club	✓	✓	✓	
3	Invisible Friends	✓	✓		
4 *	CryptoPunks	✓	✓		
5	3Landers	✓	✓	✓	
6 *	CLONE X-X TAKASHI	✓	✓		
7	CyberBrokers		✓	✓	
8 *	Azuki		✓		
9	tubby cats by tubby collective	✓	✓		
10 *	Meebits		✓		
	Total:	7	10	4	0

* The first column denotes the NFT item that ranked among the top 10 NFT items during the entire period.

The above data are depicted graphically in Figure 7 below.

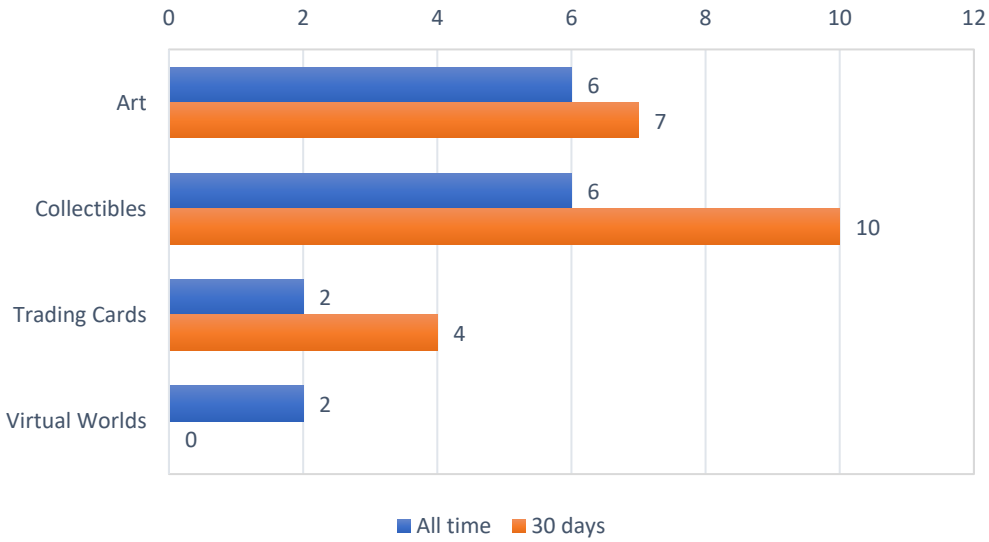


Figure 7. The trend of Top 10 NFTs.

4.6. Feature Analysis of Successful NFTs

The group discussion method was used to analyze the successful features of NFT items. Thirty-three participants with digital content and technology/design backgrounds participated in this survey. They were randomly assigned to ten discussion groups of two to three persons each to discuss the important features that contributed to the success of the products and explore whether the characteristics of the products that individuals preferred have features that are common to the current artwork trends. Analysis of the responses to the survey showed that all eight collectible items and seven of the eight items considered the uniqueness of the product to be the key to success. The research results showed that the key feature of a successful NFT artwork is the uniqueness of the product among all NFT categories. Collectability was another aspect of this analysis. Because of the above uniqueness and the fact that different accessories have different chances of being produced, certain artworks are quite rare and players might want to collect more than one artwork.

The Bored Ape Yacht Club, for example, offers an exclusive club that purchasers can join for free. This is an attraction in addition to the uniqueness of the artwork. The free Mutant Ape Yacht Club enhances the connection between the two artworks. CryptoKitties permits purchasers to create the next generation of cats in a nurturing way by mating two cats. Through genetic recombination, the next generation exhibits more interesting characteristics. This is as fun as raising animals in real life. More Than Gamers | MTG and TownStar focus on games and allow players to sell virtual game characters or props to generate greater benefits. By generating additional benefits, gaming goes beyond the conventional idea that games are only for entertainment; see Table 10.

Table 10. Feature analysis of successful NFT products.

