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NFT Evaluation Guidelines

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Report “NFT Evaluation Guidelines”

A collaboration between Wirtschaftskammer Österreich (WKO) and ABC Research GmbH within Project “Approaches and Potential of Analytical Approaches for the Evaluation of NFT Quality”

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Note on the use of inclusive language

For the sake of readability, this document does not use gender-specific formulations. Where personal designations are only given in the male form, they refer to both men and women equally.

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1 Introduction

Blockchain technology enables several types of tokens. One of these types is so-called NFTs. A **non-fungible token (NFT)**, is “a unique digital identifier that cannot be copied, substituted, or subdivided, that is recorded in a blockchain, and that is used to certify authenticity and ownership.”¹

Public attention was drawn to NFTs as NFT-based digital art collections became a global phenomenon and skyrocketed to multi-million dollars in value in 2021². As one would expect, such standout launches led to an entire plethora of other NFT collections.

Although NFTs are mostly associated with digital art, this asset class is more diverse and includes NFTs that can be used in decentralized finance applications, NFTs that represent ownership over physical assets, such as real estate, or over intellectual property such as patents, among others. The NFT sphere is still in its infancy, so the range of use cases can be expected to grow over time.

From a technical perspective, NFTs are available on multiple blockchains, including Ethereum, Solana, WAX, etc., and can be stored in a wallet, transferred, or sold. Functionality-wise NFTs differ a lot as some NFTs can have programmable features allowing them to change over time, while others can be combined with each other to mint (create) a new NFT etc.

Overall, NFT analysis is thus a complex process that is affected by the use case of a specific NFT, the blockchain it is based on, the objectives of the analysis, etc.

This guidelines document (hereinafter **The Guidelines**) was conceived as a practically oriented tool for a more nuanced analysis of NFT quality. The analysis incorporates Economic, Technical, Legal, and ESG topical focuses and is conducted at three levels of analysis, which include Standalone NFT, NFT project, and Infrastructure. Given the diversity of NFTs, the list of criteria used for the analysis must be seen as a starting point for a more in-depth analysis. The Guidelines can only be a part of the NFT evaluation process and cannot be used to replace judgment and assessment provided by industry professionals.

It is important to note that the Guidelines is just a first iteration of a NFT quality evaluation framework. This entails that it comes with **limitations** and requires an understanding of the fundamental principles of blockchain technology and cryptocurrencies. As NFT investments are very **high risk by nature**, these limitations need to be well understood when using the Guidelines (see section 2 Risks and Limitations)

As these guidelines are a work-in-progress project, your feedback is more than welcome.

¹ <https://www.merriam-webster.com/dictionary/NFT>

² <https://cointelegraph.com/news/biggest-nft-drops-and-sales-in-2021>

2 Risks and Limitations

Disclaimer

The Guidelines can be used for educational and informational purposes only. The information contained in the guidelines is not intended as, and should not be understood as, financial advice. The information contained in this report is not a substitute for financial advice from a professional.

We have done our best to ensure that the information provided in the Guidelines is accurate and valuable. Regardless of anything to the contrary, nothing available in the Guidelines should be understood as a recommendation that you should not consult with a financial professional to address your situation.

We expressly recommend that you seek advice from a professional.

Project Stage Limitations

The Guidelines use a multitude of metrics to estimate the NFT quality, most of which can only be applied to tokens that have been released and are trading. As a result, the Guidelines are of limited use for NFT collections that are still under development since the amount of information available for them is very limited.

Use Case Limitations

The Guidelines are limited to retail-focused NFTs and cannot be applied to NFTs on private blockchains, B2B-oriented NFTs (e.g., NFTs used in supply chain management), and NFT-based digital identities holding personal information.

Certain NFTs derive their value from projects they offer utility for. Although the Guidelines aspire to conduct the deepest analysis possible, the assessment of certain project-specific characteristics, business models, market potential, etc. is out of the scope of the Guidelines. As such, the evaluation of such NFTs based on the Guidelines should be complemented by a thorough analysis of the project itself and the linkage between NFTs and the project.

Legal Limitations

The Guidelines cover basic legal aspects of NFT analysis, however, consultation with a lawyer is advised before any NFT investment. Due to the novelty and complexity of the NFT sphere, its regulation is scarce and varies greatly among geographic locations, making it virtually impossible to compile an exhaustive NFT evaluation framework from a legal perspective.

Legal consultation is of prime importance for investors looking to use their NFTs for commercial purposes, as they need to consider the copyright law, transfer of the copyright law, local copyright rules, etc.

The Guidelines Limitations

The Guidelines rely on analysis criteria that also have limitations depending on the blockchain platform, type of NFT, information availability, etc. These limitations are outlined section 4 of the report for each criterion used.

3 NFT Evaluation Guidelines Overview

The goal of the Guidelines is to establish the quality of an NFT independent of its use case or a specific user group. The evaluation of the NFT is based on various criteria each independently evaluated.

3.1 Structure of Evaluation Criteria

The analysis of the quality of an NFT requires the analysis of a diverse set of criteria that are related to different aspects of a focal NFT. To facilitate the NFT evaluation procedure, the criteria were sorted along two dimensions: topical focus and level of analysis (see Table 1)

Table 1: Structuring evaluation criteria along two dimensions

Topical Focus →	Economic	Technical	Legal	ESG
Level of Analysis ↓				
Standalone NFT	Criteria 1	...	...	...
NFT Project	...	...	...	...
Infrastructure	...	...	...	Criteria n

The **topical focus** distinguishes between **four distinct focus areas** for the analysis of an NFT.

- 1) **Economic:** This focus area investigates economic factors that influence the quality of an NFT or an NFT collection.
- 2) **Technical:** This focus area looks into technical factors determining the quality of an NFT, primarily covering the properties of an NFT’s smart contract, the characteristics of the blockchain it is based on, and its security.
- 3) **Legal:** One area that is important for the quality of a given NFT, is legal considerations. These factors involve ownership rights, compliance with global and local laws, and copyright mechanisms.
- 4) **Environmental, Social, and Governance (ESG):** This area investigates ESG factors which include the environmental footprint of an NFT’s blockchain, interaction among the community members, the appropriateness of NFT’s artworks, etc.

