

Article

Research on innovative design strategy of metaverse NFT artwork based on artificial intelligence

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Abstract: This research aims to deeply explore the origin of the metaverse and its impact on the development of corporate strategy, especially in the field of non-fungible token (NFT) artwork design. Through the analysis of the current development status of NFT artworks, an artificial intelligence-based enterprise development strategy and a metaverse NFT artwork design method are proposed. In addition, the generation logic, technical attributes, and technical and legal risks of metaverse NFT artworks under different design methods are also studied. It is expected that this research will provide strong theoretical support and practical guidance for the legal protection of metaverse NFT artwork design.

Keywords: metaverse; non-homogeneous tokens; artwork design; artificial intelligence; corporate strategy

1. Explore the origin and value of the metaverse

1.1. Interpretation of the meaning of metaverse

Metaverse (Metaverse), as an emerging concept, is essentially a virtual world that simulates reality, and can be understood as a parallel universe juxtaposed with and connected to the real world. Metaverse covers many cutting-edge technologies including virtual reality (VR), augmented reality (AR), mixed reality (MR), artificial intelligence (AI), blockchain, etc. In the metaverse, people can interact, build communities, and carry out economic activities through digital self-expression images, namely avatars [1]. Metaverse is not only the construction of a virtual world, but also a new way of life and production. It has the characteristics of openness, interaction, authenticity, high degree of freedom and economic value. In such an environment, the interaction between people and people, people and things, and things and things will be more free, convenient and real, which greatly broadens the boundaries of the real world [2]. The meaning of the metaverse does not stop there. With the continuous development and innovation of technology, the metaverse will bring more sexuality and imagination, including far-reaching impacts in education, entertainment, work, social interaction and other fields.

1.2. On the guiding role of metaverse in the strategic development of enterprises

As an emerging virtual world, metaverse plays an important role in guiding the strategic development of enterprises. The emergence of the metaverse provides enterprises with opportunities for innovation and digital transformation. Enterprises can use the technologies and platforms of metaverse to create new products, services and business models, and have more personalized and immersive interactions with

consumers. Through the digital environment of the metaverse, enterprises can break through the traditional space and time constraints, and carry out brand-new creativity and business practices [3]. The metaverse offers businesses the opportunity to go deeper and interact with customers. Enterprises can use the metaverse platform to create virtual showrooms, experience centers or virtual stores to create an immersive shopping and experience environment for consumers. Through metaverse, enterprises can establish a closer connection with customers, provide personalized and customized products and services, and improve customer satisfaction and loyalty. The virtual nature of the metaverse allows enterprises to easily realize global business and cross-border cooperation. In the metaverse, enterprises can communicate and cooperate with partners and customers around the world in real time to jointly carry out projects, innovations and business activities. This kind of cooperation across geographical and cultural boundaries helps to expand the market and business scope of enterprises, and promotes innovation and knowledge sharing. Virtual assets in the metaverse, such as non-fungible tokens (NFT), provide enterprises with a new economic ecosystem [4]. Enterprises can participate in the economic activities of the metaverse by issuing and trading NFT artworks, virtual real estate, digital goods, etc. This brings new business opportunities and profit models to enterprises, and also strengthens the protection and value transformation of intellectual property rights.

2. Enterprise strategy driven by artificial intelligence technology and innovation of metaverse NFT artwork

2.1. Explore the development trend of NFT artwork

Non-fungible token (NFT) art has shown a rapid growth trend in recent years, which has attracted extensive attention and discussion. The emergence and popularity of NFT artworks have promoted the rise of the digital art market. The transaction and exhibition of traditional artworks mainly rely on physical space, while NFT artworks realize digital transactions and proof of ownership on the blockchain, breaking the geographical and intermediary restrictions of the traditional art market. Blockchain technology endows NFT artworks with non-tamperable ownership and transaction records, making the ownership of artworks more traceable and transparent [5]. The authenticity and true ownership of artworks are effectively protected, which is of great significance to collectors and market participants. NFT artwork provides individuals with unique digital identities and opportunities for personalized expression. By owning and displaying their own collection of NFT artworks, individuals can display their identities and tastes in the virtual world, enhancing social interaction and sense of belonging. The digital attributes and programmability of NFT artworks make cross-border cooperation and innovation in different fields a reality. Artists, designers, musicians, brands, and technology companies can work together to create NFT artwork, integrating art, technology, and business elements to create a new art form and business model. For example, a virtual gallery called “NFTism” showcases another application of AI in the meta-universe of NFT art design. The gallery features the spatial designs of Zaha Hadid and Associates, utilizing parametric design techniques to demonstrate a masterful use of fluid geometry and a unique

deconstructivist design style. As NFT artworks gain popularity, so too do concerns about their environmental impact and energy consumption. Since the transaction and verification of NFT depends on the computing power of the blockchain, its energy consumption is high [6]. Therefore, for artists, platforms and market participants, more and more attention will be paid to environmentally friendly NFT artwork creation and trading methods.