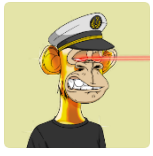
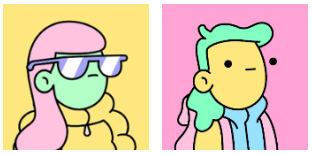
Name	Categories	Feature Analysis	Image
Bored Ape Yacht Club	Art, Collectibles, Trading Cards	1. Uniqueness: Use the algorithm to mix and match different monkey features (background, clothes, earrings, eyes, hair, hat, and mouth) to make each one a unique item. 2. Collectibles: Since the characteristics of each monkey are random, the rarer the characteristics, the more collectible the ape and the higher the price. 3. Exclusive Club: To create a sense of pride and belonging to the collector community, collector gatherings and regular airdrops of mutant serum bottles are organized, allowing buyers to create mutant monkeys.	 

Table 10. *Cont.*

Name	Categories	Feature Analysis	Image
My Pet Hooligan	Art, Collectibles	1. Uniqueness: In the game, My Pet Hooligan can make the 3D character more unique by character details (skin pattern material . . .) and action accessories, and color.	
Crypto Kitties	Art, Collectibles, Virtual Worlds	1. Uniqueness: The concept of the breeding game is combined with the technology of NFT, from ordinary cats and exotic cats to exceedingly rare and exclusive cats. Just like collecting collectibles, each cat has a unique number. 2. Cultivation: After purchasing a cat from the platform, the cat will be bred, and two cats will be mated to give birth to kittens.	
Mutant Ape Yacht Club	Art, Collectibles, Trading Cards	1. Uniqueness: A variation of the Bored Ape Yacht Club, the price is less than that of the Bored Ape Yacht Club, which attracts many new users to enter the Bored Ape Yacht Club ecosystem.	
More Than Gamers (MTG)	Art, Collectibles	1. Uniqueness: Providing in-game benefits is one of the main value drivers for NFTs, such as the introduction of limited-edition collectibles. 2. Creating interest: Many people buy traditional NFTs and wait for their value to appreciate to profit from their sale. In-game NFTs are no exception. 3. Collectibles: When evaluating the development potential of in-game NFTs and the various lucrative sales on the market, it is easy to forget that the platform itself is a game. Users may want to buy in-game NFTs to increase the game's speed or satisfy the desire to collect them.	
Town Star	Collectibles, Utility, Virtual Worlds	1. Application: Players can collect TownCoin by playing the game and exchange it for Gala cash. 2. Create benefits: Players can create benefits by playing the game, overturning the previous idea that the game can only be used for entertainment.	
Doodles	Art, Collectibles	1. Uniqueness: Has a unique shape. 2. Interesting: Use the meme.	
Dogepunks	Art, Collectibles	1. Uniqueness: Using simple vector line drawing, the theme has consistency, and the characters are cute and unique. 2. Diversity: Provide the same expressions with assorted colors for the character expressions and various choices.	

(Image Source: https://opensea.io/) (accessed on 22 March 2022).

4.7. Sustainable NFTs

With the rise of environmental awareness, scholars have proposed solutions to this situation, and at the same time the network has begun to use the concept of environmental protection-oriented NFT products. Examples of sustainable NFTs are introduced as below.

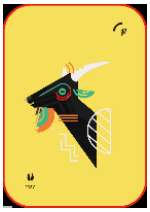
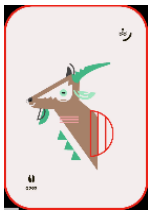
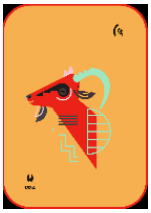
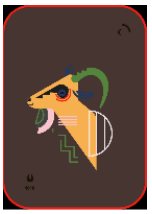
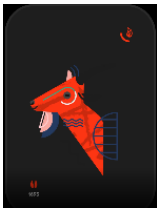
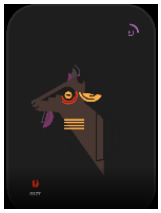
4.7.1. Happy Goat Genesis

Happy Goat Genesis has a number of different goats with different rarity characters through card colors, heads, shoulders, elements, eyes, etc. The goal is to use NFT to create renewable farms that create more nutritious food and absorb atmospheric carbon from the soil, thereby helping to combat climate change and many other issues. It is a nonprofit model that introduces people to philanthropy through creativity, art, and

experience, activities that raise awareness and influence change in the climate crisis and food justice [33].