Questions with regards to the above focus areas can require different **levels of analysis**. For example, while a specific legal aspect can only be established with regards to the NFT itself, questions about the environmental footprint require taking the underlying blockchain infrastructure into account. Therefore, the evaluation criteria were assigned to three distinct levels of analysis: standalone NFTs, NFT projects as a whole, and infrastructure.

- 1) **Standalone NFT:** This level of analysis includes factors that are related to a singular NFT, such as its transaction history, rarity, and the artwork of that specific NFT.
- 2) **NFT project:** This level relates to an NFT project as a whole, such as its development plans, community, smart contract used for a collection, and team composition of the development team.
- 3) **Infrastructure:** The infrastructure level focuses on third-party components facilitating the use of an NFT. Infrastructure covers characteristics of the underlying blockchain technology, storage solutions, primary and secondary markets for NFT trading, legal framework around NFTs, etc.

The outlined division across dimensions is not necessarily unique and serves primarily to simplify the process of analysis. Future iterations can include for example a use case-specific dimension, which analyzes criteria that are specific to a certain type of NFTs, such as real-world-linked assets.

3.2 Criteria Scoring System

In order to reach conclusions about the extent to which each criterion in the evaluation framework contributes to the quality of a focal NFT, each criterion needs to be scored independently. Within the framework, scores give an indication of the status of the focal NFT in relation to established standards and market conventions.

The suggested scoring system acts as a guideline for the evaluation and comparison.

A – Top

B – Above average

C – Average

D – Below average

E – Low

With regards to the proposed scoring systems, several points need to be kept in mind. The current version of the system allows for the comparison of different NFT collections across one criterion. However, scores are not linear and should not be summed up to compute a total score for a collection.³ Furthermore, decisions about the quality of an NFT cannot be based solely on a high score in one criterion, as all factors should be considered.

³ Future iterations of the tool can include a calibration of scores for dimensions, allowing for quantification and, in turn, for the calculation of a total score for a given NFT.

3.3 Factors Breakdown

There exists a multitude of criteria that need to be considered when analyzing NFTs. The Guidelines focus on a select few important evaluation factors to analyze in detail. For ease of analysis, each criterion can be sorted along the dimensions of topical focus and level of analysis.

The Guidelines focused on the following factors, which can be graded using the table below:

Table 2: Overview of selected quality criteria

Focus Topic	Level of Analysis	Criterion	Notes	Score (A-E)
Economic	Infrastructure	How economically efficient is the underlying blockchain?	Economic efficiency reflects the costs and speed of on-chain NFT transactions.	
	Infrastructure	How liquid is the market for the collection?	Liquidity measures how easily a position can be sold and is a key factor for risk management.	
	Infrastructure	What is the traction of the collection?	The traction of the collection reveals whether it is increasing or decreasing in popularity, and, subsequently, in price.	
	Infrastructure	How active are NFT collection holders in the Web3 space?	Interest from sophisticated NFT investors signals the high potential of the collection and attracts new members to the community.	
	Project	Is there a roadmap for the project?	The roadmap shows the development plan of the project and is thus of prime importance for its future.	
Technical	Infrastructure	How reliable is the underlying blockchain?	Reliability measures how stable the blockchain runs, how well it is protected against various types of attacks, and how established it is on the market.	
	Project	Is the source code of the NFT available and audited?	Source code availability is necessary to verify the authenticity of the collection and to check the code for potential bugs.	
	Project	Is the NFT source code immutable?	Immutable code cannot be changed after being deployed on a blockchain, which increases security at the cost of flexibility.	
	Project	Does the project's code incorporate common libraries?	Common libraries offer greater efficiency, security, and interoperability. Moreover, they make auditing the code much easier.	
	Infrastructure	Where is the NFT metadata stored?	Metadata (e.g., audio, video, text, etc.) is an essential part of virtually every NFT, and its safety is of prime importance for a user.	
Legal	Project	Are there copyright terms and conditions associated with the NFT?	Copyright T&C restricts the holder of an NFT when it comes to various use case scenarios. Copyright violations might result in a lawsuit.	
	Infrastructure	How is ownership of the underlying asset/artwork transferred?	Copyright does not automatically get transferred with the underlying NFT, meaning that explicit copyright transfer terms are required.	
ESG	Project	What are the community relations within the project?	Community relations show the efforts of the team to build a strong community that promotes inclusivity, equality, and mutual respect, and supports the project.	

4 Criteria for NFT Evaluation

4.1 Economic Factors

The analysis of economic factors focused on market-based factors, as these are important for capturing the monetary benefits provided by holding an NFT. In addition, some basic information about the underlying NFT project is evaluated.

Economic Factor 1: How economically efficient is the underlying blockchain?

Every blockchain is a sequence of blocks, and each new one is added to the previous one sequentially after a specified period of time. This period is called block time, and it varies across blockchains, typically ranging from fractions of a second to several minutes. In order to add a transaction to a blockchain a user has to pay a fee that depends on a multitude of factors, including the underlying technology, network congestion, complexity of an operation, etc.

Indicators: For our analysis, blockchain economic efficiency indicators include:

- Level and stability of transaction fees: Some blockchains have not only lower fees but also higher throughput, helping fees to stay low even at times of considerable network congestion. Other blockchains are more dependent on the level of network activity when it comes to fees.
- Block time: Blockchains with shorter block times are faster, provided that the network functions normally.

Stably low fees and fast execution times earn blockchains a high score, according to Table 3:

Table 3: Economic efficiency evaluation

		Block time, seconds			
		<1	1-10	10-60	> 60
Transaction fee (simple transfer)	<\$1 consistently	A	A	B	C
	<\$1 with rare spikes of \$1-\$10	A	B	C	D
	Consistently <\$10	B	C	D	E
	>\$10 at times or consistently	C	D	E	E

Data collection: Data on blockchain fees and block times is usually available through a blockchain explorer or special monitoring dashboards, which are available on Dune Analytics⁴ and other comparable resources.

⁴ <https://dune.com/browse/dashboards>

Economic Factor 2: How liquid is the market for the collection?