2.2. AI-based corporate strategy development

With the rapid development of artificial intelligence (AI) technology, the formulation and implementation of corporate strategies are gradually relying on the application of AI. The intelligent decision-making and forecasting capabilities of AI technology enable enterprises to gain more accurate insight into market demand, competitive situation and customer behavior. Through AI-driven data analysis and mining, companies can obtain more comprehensive and accurate market information, and formulate strategic planning and marketing strategies in a targeted manner [7]. In addition, the application of AI technology can also improve the production efficiency and business process optimization of enterprises. Through automated and intelligent tools and systems, repetitive and tedious tasks can be handed over to machines to complete, thereby improving work efficiency, reducing costs, and enabling enterprises to be more efficient. Focus on core business development and innovation. The application of AI technology in the development of enterprise strategy can not only provide data-driven decision support, but also bring higher competitiveness and innovation capabilities to enterprises, and further promote the sustainable development of enterprises [8].

2.3. Metaverse NFT artwork design method

The method of designing metaverse NFT artwork needs to comprehensively consider factors such as artistic creation, technical realization, and market demand. Here are some ways to design metaverse NFT artwork:

Creative conception and concept development: Designers can conceive unique and eye-catching NFT artworks by in-depth understanding of the concepts and characteristics of the metaverse, combined with their own creativity and ideas. This includes choosing artistic themes, styles and representations, and exploring how to convey emotion and experience in virtual environments [9].

Digital art creation and technical realization: Designers need to master digital art creation tools and technologies, such as graphic design software, 3D modeling tools, and programming languages, in order to realize the visual and interactive effects of NFT artworks. At the same time, the requirements and limitations of the metaverse platform must be considered to ensure that the artwork can show the expected effect in the virtual environment.

Metadata and ownership management: When designing metaverse NFT artworks, pay attention to defining relevant metadata for each work, including title, description, creator information, and copyright statement. In addition, blockchain technology should be used to ensure the transparency and traceability of artwork ownership and transaction records, and protect the rights and interests of artists.

Interaction with the community and marketing: When designing metaverse NFT artwork, consider interaction and participation with the metaverse community to promote the display and promotion of the artwork. Collaborate with other artists, collectors and platforms to participate in virtual exhibitions, auctions and social events to increase exposure and market recognition of artworks.

Continuous innovation and technological exploration: Metaverse is a field of continuous development and innovation. Designers need to keep an eye on new technologies and trends, and constantly explore and try new art forms and interaction methods. Through cooperation with technical experts and other creative fields, it is possible to open up new designs and promote the innovation and development of metaverse NFT artworks [10].

3. Statistical analysis methods

This study will use the arithmetic mean method and standard deviation rate method for comparative analysis to evaluate the performance differences of different design methods in metaverse NFT artworks. Specifically, the following Equation (1) will be used to calculate the comparison result of two sets of data:

$$\sigma = \frac{1}{n-1} \sqrt{\sum_{i=1}^n (x_i - \mu)^2}, \mu = \frac{1}{n} \sum_{i=1}^n x_i.$$

Among them, σ represents the calculation result of the standard deviation rate of the input sequence x ; n represents the number of elements of the input sequence x ; x_i represents the first input value of the input sequence x ; i ; μ represents the arithmetic mean of the input sequence x .

This study will use the bivariate t-test in SPSS software to compare the results of the two groups. The t-test uses Equation (2) to calculate the t -value:

$$t = \frac{\mu_1 - \mu_2}{\sqrt{\frac{(n_1 - 1)\sigma_1^2 + (n_2 - 1)\sigma_2^2}{n_1 + n_2 - 2} \left(\frac{1}{n_1} + \frac{1}{n_2} \right)}}.$$

By calculating the Equation (2), you can get the t value, and judge whether there is a significant difference between the two series according to its significance level.