In addition to the funds used to reduce carbon emissions on 2000 acres of land adjacent to Yosemite National Park in Mariposa, California. NFT owners receive a variety of additional incentives, such as workshops and parties, tickets to special Happy Goat events, and additional merchandise giveaways. Table 11 summarizes examples of NFTs on the Opensea platform.

Table 11. Happy Goat Genesis NFT introduction.

Name	NFT Image	Price (ETH)	Name	NFT Image	Price (ETH)
#1177	 (https://reurl.cc/zr0Zn7)	0.123	#183	 (https://reurl.cc/aaQnyD)	0.1247
#1890	 (https://reurl.cc/X5oj0j)	0.15	#293	 (https://reurl.cc/X5oj0j)	0.2
#1384	 (https://reurl.cc/deR2Y2)	0.22	#1818	 (https://reurl.cc/GX7x1D)	0.25
#1693	 (https://reurl.cc/LXYmya)	0.35	#537	 (https://reurl.cc/gQ92V4)	0.75
#1687	 (https://reurl.cc/OEdAZg)	6.66	#127	 (https://reurl.cc/OEdAZ9)	2.42

Source: https://www.happygoat.co/#farm (access on: 2 February 2023).

4.7.2. World Earth Day Carbon Reduction Response NFT

World Earth Day Carbon Reduction Response NFT is a collaboration between BELS and companies to raise public awareness of the need to protect the environment. The

operation model is that after purchasing this NFT, the "International Vegetable Industry Promotion Association" will plant a tree in the name of the purchaser, who will receive an energy-saving and carbon-reducing light as well as a lucky bag, and there is a chance to receive other goodies after purchasing the lucky bag. It is important to note that the above-mentioned benefits are the rights of the original purchaser and a new purchaser is not be eligible after reselling the NFT [34]. Introduction to World Earth Day Carbon Reduction Response NFT is summarized in Table 12.

Table 12. World Earth Day Carbon Reduction Response NFT introduction.

Item	Description
Chinese Name	World Earth Day Carbon Reduction Response NFT
English Name	WORLD ENVIRONMENT DAY
Platform	BELS Website (https://www.bels.co/)
Product Images	
Number	3
Price	422USDT
Behavior	Plant a tree in the name of the purchaser
Added Value	Energy-saving and carbon-reducing Hanukkah and lucky bags

Source: https://www.bels.co/ (accessed on 19 January 2023).

4.7.3. Absurd Arboretum

Absurd Arboretum is similar to BELS above, with purchase of a virtual NFT product and the planting of a tree is the main difference. The proceeds from the work of the Ridiculous Botanical Garden will be donated to non-profit environmental organizations around the world, and the purchaser can participate in the promotion of ecological sustainability and contribute to the sustainability of the Earth [35].

In the case of NFT products, each tree costs 0.06 ETH to purchase and provides a tree unique to itself, as shown in Figure 8. If the buyer resells the product after purchasing it, Ridiculous Botanical Gardens will plant a real tree in return, thereby achieving sustainability. The product is presented in the form of a video, initially consisting of different shapes and colors of seeds (product images left), which then gradually grows into a tree (product images right). The number of resales is the number of times the product is re-sold after it has been purchased, and each time the number of resales increases, a tree is actually planted in real life to prove it [35]. Examples of plant NFTs of Absurd Arboretum are summarized in Table 13.