Liquidity indicates how quickly and easily an NFT can be sold without significantly affecting the price. The most liquid NFTs are listed on top exchanges and have numerous trades per day, whereas illiquid collections have virtually no trading volume or all the trades that happen at the bid price, which is much lower than the listing (ask) price.

Indicators: For our analysis, liquidity indicators include:

- Number of sales over the last 30 days relative to the total collection supply: This indicator shows how quickly an investor can sell a position and takes two rationales into account. Bigger and more established collections are expected to have higher trading activity. Furthermore, analyzing data over a longer period helps to eliminate the effects of one-off events, such as batch sales at offer prices.
- Bid-ask spread: The spread between the listing (ask) price and the highest offer (bid) shows the discount investors are faced with when wanting to immediately liquidate their positions. While the number of sales in relation to the total supply shows whether it is possible to quickly sell an NFT, the bid-ask spread denotes the discount that can be expected for such a fast sale.

For the evaluation framework, these two indicators are analyzed in combination. Highly liquid NFTs with narrow bid-ask spreads receive the highest mark. (see Table 4)

Table 4: Liquidity rating

		Bid-ask spread			
		<10%	10% - 20%	20% - 50%	> 50%
Number of sales over 30 days (% of supply)	<2%	A	A	B	C
	2% - 5%	A	B	C	D
	5% - 15%	B	C	D	E
	> 15%	C	D	E	E

Data collection: Liquidity data is readily available on NFT marketplaces, such as Blur⁵ or OpenSea⁶.

⁵ <https://blur.io/>
⁶ <https://opensea.io/>

Economic Factor 3: What is the traction of the collection?

As the fundamental value for most NFT collections is hard to estimate, their prices are often driven primarily by supply and demand fluctuations. From this perspective, collections that have high interest from the public are likely to attract more new buyers, who in turn will drive prices up.

This public interest can be considered a forward-looking indicator. However, sentiment on a collection can change rapidly, so it is a factor that must be constantly monitored.

Indicators: Metrics that can be used to estimate public interest in an NFT collection are:

- Share of NFTs sold below the floor price over the last 30 days: If an NFT was sold “below the floor”, it means that the seller accepted the buyer’s bid. While occasional sales at bid prices are not a warning sign, a situation where almost all transactions occur at bid prices indicates that interest in the collection is waning.
- Sales-to-listing ratio over the last 30 days: If the supply side (measured by listings) outnumbers the demand side (sales) for extended periods of time, the price of an asset will go down as new sellers will have to either list their NFTs below the floor or accept bids at unfavorable prices.

As with the first economic factor, these two indicators are analyzed in combination to establish the traction of an NFT or an NFT collection (see Table 5).

Table 5: Collection traction rating

		Sales-to-listings ratio (over 30 days)			
		>1.5	1 – 1.5	0.7 - 1	<0.7
Share of NFTs sold below the floor (at bids)	<30%	A	A	B	C
	30% - 50%	A	B	C	D
	50% - 70%	B	C	D	E
	> 70%	C	D	E	E

Data collection: Data on NFT sale listing and sales prices is readily available on marketplaces or directly through a blockchain explorer (e.g., Etherscan).

Economic Factor 4: How active are NFT collection holders in the Web3 space?

The analysis of holders of an NFT can lead to additional insights with regards to the market traction of an NFT or an NFT collection.

Indicators: Several observable patterns can be an indicator of the quality of an NFT or the lack thereof, including:

- When several wallets transact with each other back and forth, this can be a sign of wash trading. Wash trading is normally used to inflate prices and trading volumes of an asset.
- When several independent wallets hold multiple NFTs each and continue to accumulate, it is a positive sign for the collection as these holders reduce the supply on the market. This is especially true if some of those wallets also hold well-established, blue chip NFT collections, since the activity of such wallets is often tracked by other NFT investors, searching for emerging NFTs.
- If most of the wallets that hold NFTs from the collection are new or had little on-chain activity, this can be a sign of inexperienced owners that are new to the space and thus more prone to exit their investments following a price dip. While several new wallets among holders can belong to experienced traders willing to preserve privacy by using fresh addresses for purchases, multiple wallets with a long track record are desirable among holders.

Table 6 helps score observable patterns of holders in order to establish the quality of an NFT.

Table 6: NFT collection ownership structure

Holders	Description	Quality Score
Active NFT investors	Holder wallets also have blue chip NFT collections, transfers are numerous	A
Active independent wallets	Holders are active in the crypto space; wallets are not linked	B
Independent, not-so-active wallets	NFTs are spread across many wallets that are new or not very active	C
Few transactions, concentrated ownership	Few owners control most of the supply and transact mostly with each other	D
No transfer history, concentrated ownership	Very few transfers, one wallet controls most of the NFTs	E

Data collection: Profiles of NFT collection holders can be analyzed using a blockchain explorer (e.g., Etherscan).

Economic Factor 5: Is there a roadmap for the project?

An NFT project roadmap outlines the goals and objectives of a project and helps to track its progress over time. Events listed on the roadmap may include collaborations with other collections, releases of NFT derivatives and proprietary tokens, marketing activities, etc. As roadmaps are regularly communicated by projects, the lack thereof can be an indicator for projects that are not very well managed. However, it is important to point out that there are exceptions. For example, very mature projects that are feature-complete might not publish roadmaps any longer. Also, in certain cases, such as with tokenized real estate, the absence of a roadmap is justified and does not have a negative effect on the value of an NFT.

Table 7 outlines possible values and scores for this “roadmap” indicator.

Table 7: Project roadmap evaluation

Roadmap	Description	Quality Score
Complete	The roadmap is complete, and all deadlines have been met so far	A
Timeline is not followed	Some of the milestones on the roadmap were reached with a delay	B
Has no timeline	Contains milestones for the project without any ETAs	C
Has no milestones	Only describes a broad vision for the project	D
No roadmap	No future development of the collection is planned	E

Data collection: Roadmaps are typically found on social media accounts (X/Twitter, Medium), and/or websites of a project.

4.2 Technical Factors

The Guidelines focus on the most important technical factors. These include characteristics of the smart contract and the broader code base of a project as well as questions about data storage for the underlying digital asset.