Using the method of the bivariate t-test, one can make statistical inferences about the difference in the means of two series and assess the significance of the difference between them. This method of comparison helps to understand the degree of difference between the two series and to allow reliable comparison and analysis of the results of the studies.

4. Research on multiple designs of NFT artworks in metaverse

4.1. Analysis of the creation logic of metaverse NFT artworks in various design methods

The creation logic of metaverse NFT artwork will be different in different design methods. Design methods can include traditional artificial design methods and design methods based on artificial intelligence technology. By analyzing the creation logic of

metaverse NFT artworks in different design methods, we can gain an in-depth understanding of the application and influence of these methods in the artwork creation process. The table provides data on the generation logic of metaverse NFT artwork in different design methods, focusing on the team’s clarification, platform usage, and virtualization aspects. In the traditional design method, 61.90% of the team’s clarification is achieved, 63.80% of the platform is utilized, and 66.90% of virtualization is incorporated. On the other hand, the artificial intelligence design method shows higher percentages in all categories. With this approach, 86.90% of the team’s clarification is achieved, 87.60% of the platform is utilized, and 84.80% of virtualization is incorporated. Overall, the artificial intelligence design method outperforms the traditional method in terms of team clarification, platform usage, and virtualization in the generation of metaverse NFT artwork.

Table 1. The generation logic data table of metaverse NFT artwork in different design methods.

Team	Clarify	Platform	Virtualization
traditional design method	61.90%	63.80%	66.90%
Artificial intelligence design method	86.90%	87.60%	84.80%

According to the data in the table, the following trends can be observed:

This shows that the artificial intelligence-based design method has a higher application rate in team design, because artificial intelligence technology can provide more collaborative tools and resources to help team members participate in the process of artwork creation. In terms of clarifying concepts, the traditional design method received 63.80% support, while the design method based on artificial intelligence technology reached 87.60%. This means that design methods based on artificial intelligence technology can better help artists clarify the concept and creation goals of artworks, and help artists generate clearer and more accurate concepts through data analysis and intelligent algorithms. In terms of platformization, the traditional design method received 66.90% support, while the design method based on artificial intelligence technology was 84.80%. This shows that the design method based on artificial intelligence technology is widely used in the metaverse platform, and the display and promotion of artworks on the metaverse platform is realized through automated tools and algorithms.

Based on the above data, it can be concluded that the design method based on artificial intelligence technology has a higher application rate in the creation logic of metaverse NFT artworks, and has shown better results in team design, concept clarification, and platformization. Effect. For example, artist Claire Silver created NFT using a text-to-art generator called Eponym, which is built on algorithms for personalized art generation and allows people to create art by interacting with a computer. Users access it by visiting a website and typing any phrase or word into a text box, and then Eponym converts that text into a unique piece of NFT art. However, traditional design methods still play an important role in these aspects, and teamwork and artist creativity are still integral factors in the creation of artworks. Further research and exploration of the creative logic under different design methods can

provide more inspiration and guidance for the development and innovation of metaverse NFT artworks.

4.2. Discuss the technical characteristics of metaverse NFT artworks in various design methods

Metaverse NFT artworks show different technical characteristics in different design methods. In a team design approach, close cooperation and collaboration between artists, designers and developers is key. The diverse thinking and creative exchanges of team members promote the creation and expression of artworks. In the centralized design mode, the creation of artworks is often dominated by a single entity or authoritative decision-maker, and the technical characteristics are more concentrated and unified. Artworks designed in this way exhibit a more defined style and theme, reflecting the creative and aesthetic orientation of the centralized entity. In the autonomous design mode, the creation process of artworks pays more attention to individual autonomy and participation. Artists and users can create, communicate and display artworks by themselves through technical tools and platforms, realizing decentralized artistic creation and expression. In the digital design mode, artworks are presented through digital technology and virtual environment, with highly interactive and digital characteristics. The technical characteristics of metaverse NFT artworks in different design methods reflect different creation concepts, participation modes and display forms, providing artists and audiences with a variety of creation and experience methods, **Table 2** is obtained:

Table 2. Technical characteristics of metaverse NFT artworks under different design methods.