As environmental awareness continues to rise, scholars and companies are proposing solutions and NFT products to promote sustainability concepts in the NFT market. Happy Goat Genesis is a non-profit NFT project that aims to create renewable farms that combat climate change and promote food justice by absorbing atmospheric carbon and producing more nutritious food. The World Earth Day Carbon Reduction Response NFT and Absurd Arboretum both incentivize NFT purchasers to contribute to environmental sustainability by planting trees and reducing carbon emissions. These NFTs allow purchasers to make a positive impact on the environment while providing various perks and benefits. Overall, sustainable NFT projects such as these demonstrate potential opportunities for NFTs to promote sustainability and encourage environmentally responsible behavior.

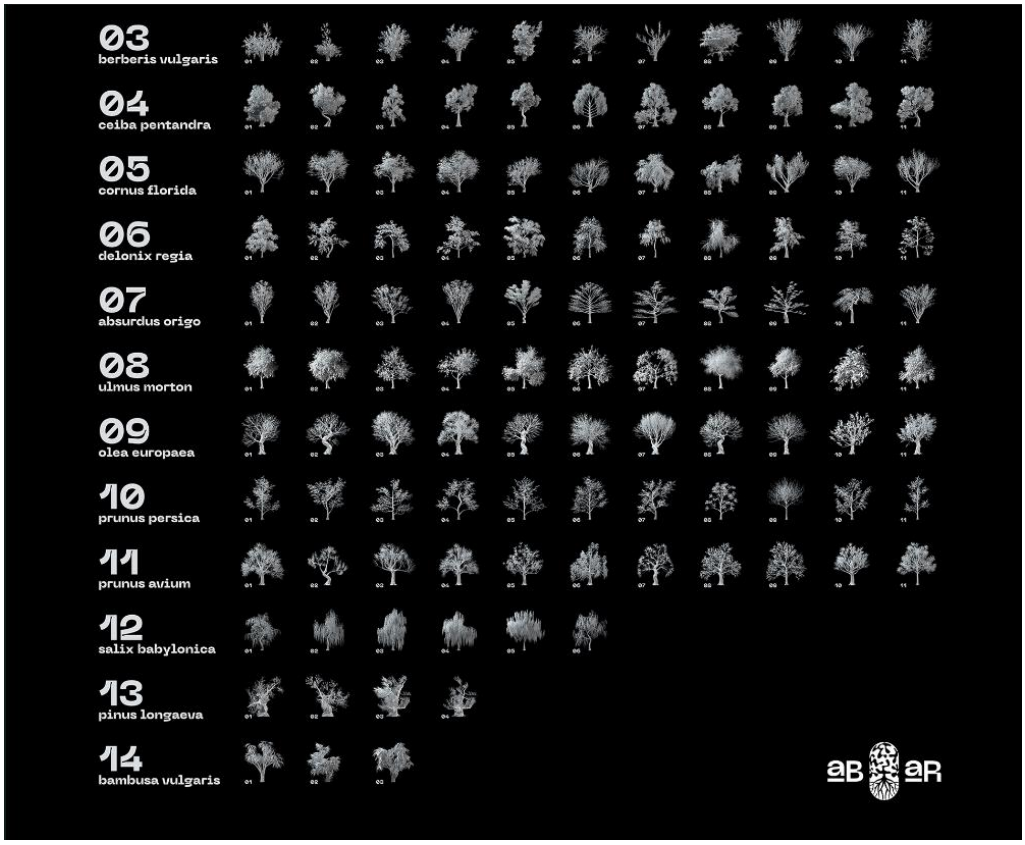


Figure 8. Tree Species Map. Source: https://ab-ar.art/ (accessed on 19 January 2023).

Table 13. Examples of Absurd Arboretum NFTs on Opensea.