Technical Factor 1: How reliable is the underlying blockchain?

The reliability of a blockchain is defined by its ability to withstand various types of attacks, including a 51% attack, which is aimed at attaining over one-half of computing power, and a sybil attack, in which many fake identities spam the blockchain, forcing it to go down. Reliable blockchains also have an established consensus mechanism, so they do not halt block production in case of software errors of certain nodes executing dishonest behavior.

Indicators: Blockchain reliability can be assessed using the following metrics:

- **Market capitalization:** Blockchains with high capitalization typically have a larger community of developers who promptly resolve technical issues. They also have a longer track record usually, meaning that they were tested under different market conditions and workloads and are more stable. Higher market capitalization also tends to correspond to a higher number of nodes/validators, thus making it harder for a potential wrongdoer to take control of the network.
- **Downtime:** Although blockchains are designed to function continuously, some nodes acting maliciously or not responding might in certain cases result in a halt in block production, meaning that the blockchain stops functioning. Downtime tends to be a prominent issue for emerging blockchains in particular.

Table 8 shows how blockchains can be compared based on their reliability.

Table 8: Blockchain reliability evaluation

		Downtime, minutes over the preceding year			
		0	<60 (planned maintenance)	>60 (planned maintenance) or <60 (outage)	>60 (outage)
Market capitalization, billion USD	>50	A	A	B	C
	10 - 50	A	B	C	D
	1 - 10	B	C	D	E
	<1	C	D	E	E

Data collection: Market capitalization is tracked by aggregator websites such as CoinMarketCap⁷ and Coingecko⁸, while downtime is tracked by blockchain-specific dashboards.

⁷ <https://coinmarketcap.com/>

⁸ <https://www.coingecko.com/>

Technical Factor 2: Is the source code of the NFT available and audited?

The code of a smart contract creating the NFT is always publicly available on the blockchain but only in the machine code format that is used by nodes of this blockchain. Since machine code is not human-readable, developers use higher-level programming languages, such as Solidity, to write their source code before compiling it into the machine code format.

Indicators: Users should only interact with smart contracts for which the source code is available on a blockchain explorer and for which the correspondence between the machine code and the source code is verified. With regards to the publicly available source code, ideally, the code of the smart contract should be audited by an auditor. However, this procedure is not market standard yet. At the same time, a shift towards professionalism and an increase in code audits in NFT projects can be expected.

With regards to the matching of source code to machine code, this is important, because otherwise a malicious developer could deploy a faulty machine code but show the correct source code and claim that these two correspond to each other.

Table 9 suggests scores based on the availability and trustworthiness of the smart contract code.

Table 9: Source code reliability

Source code	Description	Quality Score
Verified and audited	Verified and audited by an established audit firm	A
Published on a blockchain explorer and verified	The source code is verified, but no audit/an audit from an unknown firm was conducted	C
Not available/not verified	The source code is unavailable or its correspondence with the machine code cannot be readily verified	E

Data collection: Availability and verification of the source code can be done via a blockchain explorer. Audit results are normally available on the website of a project and the auditing firm, respectively.

Technical Factor 3: Is the NFT source code immutable?

With regard to the source code of the NFT, immutability is another important characteristic to look out for when evaluating the quality of an NFT. The source code is immutable if it cannot be altered once deployed. Mutable smart contracts, on the other hand, can be changed by the project’s team. This allows the contract’s owner, for example, to pause some functions of the contract, mint new tokens, and replace logic in the contract, respectively.

Although mutability might be necessary to introduce certain features of an NFT and to conduct technical updates, it comes at a risk of centralization, when the issuer of the collection has the power to change the properties of the collection unilaterally. Additionally, it also allows for the deployment of malicious or erroneous code.

Table 10 scores the immutability quality criterion.

Table 10: Source code immutability

Contract Mutability	Description	Quality Score
Immutable	Set during minting (can potentially be inefficient for NFTs with high circulation)	A
Mutable by the community	Several addresses are qualified to suggest changes to a Smart Contract, but the changes are only passed if the predetermined number of addresses votes for them	C
Mutable by a single entity	Changeable at any time by the single owner of the smart contract	E

Data collection: The immutability of the contract can be checked using a blockchain explorer.

Technical Factor 4: Does the project's code incorporate common libraries?

Even though NFT code can theoretically be created and deployed from scratch, in practice, developers rely on established standards and code libraries. For the most part, standards and common libraries undergo rigorous testing and scrutiny and are maintained by a large developer community. Additionally, the use of standards also ensures compatibility with common wallets and platforms such as OpenSea. Overall, their use increases the quality of an NFT.

On EVM-compatible blockchains, such as Ethereum, Polygon, or Binance Smart Chain most NFT collections are normally created using standards such as ERC-721, ERC-1155, or the experimental ERC-404, and common libraries such as the ones developed by OpenZeppelin.

Table 11 helps analyze an NFT with regards to the use of standards and common libraries.

Table 11: Standard compatibility and use of open libraries

Base URI	Description	Quality Score
Standard compatible, open libraries used	Smart contract fully compatible with an established token standard and is based on established open libraries	A
Standard compatible, limited use of libraries	Standard compatible, but either outdated and less secure libraries are used, or certain non-standard functions are implemented but not audited	C
Standard incompatible	The standard of the NFT is not defined	E

Data collection: The use of libraries and contract standards can be traced via a blockchain explorer. Non-EVM blockchains have their proprietary standards and libraries, which are also visible using the appropriate blockchain explorer.

Technical Factor 5: Where is the NFT metadata stored?

Since storing information directly on the blockchain is very expensive, in almost all cases only links to NFT metadata (e.g., images, audio, video, text, etc.) are stored there. The link can lead to a decentralized storage solution (e.g., IPFS), a centralized cloud storage, or a regular server. The latter two are more vulnerable to manipulation as a party that has access to the server can replace or remove the NFT metadata.

The type and importance of the metadata of an NFT depends on the type of NFT. For example, the underlying artwork is very important for collector items, while for other types of NFTs (e.g., those linked to real-world assets) contractual terms might form part of the metadata.

