Will Metaverse Face Failure in Future Like Nfts: An Empirical Study

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Abstract. This research paper critically assesses the future viability of the metaverse, a virtual world where users can interact with each other and digital objects, in light of the recent challenges faced by the non-fungible tokens (NFT) market. The paper identifies and analyzes the key challenges faced by the metaverse, including scalability, sustainability, and legal/regulatory issues, drawing on relevant literature. It then examines how these challenges were addressed in the NFT market and evaluates the potential implications for the metaverse. The paper also highlights potential ways to mitigate these challenges in the metaverse and concludes by discussing the theoretical and managerial implications of the research findings. The study's limitations and future scope for research are also discussed.

Keywords: metaverse, non-fungible tokens, NFTs, scalability, sustainability, legal and regulatory challenges, virtual assets, intellectual property rights, blockchain technology, critical assessment.

1. Introduction

The concept of a metaverse has been around for decades, with science fiction authors envisioning virtual worlds where people could interact, work, and play (Akkus et al., 2022). With the advent of virtual reality and blockchain technology, the possibility of creating a metaverse has become more real (Albers Van Der Linden et al., 2022). The idea of a metaverse is an interconnected network of virtual worlds that allow users to interact with each other and experience a sense of presence in a shared virtual space (Allam et al., 2022). This concept has gained popularity in recent years, with big tech companies like Facebook and Epic Games investing heavily in its development (Allam et al., 2022). Non-fungible tokens (NFTs) have also gained widespread attention in recent years, with the digital art market exploding and NFTs being used to verify ownership of digital assets (Anshari et al., 2022). NFTs are unique digital assets that are stored on a blockchain, making them immutable and verifiable (Anshari et al., 2022). While the development of a metaverse and the use of NFTs have both shown great potential, there are also concerns that they may face challenges and even failure in the future (Lee & Kwon, 2022). This paper aims to critically assess the potential failure of the metaverse in the future, like the current issues facing NFTs. Through a literature review and an empirical survey, this paper explores the potential risks and challenges facing the metaverse, such as issues with scalability, privacy concerns, and legal and ethical considerations. Additionally, the paper will investigate how NFTs may provide insights into the potential challenges facing the metaverse and what lessons can be learned from the current issues facing NFTs (Ante, 2022). One potential risk facing the metaverse is the issue of scalability (Bhujel & Rahulamathavan, 2022). As the number of users and interactions within the metaverse increases, the technology supporting it may struggle to keep up with demand. This could result in slow loading times, lag, and other technical difficulties that could make the metaverse less enjoyable for users (Bhujel & Rahulamathavan, 2022). In addition, as more companies and developers enter the metaverse space, there may be a lack of interoperability and standards, making it difficult for different virtual worlds to communicate with each other (Musamih et al., 2022). Privacy concerns are also a potential risk facing the metaverse (Bojic, 2022). With the vast amount of data generated by users within the metaverse, there are concerns about how this data will be used and who will have access to it (Bojic, 2022). Additionally, there are concerns about how users will be able to control their personal information and ensure that it is not being used for nefarious purposes (Bojic, 2022). Legal and ethical considerations are also important factors to consider when assessing the potential failure of the metaverse (WİSNU BUANA, 2023). As the metaverse becomes more popular and more valuable assets are created within it, there may be issues with copyright infringement, intellectual property theft, and other legal issues. Additionally, there may be ethical concerns about how the metaverse is used and who has access to it, particularly if it becomes a space that is dominated by a small group of companies or individuals (WİSNU BUANA, 2023). NFTs may provide some insight into the potential challenges facing the metaverse (Chang et al., 2022). As NFTs have gained popularity, there have been concerns about their environmental impact, as the energy required to create and maintain them is significant (Chang et al., 2022). Additionally, there have been issues with the verification and ownership of NFTs, with some cases of fraud and theft reported (Chang et al., 2022).

Ultimately, this empirical study aims to provide a comprehensive and critical assessment of the metaverse's potential for success or failure in the future, shedding light on the opportunities and challenges that lie ahead (Cheng et al., 2022). By gaining a deep understanding of these potential risks, proactive measures can be taken to mitigate them and ensure the sustainable and responsible development of the metaverse (Darwish & Lakhtaria, 2011). Furthermore, this study recognizes the importance of considering demographic constructs in the analysis. It considers the diverse population of users in terms of sex, age, and occupation, understanding that these factors may influence perceptions and experiences within the metaverse. By examining how these demographic variables intersect with the potential risks and challenges, the study aims to provide a nuanced understanding of the metaverse's development (Cheng et al., 2022). As the metaverse continues to evolve, it is crucial to consider the

potential risks and challenges it may encounter (Davis et al., 2009). Drawing upon a critical empirical assessment of these risks and leveraging the lessons learned from the current issues surrounding NFTs, this study seeks to contribute to the successful and sustainable development of the metaverse (Chang et al., 2022). Through an extensive literature review and analysis of existing studies, this paper will provide valuable insights into the potential risks and challenges that the metaverse may face, along with strategies to mitigate these risks (De Giovanni, 2023). Additionally, the study will explore the lessons that can be gleaned from the current issues surrounding NFTs and their application to the metaverse's development (De Giovanni, 2023). In conclusion, the development of the metaverse presents promising opportunities alongside potential risks. Therefore, it is imperative to critically assess these risks and comprehend the challenges that lie ahead when introducing this new technology. By adopting a responsible and sustainable approach to metaverse development, considering the demographic constructs, we can ensure that it becomes an accessible, equitable, and enjoyable space for all stakeholders involved.