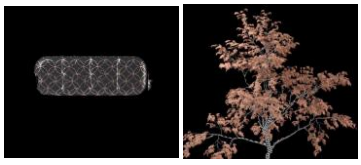
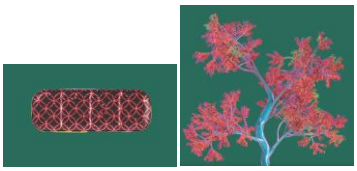
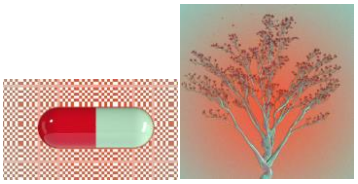
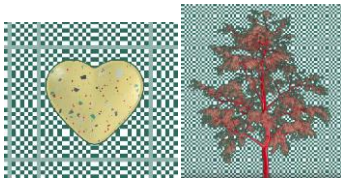
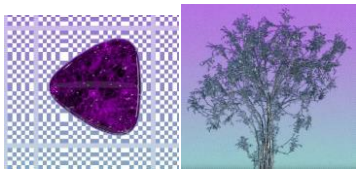
NFT Name	Product Images	Price (ETH)	Number of Resales
0034	 (https://reurl.cc/91MGMv)	6.942	1
0469	 (https://reurl.cc/zr0Z2k)	0.552	2
2402	 (https://reurl.cc/qZy590)	0.05	2

Table 13. *Cont.*

NFT Name	Product Images	Price (ETH)	Number of Resales
2415	 (https://reurl.cc/6LW0gy)	0.025	2
2933	 (https://reurl.cc/eWq3jm)	0.03	1
3028	 (https://reurl.cc/deR2Rk)	0.01	4
1447	 (https://reurl.cc/bGME5y)	1.69	2
0916	 (https://reurl.cc/YdLX6X)	0.169	2
3355	 (https://reurl.cc/deRWV8)	0.02	5
3351	 (https://reurl.cc/gQ929V)	0.024	1

Source: https://ab-ar.art/ (accessed on 19 January 2023).

5. Discussion and Conclusions

5.1. Discussion of Trends in NFTs and Current Challenges

NFTs have become a rapidly growing and popular marketplace for digital work in recent years [3,6,36]. The advantage of NFT is that makers can freely create their works on the shelves through the NFT platform, which can reduce limitations of traditional methods such as the need for venues, exhibition setup costs, and intermediary commissions. However, NFTs have a number of challenges, such as theft of NFT digital products to re-shelf, NFT hacking to cause losses, and challenges around building a brand and reputation among the many NFT products, which are all noteworthy emerging issues. In addition, previous studies [4] have discussed major challenges of current NFT applications, including usability challenges, security and privacy issues, and governance considerations. The slow confirmation and high gas prices of NFTs decrease the effectiveness, efficiency, and satisfaction of users in NFT transactions. The characteristics of NFT data inaccessibility and privacy are major considerations in NFT security issues. Well-designed NFT regulations and laws for cross-border transactions and taxability of property are critical issues in governance considerations [4,37,38].

What can be learned from the case study of successful NFTs? Buying NFT products resembles buying artwork in real life. The difference is that NFTs provide the buyer with rare or unique items while at the same time protecting the copyright of the creators of the artwork. NFT products are currently the most popular products because of their collectability. NFT products currently sold on the internet are not as numerous as those sold in the real world; however, one may assert that many artists will switch to making and selling their work on NFT platforms in the future. In the future, NFTs can adopt applied computing technology in the arts and humanities domains to develop fantastic fine arts or media arts based on computer algorithms in the theory of computation [2].

NFTs offer several benefits for innovators and makers. The benefits of NFTs provide an innovation platform and channel that allows all makers across the industry to sell their art, gaming, and multimedia works [19]. NFT platforms provide a marketplace that allows inventors, collectors, and game developers to purchase or sell game art [20] and develop educational applications [6]. NFTs have potential benefits in intellectual property development to promote transparency and liquidity for innovators who aim to commercialize their innovations [18]. The authors of this study believe that their research results on NFT could help people move from being thinkers to being artwork makers or education makers.

This study proposes several policy recommendations for governments to formulate relevant laws in the following directions with regard to the characteristics of NFTs: 1. security protection; 2. anti-money and money transmission regulations; 3. intellectual property protection; and 4. capital gains tax liability [39].