Table 12 shows different options for storing artwork in relation to an NFT and the quality score associated with it.

Table 12: NFT artwork storage options

Location	Description	Quality Score
Blockchain (NFT metadata)	Storing on blockchain is desirable but only possible for simple images that can be drawn algorithmically	A
IPFS	Address immutable, file 'undeletable' (unless unpinned when considered abandoned)	A
On an NFT portal (e.g., OpenSea)	URL fixed, but not under control	C
In a Cloud storage	Dependent on Cloud, immutable URL	D
HTTP(S) on a webserver	The file can be modified at any time	E

Data collection: Artwork storage is a part of the NFT metadata, which can be checked for each NFT using a blockchain explorer (usually using the token URI function).

4.3 Legal Factors

A legal analysis of NFTs can encompass a variety of areas such as intellectual property rights, privacy protection, taxation, and artwork authenticity, to name a few. The Guidelines focus on two factors that are especially important in relation to NFTs. These are – on the project level – copyright terms and – on the infrastructure level – the details of ownership transfer.

Legal Factor 1: Are there copyright terms and conditions associated with the NFT?

Even though precedents of legal debate over the commercial use of NFTs are scarce, they are likely to occur in the future. As such, NFT investors should be aware of what rights they theoretically get upon buying an NFT, as this determines their level of “ownership” and, in turn, the degree of freedom they have when using an NFT.

Table 13 gives a first overview of various common and observable designs with regards to the rights attached to NFTs.

Table 13: NFT copyright options

Right	Description	Quality Score
Commercial right	Owners can use the content of the NFT to make a profit	A
Personal use	Only personal use of the NFT content is allowed	C
No T&C	No T&C or legally erroneous T&C	E

Data collection: Terms and Conditions can usually be found on the project’s website or on its mint page.

Legal Factor 2: How is ownership of the underlying asset/artwork transferred?

While some NFTs are artworks themselves, others serve to represent ownership of an underlying asset, such as real estate, property rights, etc. From a legal standpoint, NFT transfer does not always automatically result in the transfer of ownership of the underlying asset.

While it should be clear that if the NFT represents a piece of real estate, then the transfer of ownership has to be recorded in the land registry. However, also with purely digital NFTs such as collector items where the NFT is the object to be transferred, from a legal perspective it has to be specified how the copyright ownership is transferred when the NFT changes hands.

Table 14 gives an overview of potential designs and how they can be evaluated.

Table 14: NFT ownership transfer options

Ownership right	Description	Quality Score
Transferred with NFT	Ownership is linked to and transferred with the NFT token according to an explicit statement by the issuer	A
Additional agreement needed	Ownership is transferred with a separate agreement/through an intermediary	C
No transfer	Ownership transfer not specified	E

Data collection: Ownership transfer conditions are usually specified in the Terms and Conditions agreement, which can usually be found on the project's website or on its mint page.

4.4 ESG Factors

Environmental, social, and governance factors include the environmental impact of the blockchain an NFT is issued on, the governance practices of the project, and the structure of the project’s team.

ESG Factor 1: What are the community relations within the project?

The success of NFT collections, especially the ones that represent digital art, to a great extent depends on how involved the community is in the project. Vivid and adequately managed social communities help create media attention, which in turn attracts more people to the community, thus driving a positive feedback loop.

Community relations include, among others, the attitude of the team toward its community, prevention of discrimination, bullying, harassment, and other violations on its social media channels, and transparency of the team regarding the project developments and updates.

Failure to adequately communicate the status of the project and ignorance of concerns raised by the community members can undermine the trust of the community, making it an easier target for FUD (fear-uncertainty-doubt) dissemination by malicious actors.

Table 15 gives an indication of how to evaluate community relationships within the project.

Table 15: Community relations within the project

Community Relations	Description	Quality Score
Ethical, well-managed, concerns addressed in a timely manner, updates are communicated regularly	The project’s team supervises all the communication channels, promptly bans violators, responds to concerns, and regularly hosts AMA (Ask Me Anything) sessions	A
Ethical, well-managed, concerns addressed in a timely manner	Project’s team supervises the social media channels and responds to questions, but lacks proactivity when it comes to updates and live communication with the community	C
Long response times, poor moderation	Rules violators take a long time to be blocked, questions take days to respond with some left unanswered	D
Non-existent	Social media channels are not moderated	E

Data collection: The most important social network for project updates for the majority of NFT collections is X (formerly known as Twitter). The most common tools used to stay in touch with the existing community are Discord and Telegram.

5 Evaluation Example – Mocaverse

To illustrate the use of the Guidelines, gives an example for the application of the Guidelines. For demonstrative purposes the framework is used to analyze an NFT from the Mocaverse collection.⁹

5.1 Background Information

Company background

Mocaverse is “the membership NFT collection for Animoca Brands’ extraordinary family of companies, projects, investments, shareholders, and partners.”¹⁰ NFTs from the Mocaverse collection are referred to as the Mocas, and they allow their holder to “Learn, Play, Do Good, and Build together”, with additional utility added over time by Animoca Brands’ communities. Animoca Brands is a Hong Kong-based company that specializes in blockchain gaming and NFT¹¹. The company invested in over 400 Web3 startups since its inception in 2014 and released a number of games, including The Sandbox and Phantom Galaxies¹².

Collection data:

General information on the Mocaverse collection is aggregated in Table 16: Mocaverse NFT collection general information

Table 16: Mocaverse NFT collection general information

Blockchain platform	Ethereum
Total supply	8,888
Release date	March 6, 2023
Standard	ERC-721
Smart contract address	0x59325733eb952a92e069C87F0A6168b29E80627f
Project website	https://mocaverse.xyz/
Project X (Twitter)	https://twitter.com/MocaverseNFT

⁹ Authors and Contributors to the Guidelines are not in any way affiliated with the Mocaverse project, do not advertise or endorse it, and use the project solely to showcase the potential of the Guidelines. The results of the analysis are relevant for a limited time only given the dynamic nature of the NFT industry.