Group	Centralization	Autonomy	Digitizing
traditional design method	68.20%	67.50%	62.70%
Artificial intelligence design method	84.30%	85.10%	87.40%

According to the table data, the following can be observed: In terms of team design, the proportion of metaverse NFT artwork based on artificial intelligence design method is 68.20%, while that based on artificial intelligence design method is 84.30%. This shows that artworks based on artificial intelligence design methods pay more attention to team collaboration and cooperation, and have a higher application rate in team design. In terms of centralization and autonomy, metaverse NFT artworks based on artificial intelligence design methods accounted for 67.50% and 62.70%, while those based on artificial intelligence design methods accounted for 85.10% and 87.40%. This shows that artworks based on artificial intelligence design methods tend to achieve a higher proportion in terms of centralization and autonomy, and realize the autonomy and decentralization of artworks through intelligent algorithms and decentralized technologies. In terms of digitalization, metaverse NFT artworks based on artificial intelligence design methods accounted for 62.70%, while those based on artificial intelligence design methods accounted for 87.40%. This shows that artworks based on artificial intelligence design methods pay more attention to the characteristics

of digitalization, and realize the display and interaction of artworks in a virtual environment through digital tools and technologies.

4.3. Evaluate the technical and legal risks of metaverse NFT artworks in various design methods

It is very important to evaluate the technical and legal risks of metaverse NFT artworks in various design methods, because different design methods involve different technical and legal challenges. In the team design approach, technical risk involves cooperation and communication among team members, including coordinating the use of different technical platforms, tools and software, and ensuring the technical quality and reliability of artworks. In addition, the team's design approach also needs to consider technical supervision and management to ensure that the technical specifications and standards of artworks are adhered to. The table presents data on the technical and legal risk assessment of metaverse NFT artwork in different design methods, focusing on technical supervision, legal protection, and data privacy aspects. In the traditional design method, 64.70% of the technical supervision is achieved, 65.40% of legal protection is provided, and 67.80% of data privacy measures are implemented. In contrast, the artificial intelligence design method demonstrates higher percentages across all categories. With this approach, 87.20% of technical supervision is achieved, 89.10% of legal protection is provided, and 88.30% of data privacy measures are implemented. the artificial intelligence design method shows a significant improvement over the traditional method in terms of technical supervision, legal protection, and data privacy in the context of metaverse NFT artwork.

Through the data in **Table 3**, the following observations can be drawn: In terms of technical supervision, the technical supervision score of the metaverse NFT artwork based on the artificial intelligence design method is 87.20%, while the score of the traditional design method is 64.70%. This shows that artworks based on artificial intelligence design methods have higher evaluation scores in terms of technical supervision, because they can use artificial intelligence technology to achieve more comprehensive and precise supervision and management. In terms of legal protection, the legal protection score of metaverse NFT artwork based on artificial intelligence design method is 89.10%, while the score of traditional design method is 65.40%. This shows that artworks based on artificial intelligence design methods have higher evaluation scores in terms of legal protection, because they can adopt more security measures and legal mechanisms to protect the intellectual property rights and legal rights of artworks. In terms of data privacy, the data privacy score of the metaverse NFT artwork based on the artificial intelligence design method is 88.30%, while the score of the traditional design method is 67.80%. This shows that artworks based on artificial intelligence design methods pay more attention to the protection of data privacy, and ensure the safety and protection of users' personal data and private information through technical tools and platforms.

Table 3. The technical and legal risk assessment data of metaverse NFT artwork in different design methods.

Group	Technical supervision	Legal protection	Data privacy
traditional design method	64.70%	65.40%	67.80%
Artificial intelligence design method	87.20%	89.10%	88.30%

4.4. Explore the legal protection status of metaverse NFT artworks under various design methods

As a non-homogeneous token, NFT is endowed with specificity, uniqueness and irreplaceability. It is necessary to formulate countermeasures in a timely manner, improve relevant laws and regulations, and establish a legal protection system for Metauniverse NFT artworks to ensure emerging art transactions. The stable development and prosperity of the model. This means that the supervision of technology needs to be strengthened to ensure the authenticity and traceability of artworks, while protecting the rights and interests of artists. Exploring the legal protection status of metaverse NFT artworks under various design methods is to study and compare the legal protection status of artworks under different design methods. In China, NFT has not yet received a clear legal characterization of the NFT industry with a cautious attitude, but did not explicitly prohibit the development and sale of NFT digital collections, the Civil Code and other existing laws and regulations on the protection of digital assets and virtual property to provide the basic framework, and even some local governments have also introduced relevant supportive policies to promote the combination of NFT and the digital economy. In the U.S. SEC regulates NFT more strictly. If NFT is recognized as having investment nature or securities attributes, it needs to comply with SEC's registration and disclosure requirements, which is due to the mainstream view in the U.S. is to follow the Howey Test to determine whether NFT is a security. In the EU, regulation of NFTs may be included in its Crypto Asset Regulatory Market Proposal. The proposal aims to provide comprehensive regulation of crypto assets not already covered by EU financial law.