The success of NFT applications is a strong case study that can be explained by three behavioral psychologies: scarcity, social proof, and signaling. Marketers can leverage these three behavioral psychology concepts to motivate NFT adoption and growth [40]. For future researchers, little is known about the psychological effects of what makes buyers pay a lot of money for something that is a pixel-by-pixel indistinguishable digital asset [41].

The challenge of sustainability for NFTs refers to improvements to the NFT ecosystem in order to become more environmentally and socially responsible [6,42]. With the increasing popularity of NFTs and their applications in various industries such as art, collectibles, education, and gaming, the energy consumption and carbon footprint associated with NFT transactions have brought major issues around sustainability concerns. The challenges of NFTs around sustainability can be overcome by implementing more eco-friendly blockchain technologies with proof-of-stake consensus algorithms instead of proof-of-work, which has less energy consumption [6,43]. Additionally, NFT platforms and creators can create sustainability-related NFT products to promote sustainability concepts through incentives related to sustainability, such as planting trees, investing in renewable energy projects, and using environmentally friendly materials for NFT production.

5.2. Discussion of Sustainable NFT

The creation of NFTs is so energy-intensive that the carbon footprint of a single NFT transaction is estimated to be 14 times greater than that of producing and transporting art prints [44]. Additionally, the carbon footprint of selling 100 NFTs exceeds 10 tons of CO_2, surpassing the average annual per capita carbon footprint in the European Union [45]. This impact is largely due to the three main stages of NFT creation: casting, listing, and purchase [46]. These factors demonstrate the significant environmental impact of NFT creation [43,46].

Most of NFTs are primarily minted on proof-of-work (PoW) blockchains, which require a vast amount of computing power for their mining process. The majority of NFTs are created on the Ethereum blockchain, and it is estimated that each NFT minted on Ethereum consumes 223.85 kilowatt-hours of electricity according to the Ethereum Energy Consumption Index. One NFT transaction on the Ethereum PoW blockchain alone releases 124.86 kg of carbon dioxide into the environment [47]. A sustainable green NFT would be carbon-neutral or carbon-negative, meaning that upcoming projects should be able to fully offset the emissions of an NFT by investing in renewable energy, conservation projects, or technologies that absorb carbon dioxide from the atmosphere. OneOf, an NFT platform that utilizes Tezos blockchain protocol, aims to differentiate itself by providing its customers with an affordable and environmentally friendly service that uses less energy than other blockchain networks. According to the company, artists are utilizing the platform to sell green NFTs on the NFT market [48].

The use of sustainable concepts in the production of NFTs to reduce energy consumption is becoming an increasingly important issue for artists. As such, when purchasing and creating NFTs, it is possible to consider incorporating environmental sustainability, including purchasing proof of stake NFTs, using and investing in renewable energy sources, purchasing carbon credits to offset emissions, and investing in experimental technologies [43,44,46]. Proof of stake requires users to demonstrate ownership of a specific amount of cryptocurrency, which consumes less energy compared to proof of work, as it requires less computational resources [43,44,46]. Using and investing in renewable energy sources by purchasing renewable energy sources such as wind and solar power can meet the energy needs of NFTs and other cryptocurrencies while reducing or eliminating associated carbon emissions [43,46]. While buying carbon offsets from a trusted provider does not impact the energy supply provided by cryptocurrencies, it can support efforts to reduce or capture emissions elsewhere in the world [44]. Finally, NFT sales revenue can be invested in experimental technologies aimed at mitigating or reversing the impacts of climate change [43,46].

5.3. Conclusions

This study analyzed three major NFT platforms (OpenSea, OurSong, and Mintable). The results show that each platform has its own advantages and disadvantages. The following are suggestions for creators, from thinkers to makers. The advantage of OpenSea is that it has the most significant number and variety of NFTs and is currently the most popular and mainstream NFT trading platform. However, it is not possible to transact directly by credit card payment, and buying ETH is required before trading. OpenSea has a higher gas fee and no Chinese-language support. These restrictions are a relatively high threshold for newcomers. The advantages of OurSong include the ability to create community interactions and the availability of direct credit card payments, making it more acceptable to NFT purchasers. The advantage of Mintable is that it does not require a gas fee for minting NFTs. However, Mintable is an emerging platform that may not be as popular or tradable as other platforms. Newb makers can choose OpenSea if they want to be on the most mainstream platform and OurSong if they want to pay conveniently, and Mintable as the platform with the lowest cost.