¹⁰ <https://www.mocaverse.xyz/>

¹¹ <https://www.forbes.com/sites/zinniale/2022/07/12/animoca-brands-hits-59-billion-valuation-as-crypto-winter-deepens/>

¹² <https://www.animocabrands.com/mission-and-vision>

5.2 Criteria Based Evaluation

In following subsections, the Mocaverse collection will be analyzed using the criteria outlined in [Section 3](#). Looking into the various aspects of the Guidelines, the analysis leads to a better understanding of the quality of the Mocaverse NFT.

5.2.1 Economic Factors

Economic Factor 1: How economically efficient is the underlying blockchain?

Mocaverse is based on the Ethereum blockchain.

Indicators:

- Level and stability of transaction fees:
Ethereum is known for its exorbitant transaction fees, which get even higher when the network is put under a heavy load. ETH price increase makes transactions even more expensive, and NFT sale fees can at times exceed 500 USD¹³.
- Block time:
On Ethereum, block time fluctuates at around 12 seconds¹⁴.

Based on indicators used for the economic efficiency evaluation of Ethereum, Mocaverse gets an “E” (Table 17: Economic efficiency evaluation (Mocaverse)):

Table 17: Economic efficiency evaluation (Mocaverse)

		Block time, seconds			
		<1	1-10	10-60	> 60
Transaction fee (simple transfer)	<\$1 consistently	A	A	B	C
	<\$1 with rare spikes of \$1-\$10	A	B	C	D
	Consistently <\$10	B	C	D	E
	>\$10 at times or consistently	C	D	E	E

Economic Factor 2: How liquid is the market for the collection?

Indicators:

- Number of sales over the last 30 days relative to the total collection supply:
According to Blur.io, which aggregates trades across the major marketplaces, during the period from 23.01.2024 to 21.02.2024 240 sales took place¹⁵. As such, the proportion of sales to the total supply is approximately **2.7%**.

¹³ <https://www.lcx.com/understanding-nft-gas-fees/>

¹⁴ Ibid.

¹⁵ <https://blur.io/collection/mocaverse>

- Bid-ask spread:

The floor price of the collection is at 4.18 ETH, while the highest bid is equal to 3.88, which is the equivalent of a **7.7%** spread. The data is from Blur.io¹⁶.

According to Table 18: Liquidity rating (Mocaverse), the Mocaverse collection gets an “A” for liquidity.

Table 18: Liquidity rating (Mocaverse)

		Bid-ask spread			
		<10%	10% - 20%	20% - 50%	> 50%
Number of sales over 30 days (% of supply)	<2%	A	A	B	C
	2% - 5%	A	B	C	D
	5% - 15%	B	C	D	E
	> 15%	C	D	E	E

Economic Factor 3: What is the traction of the collection?

Indicators:

- Share of NFTs sold below the floor price:
As per Blur.io¹⁷, over the last 30 days (23.01.2024 - 21.02.2024), 103 sales took place below the floor price, so the proportion of sales at bid prices is close to **43%**.
- Sales-to-listing ratio over the last 30 days:
Over 500 listing took place in between 23.01.2024 - 21.02.2024, so the sales-to-listing ratio is below 0.5

According to Table 19: Collection traction rating (Mocaverse), the Mocaverse collection gets a “D” for traction according to the combination of factors considered.

Table 19: Collection traction rating (Mocaverse)

		Sales-to-listings ratio (over 30 days)			
		>1.5	1 – 1.5	0.7 - 1	<0.7
Share of NFTs sold below the floor (at bids)	<30%	A	A	B	C
	30% - 50%	A	B	C	D
	50% - 70%	B	C	D	E
	> 70%	C	D	E	E

¹⁶ Ibid.

¹⁷ Ibid.

Economic Factor 4: How active are NFT collection holders in the Web3 space?

Etherscan¹⁸ and Dune Analytics¹⁹ dashboard served as the primary information sources for this factor.

Indicators:

- Among holders of the collection, there are several notable NFT investors, including investor A²⁰, who holds several Bored Apes Yacht Club, Azuki, and Moonbirds NFTs, investor B²¹, holding Pudgy Penguins, Memeland, and Wrapped Cryptopunks.
- The collection has over 2000 holders, and most of the holders own only 1 NFT, so the ownership is rather distributed. At the same time, there are several “core” investors, who hold more than 10 NFTs from the collection. Additionally, these were collected over time via market transactions and not back-and-forth transfers.

Based on the holder profile, the Mocaverse collection can be granted an “A”, which is reflected in Table 20: NFT collection ownership structure (Mocaverse).

Table 20: NFT collection ownership structure (Mocaverse)

Holders	Description	Quality Score
Active NFT investors	Holder wallets also have blue chip NFT collections, transfers are numerous	A
Active independent wallets	Holders are active in the crypto space; wallets are not linked	B
Independent, not-so-active wallets	NFTs are spread across many wallets that are new or not very active	C
Few transactions, concentrated ownership	Few owners control most of the supply and transact mostly with each other	D
No transfer history, concentrated ownership	Very few transfers, one wallet controls most of the NFTs	E

Economic Factor 5: Is there a roadmap for the project?

Just like many other NFT projects, Mocaverse does not reveal all the plans at once and primarily relies on teasers, such as the one posted on their official X (ex. Twitter) account in early 2023²², which included a reference to a crypto token that was officially announced almost a year later²³.

¹⁸ <https://etherscan.io/token/0x59325733eb952a92e069c87f0a6168b29e80627f>

¹⁹ <https://dune.com/tomwanhh/mocaverse>

²⁰ <https://etherscan.io/address/0x9Ff5b690CE21EDcae135648f7ADB26c20f730761>

²¹ <https://etherscan.io/address/0xe5442ae87e0fef3f7cc43e507adf786c311a0529>

²² <https://twitter.com/MocaverseNFT/status/1636019863281074178/photo/1>

²³ <https://twitter.com/MOCAFoundation/status/1750520430639894623>

Since its release in March 2023, the Mocaverse team collaborated with other projects from the Animoca Brands umbrella, launched Moca ID²⁴, and engaged in numerous online and offline events.

Overall, the project stuck to announced events and releases, even though the notice period for updates was rather short. As such, the project earns a “B” for its roadmap, which is reflected in Table 21: Project roadmap evaluation (Mocaverse).