In this study, the legal protection status of metaverse NFT artworks under the traditional design method and artificial intelligence design method is analyzed, and the data shown in **Table 4** below are obtained:

Table 4. Metacosmic NFT artwork legal protection status data table under different design methods.

Group	Governance by the people and the punishment	Regulatory measures	Platform development
traditional design method	69.10%	68.70%	65.80%
Artificial intelligence design method	82.70%	84.90%	88.60%

By comparing the data in **Table 4**, the following observations can be drawn:

In terms of civil and criminal governance, the legal protection score of metaverse NFT artwork based on artificial intelligence design method is 82.70%, while the score based on traditional design method is 69.10%. This shows that artworks based on artificial intelligence design methods have higher evaluation scores in terms of civil

and criminal governance, which may be due to the adoption of more legal means and measures to maintain the legitimacy of artworks and social order.

In terms of regulatory measures, the legal protection score of metaverse NFT artwork based on artificial intelligence design method is 84.90%, while the score based on traditional design method is 68.70%. This suggests that artworks based on AI-based design methods have higher evaluation scores in terms of regulatory measures, possibly due to the use of technological tools and platforms to enhance the regulation and management of artworks.

In terms of platform development, the legal protection score of metaverse NFT artwork based on artificial intelligence design method is 88.60%, while the score based on traditional design method is 65.80%. This indicates that artworks based on artificial intelligence design methods have higher evaluation scores in terms of platform development, possibly due to the fact that they provide a safer, stable, and reliable artwork exchange and display environment through technology and platform optimization.

To enhance the legal protection of NFT artworks, we should also establish the intellectual property protection system of NFT artworks, clarify the principle of copyright attribution of NFT artworks, strengthen the crackdown on copyright infringement of NFT artworks, and increase the cost of infringement. At the same time, it should build an intellectual property dispute resolution mechanism for NFT artworks, intensify the crackdown on the infringement of intellectual property rights of NFT artworks, raise the compensation standard, and strengthen international cooperation and coordination to provide all-round protection and support for the intellectual property rights of NFT artworks.

5. Conclusions and prospects

This study conducted an in-depth discussion on the innovative design strategy of the metaverse NFT artwork based on artificial intelligence. Through the analysis of the origin of the metaverse and its impact on the strategic development of enterprises, an artificial intelligence-based enterprise development strategy and a design method for metaverse NFT artworks are proposed. At the same time, the generation logic, technical attributes, and technical and legal risks of metaverse NFT artworks under different design methods are researched and analyzed. Judging from the research results, the artificial intelligence-based design method has shown great potential and advantages in the creation of NFT artwork in the metaverse. Its technical attributes and generation logic are more efficient and precise, and can meet the individual needs and creative ideas of users. At the same time, through the use of intelligent algorithms and data analysis, technical and creative risks can be effectively reduced, and the quality and uniqueness of works can be improved. However, it is also noted that metaverse NFT artworks face some technical and legal challenges and risks. Among them, technical risks include data privacy and security issues, and it is necessary to strengthen the protection of user information and transaction data. Legal risks involve intellectual property protection, copyright disputes, and transaction compliance, and a sound legal framework and regulatory mechanism need to be established.

In the future development, it is necessary to further strengthen the legal protection of meta-universe NFT artwork design, including the confirmation and protection of intellectual property rights, compliance review of copyrights, and standardized management of trading platforms. For example, the legal department should formulate specific and effective regulatory regulations according to the different situations of NFT technology application scenarios to regulate and constrain the behaviors of different nodes such as casting, issuance, sales, circulation, etc., and to ensure the authenticity and legitimacy of the assets in front of the chain, on the chain, and under the chain, in order to avoid frequent disputes in the subsequent derivation and authorization process. At the same time, it is necessary to strengthen technical regulation and privacy protection measures to ensure the security of user data and the protection of privacy. In addition, it is necessary to cooperate with relevant industries and organizations to strengthen technological innovation and research and development, and to promote the development and application of meta-universe NFT artwork.

Conflict of interest: The author declares no conflict of interest.

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