This study found that the most popular NFT product types on the OpenSea platform were collectibles, followed by art, indicating that the most popular types are collectible

digital works and creative artworks. These results show that the price of NFTs has a low correlation with the degree of NFT preference, and the main factor that affects the purchaser's preference is the design of the artwork. Therefore, it is recommended that makers first try to create their NFTs mainly in Collectibles and Art categories.

In this study, the popular features of NFTs were analyzed using keywords, and the results showed that the most popular keywords in the answers by the respondents were lovely (cute), beautiful, and interesting. The main types of art were cute, special, funny, diverse, interesting, and creative. Further analysis by gender showed that women paid more attention to whether artwork was cute or beautiful, while men preferred it for a wide range of reasons, including whether it was funny and interesting, had a high usage value, or had special characteristics in addition to being cute. Therefore, it is recommended that NFT makers use the above-mentioned characteristics to create these two types of artworks, and that they use special characteristics.

Our results showed that art and collectibles were the two most popular categories, in line with consumer preferences. The data showed that NFT transactions in the collectibles category have risen in the last month. Therefore, it is suggested that NFT makers might start with this type of NFT creation, as it is more likely to be sold.

This study collected users' perceptions of NFTs and the characteristics of successful NFT products through group discussions and case study analysis. The results showed that product uniqueness and added value were the two most important success factors. First, the success of NFT products was characterized by their uniqueness. Each product had more than one accessory to match the character by creating a main character and matching accessories, making each NFT unique. The chance of matching characters with accessories is different, and the low chance of the NFT creates its unique characteristics, which in turn generates collectible value and attracts consumers. In addition, the uniqueness of product characteristics through the creation of additional value, such as exclusive clubs and cultivation, is an important success factor. Each piece has different characteristics and interesting features, and the community is limited to NFT purchasers, attracting consumers to come and buy. An analysis of the product characteristics revealed that the uniqueness of the product is the key to success, along with the importance of added value. Specifically, the difference in the product's characteristics, such as clothing and facial features, makes the product unique. In addition to the aforementioned distinguishing characteristics, if the item rarely appears on the platform, this adds to its uniqueness and rarity. Each piece has distinctive characteristics and interesting features that attract buyers.

The challenges of NFTs around sustainability require collaborative work from the entire NFT market and community, including NFT stakeholders, creators, platforms, investors, cryptocurrency exchanges, and consumers to improve the NFT ecosystem and have a positive impact on the environment. This study suggests that future researchers develop academic theoretical frameworks and validate their models through empirical research.

This study has several limitations. First, this study investigated the opinion of a small group of people, and the results may not reflect the opinion of the whole population. Second, due to the time limitations on data collection, this study only collected and analyzed Opensea historical transaction data. Thus, the results may not reflect the fashion trends of other NFT platforms or of the entire NFT market. The results of this study are only representative of the current situation, and cannot be used to infer future trends.

The conduct of this study adhered to research ethics and principles, including respect for the autonomy, dignity, and privacy of the participants. Data anonymity was maintained throughout the empirical study. In conducting this research, we upheld ethical, transparent, and responsible attitudes and adhered to the standards of research ethics.

Author Contributions: Conceptualization, C.-H.W. and C.-Y.L.; Data Curation, C.-H.W. and C.-Y.L.; Investigation, C.-H.W. and C.-Y.L.; Methodology, C.-H.W. and T.-S.W.; Resources, C.-H.W. and T.-S.W.; Writing-original draft, C.-H.W. and C.-Y.L.; Writing—review & editing, C.-H.W. and T.-S.W.; Visualization, C.-Y.L. and T.-S.W.; Formal analysis, T.-S.W. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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