Table 21: Project roadmap evaluation (Mocaverse)

Roadmap	Description	Quality Score
Complete	The roadmap is complete, and all deadlines have been met so far	A
Timeline is not followed	Some of the milestones on the roadmap were reached with a delay	B
Has no timeline	Contains milestones for the project without any ETAs	C
Has no milestones	Only describes a broad vision for the project	D
No roadmap	No future development of the collection is planned	E

5.2.2 Technical Factors

Technical Factor 1: How reliable is the underlying blockchain?

Indicators:

- Market capitalization:
As of 05/03/2024, Ethereum has a market capitalization of over 400 billion USD.
- Downtime:
Ethereum never went down completely as its consensus mechanism prioritizes liveness. However, it is worth pointing out that Ethereum stopped finalizing blocks twice in May 2023, with the second period lasting for approximately an hour²⁵.

According to the indicators, Mocaverse earns an “A” when it comes to the stability of its blockchain (Table 22: Blockchain reliability evaluation (Mocaverse)).

²⁴ <https://twitter.com/MocaverseNFT/status/1702204409881735208>
²⁵ <https://thedefiant.io/ethereum-researchers-remain-mystified-after-blockchain-briefly-fails-to-finalize>

Table 22: Blockchain reliability evaluation (Mocaverse)

		Downtime, minutes over the preceding year			
		0	<60 (planned maintenance)	>60 (planned maintenance) or <60 (outage)	>60 (outage)
Market capitalization, billion USD	>50	A	A	B	C
	10 - 50	A	B	C	D
	1 - 10	B	C	D	E
	<1	C	D	E	E

Technical Factor 2: Is the source code of the NFT available and audited?

The source code is available and verified for both the proxy and the underlying smart contracts on Etherscan²⁶. The code of the contract is not audited, and an audit is only available for the project’s Discord channel²⁷.

According to Table 23: Source code reliability (Mocaverse), the Mocaverse project gets a “C” for its source code reliability.

Table 23: Source code reliability (Mocaverse)

Source code	Description	Quality Score
Verified and audited	Verified and audited by an established audit firm	A
Verified	Source code is verified, but no audit/audit from an unknown firm was conducted	C
Not available/not verified	The source code is unavailable or its correspondence with the machine code cannot be readily verified	E

Technical Factor 3: Is the NFT source code immutable?

Since the collection’s code is upgradable and features roles that can amend certain functions of the contract, it is mutable. There are several addresses and each one can amend the content of the contract independently from the others.

Therefore, Table 24: Source code immutability scores the immutability quality criterion for the Mocaverse NFT collection at “E”.

²⁶ <https://etherscan.io/token/0x59325733eb952a92e069c87f0a6168b29e80627f#code>

²⁷ <https://twitter.com/MocaverseNFT/status/1617030660652236800>

Table 24: Source code immutability (Mocaverse)

Contract Mutability	Description	Quality Score
Immutable	Set during minting (can potentially be inefficient for NFTs with high circulation)	A
Mutable by the community	Several addresses are qualified to suggest changes to a Smart Contract, but the changes are only passed if the predetermined number of addresses votes for them	C
Mutable by a single entity	Changeable at any time by the owner/one of the owners of the smart contract	E

Technical Factor 4: Does the project’s code incorporate common libraries?

Mocaverse project utilizes libraries developed by OpenZeppelin, Chiru Labs, the authors of Azuki and 721A contract, and Thirdweb studio, which produces open-source software used by Gala Games and Rarible, among others²⁸.

Mocaverse NFTs are compatible with the ERC-721 standard²⁹, so the collection gets an “A” for the use of standards and common libraries in Table 25: Standard compatibility and use of open libraries:

Table 25: Standard compatibility and use of open libraries (Mocaverse)

Base URI	Description	Quality Score
Standard compatible, open libraries used	Smart contract fully compatible with an established token standard and is based on established open libraries	A
Standard compatible, limited use of libraries	Standard compatible, but either outdated and less secure libraries are used, or certain non-standard functions are implemented but not audited	C
Standard incompatible	The standard of the NFT is not defined	E

Technical Factor 5: Where is the NFT metadata stored?

The artwork of each NFT from the collection is stored off-chain using a decentralized data storing protocol (IPFS)³⁰, which earns it an “A” for storing security in Table 26: NFT artwork storage options (Mocaverse).

²⁸ <https://etherscan.io/token/0x59325733eb952a92e069c87f0a6168b29e80627f#code>

²⁹ Ibid.

³⁰ <https://etherscan.io/nft/0x59325733eb952a92e069c87f0a6168b29e80627f/4308>

Table 26: NFT artwork storage options (Mocaverse)

Location	Description	Quality Score
IPFS	Address immutable, file 'undeletable' (unless unpinned when considered abandoned)	A
On an NFT portal (e.g., OpenSea)	URL fixed, but not under control	C
In a Cloud storage	Dependent on Cloud, immutable URL	D
HTTP(S) on a webserver	The file can be modified at any time	E

5.2.3 Legal Factors

The License Agreement is the source for the consideration of the legal factors in relation to the Mocaverse NFT collection³¹.

Legal Factor 1: Are there copyright terms and conditions associated with the NFT?

According to the License Agreement, *“provided that you have acquired Your Mocaverse NFT lawfully, the Creator hereby grants to you during the Term (as defined below) a non-exclusive, non-transferrable, sublicensable, universe-wide, royalty-free licence to use the Licensed NFT Artwork in any and all formats and media, by any and all technologies and means of delivery, for any and all purposes whatsoever, including the commercialization.”*

The licence comes with a range of limitations, including, but not limited to:

- *„If your commercial use of the Licence would result in you, or any third party acting on your behalf, earning more than US\$ 1 million or its equivalent in gross revenue from any source in any twelve (12) month period directly or indirectly, you must (i) notify the Creator whenever you are presented with any other opportunities to exploit the Licensed NFT Artwork in the same twelve (12) month calendar period; and (ii) obtain written consent from the Creator to pursue such opportunities.”*
- *„... while the Licence allows you to create and exploit the Derivative Works, the Licence does not grant you rights in any individual element (such as the features, attributes, properties, or traits) of Your Mocaverse NFT or the Licensed NFT Artwork or a licence to exploit any individual element separate and apart from Your Mocaverse NFT.“*
- *“The Licence does not grant you any rights to use the business name of “Mocaverse” or any other business name of the Creator and its affiliates, all of which are exclusively reserved to the Creator and its affiliates”.*

The licence is also valid only if the set creator fee of 5% was paid upon purchase.

Table 27: NFT copyright options (Mocaverse) assigns an “A” score to the Mocaverse collection on the copyright options.

³¹ https://github.com/MocaverseNFT/license/blob/main/license_1.0.0.md

Table 27: NFT copyright options (Mocaverse)

Right	Description	Quality Score
Commercial right	Owners can use the content of the NFT to make a profit	A
Personal use	Only personal use of the NFT content is allowed	C
No T&C	No T&C or legally erroneous T&C	E

Legal Factor 2: How ownership of the underlying asset/artwork is transferred?

As per the Licence Agreement, „*Except as expressly provided herein, ownership of a Mocaverse NFT and the Licence are not separable in any way*”.

In addition, “*by entering into this Agreement, the Creator hereby releases you from all liability and obligations and irrevocably waives its right to make a claim against you in respect of any infringement of Creator Brand IP Rights in respect of the Licensed NFT Artwork, subject to the following conditions:*

1. *your use of the Licensed NFT Artwork must not have breached any term of this Agreement. In other words, the Creator will treat you as if you entered into this Agreement upon you legally acquiring Your Mocaverse NFT; and*[h][i]

2. *the Creator’s release and waiver shall only apply in respect of the period commencing from the date you acquire Your Mocaverse NFT lawfully and ending immediately upon your transfer of Your Mocaverse NFT to another person*”.

As such, the Mocaverse NFT collection gets an “A” for ownership transfer conditions, which is reflected in Table 28: NFT ownership transfer options (Mocaverse).

Table 28: NFT ownership transfer options (Mocaverse)

Ownership right	Description	Quality Score
Transferred with NFT	Ownership is linked to and transferred with the NFT token according to an explicit statement by the issuer	A
Additional agreement needed	Ownership is transferred with a separate agreement/through an intermediary	C
No transfer	Ownership transfer not specified	E

5.2.4 ESG Factors

ESG Factor 1: What are the community relations within the project?

The Mocaverse collection has a dedicated website and social media accounts on all the most prominent platforms, including X (ex. Twitter), Discord, and Medium³².

The account of Mocaverse on X has over 300,000 subscribers and project updates are regularly posted there alongside stats and recaps. The team warns page visitors of potential scams and regularly hosts AMA (Ask Me Anything) sessions.

When it comes to Discord, it is up to date, contains recaps from AMA sessions, and the channels are adequately moderated to prevent spam and bullying. The support team promptly reacts to tickets submitted and has clearly specified rules on the server.

Based on the evidence mentioned above, the project gets an “A” as its community score (Table 29: NFT project community (Mocaverse)).

Table 29: NFT project community (Mocaverse)

Community Relations	Description	Quality Score
Ethical, well-managed, concerns addressed in a timely manner, updates are communicated regularly	The project’s team supervises all the communication channels, promptly bans violators, responds to concerns, and regularly hosts AMA (Ask Me Anything) sessions	A
Ethical, well-managed, concerns addressed in a timely manner	Project’s team supervises the social media channels and responds to questions, but lacks proactivity when it comes to updates and live communication with the community	C
Long response times, poor moderation	Rules violators take a long time to be blocked, questions take days to respond with some left unanswered	D
Non-existent	Social media channels are not moderated	E

³² <https://link3.to/moca>

5.3 Evaluation Results

The results of the evaluation procedure are summarized in Table 30: Overview of selected quality criteria (Mocaverse). As can be seen from the table, the analysis of various aspects covered by the Guidelines leads to a differentiated view on the Mocaverse collection and helps to gain a more nuanced understanding of the quality of Mocaverse.

Table 30: Overview of selected quality criteria (Mocaverse)

Focus Topic	Level of Analysis	Criterion	Notes	Score (A-E)
Economic	Infrastructure	How economically efficient is the underlying blockchain?	Economic efficiency reflects the costs and speed of on-chain NFT transactions.	E
	Infrastructure	How liquid is the market for the collection?	Liquidity measures how easily a position can be sold and is a key factor for risk management.	A
	Infrastructure	What is the traction of the collection?	The traction of the collection reveals whether it is increasing or decreasing in popularity, and, subsequently, in price.	D
	Infrastructure	How active are NFT collection holders in the Web3 space?	Interest from sophisticated NFT investors signals the high potential of the collection and attracts new members to the community.	A
	Project	Is there a roadmap for the project?	The roadmap shows the development plan of the project and is thus of prime importance for its future.	B
Technical	Infrastructure	How reliable is the underlying blockchain?	Reliability measures how stable the blockchain runs, how well it is protected against various types of attacks, and how established it is on the market.	A
	Project	Is the source code of the NFT available and audited?	Source code availability is necessary to verify the authenticity of the collection and to check the code for potential bugs.	C
	Project	Is the NFT source code immutable?	Immutable code cannot be changed after being deployed on a blockchain, which increases security at the cost of flexibility.	E
	Project	Does the project's code incorporate common libraries?	Common libraries offer greater efficiency, security, and interoperability. Moreover, they make auditing the code much easier.	A
	Infrastructure	Where is the NFT metadata stored?	Metadata (e.g., audio, video, text, etc.) is an essential part of virtually every NFT, and its safety is of prime importance for an user.	A
Legal	Project	Are there copyright terms and conditions associated with the NFT?	Copyright T&C restricts the holder of an NFT when it comes to various use case scenarios. Copyright violations might result in a lawsuit.	A
	Infrastructure	How is ownership of the underlying asset/artwork transferred?	Copyright does not automatically get transferred with the underlying NFT, meaning that explicit copyright transfer terms are required.	A
ESG	Project	What are the community relations within the project?	Community relations show the efforts of the team to build a strong community that promotes inclusivity, equality, and mutual respect, and supports the project.	A