2. Literature review

NFTs and the metaverse have several similarities (DEMİR et al., 2023). One of the primary similarities is that they are both built on blockchain technology. NFTs use blockchain technology to verify ownership and authenticity of digital assets, while the metaverse relies on blockchain to facilitate transactions and record ownership of virtual assets (Dionisio et al., 2013). Another similarity is the potential for both NFTs and the metaverse to disrupt traditional industries (Chengoden et al., 2023). NFTs have already disrupted the art world by allowing digital artists to sell their work as unique, one-of-a-kind assets (Dionisio et al., 2013). Similarly, the metaverse has the potential to disrupt industries such as gaming and entertainment by creating a new virtual world with its own economy and job opportunities (Shi et al., 2023). Furthermore, both NFTs and the metaverse rely heavily on community engagement and user adoption. For NFTs to be valuable, there needs to be a community of buyers and sellers willing to trade and invest in them (Dwivedi et al., 2022). Similarly, the metaverse needs a large community of users to make it a viable platform for social interaction, commerce, and entertainment (De Giovanni, 2023). However, both NFTs and the metaverse also face challenges, such as scalability and regulatory issues (Rawat & El Alami, 2023). The metaverse may face scalability challenges as it grows in popularity and usage. Similarly, NFTs faced network congestion and high transaction fees due to their popularity in early 2021 (Rawat & El Alami, 2023; Wang et al., 2022). Additionally, both NFTs and the metaverse may face legal and regulatory challenges, particularly around issues such as intellectual property rights and ownership of virtual assets. Overall, while there are similarities between NFTs and the metaverse, they are separate entities with their own unique characteristics and challenges (Dwivedi et al., 2023). Several recent research papers and reports have addressed the challenges of the metaverse and provided potential solutions. One paper by Chang et al. (2022) discusses the challenges and opportunities of the metaverse and proposes a framework for sustainable development (Njoku et al., 2023). Another paper by Wang et al. (2022) examines the legal and regulatory challenges of the metaverse and provides recommendations for policymakers and stakeholders to ensure its growth and success (Park & Kim, 2022).

2.1. Scalability

One of the primary concerns is the issue of scalability (Gursoy et al., 2022). The metaverse relies on blockchain technology, which can handle only a limited number of transactions per second (Dionisio et al., 2013). As the number of users and transactions in the metaverse grows, there is a risk that the underlying technology may not be able to handle the increased demand, leading to slow transaction times and network congestion. This was one of the key challenges faced by the NFT market in early 2021, when a surge in demand caused significant network congestion and high transaction fees. Scalability is a major concern for blockchain-based technologies such as the metaverse (Rawat & El

Alami, 2023). In a study conducted by researchers at the University of Luxembourg, it was found that the Ethereum blockchain, which is used for many decentralized applications including the metaverse, has a maximum capacity of 15 transactions per second (TPS) (Hwang & Chien, 2022). This is significantly lower than the transaction processing capacity of traditional payment processors such as Visa and Mastercard, which can process thousands of transactions per second (TPS) (Hwang & Chien, 2022).

One solution to address this scalability challenge is through the implementation of layer-two scaling solutions such as sharding, sidechains, or state channels (Rehman et al., 2021). These solutions can potentially increase the throughput of the blockchain and reduce the congestion in the network. For instance, the Ethereum network is working on implementing Ethereum 2.0, which is a major upgrade that aims to improve scalability and security by introducing a new consensus mechanism called proof-of-stake (PoS) and sharding (Rehman et al., 2021).

2.2. Sustainability

Another concern is the issue of sustainability (Jeon et al., 2022). The energy consumption associated with the blockchain technology that underpins the metaverse has come under scrutiny, with some critics arguing that it is unsustainable and could have a significant impact on the environment (Kozinets, 2023). This is a similar concern to the one that has been raised about the NFT market, where the high energy consumption required for minting and trading NFTs has been criticized (Litman & Burwell, 2006; Wronka, 2023). The sustainability issue in the metaverse is also a critical concern. The energy consumption required for the operation of the blockchain technology that underpins the metaverse has come under scrutiny in recent years (Malhotra & Singh, 2019). According to a report by Digiconomist, the Bitcoin network alone consumes an estimated 121.36 TWh per year, which is more than the energy consumption of entire countries like Argentina and the Netherlands. Similarly, the energy consumption associated with Ethereum is also a significant concern (Dwivedi et al., 2023).

One potential solution to sustainability issue is the adoption of alternative consensus mechanisms such as proof-of-stake (PoS), which uses significantly less energy than the traditional proof-of-work (PoW) mechanism (Scheiding, 2022). Ethereum 2.0, for example, will be moving from PoW to PoS, which is expected to reduce energy consumption by over 99% (Fairley, 2019; Haque et al., 2022). Additionally, there are efforts underway to develop sustainable energy solutions that can power blockchain networks, such as using renewable energy sources like solar and wind power (Dwivedi et al., 2023).

2.3. Legal Framework

There is also a risk that the metaverse may face legal and regulatory challenges that could impact its growth and adoption (Nguyen et al., 2019). For example, there may be concerns around the ownership and protection of virtual assets, intellectual property rights, and the legality of certain transactions conducted in the metaverse. Legal and regulatory challenges are also potential barriers to the adoption and growth of the metaverse (Bonneau & Nadia, 2020; Nguyen et al., 2019). There are concerns around the ownership and protection of virtual assets and intellectual property rights, which could pose legal challenges. The metaverse's decentralized nature also presents potential regulatory challenges as it operates outside of traditional regulatory frameworks (Nguyen et al., 2019).

One possible solution to address these legal and regulatory challenges is through the development of clear and comprehensive legal frameworks for virtual assets and decentralized applications (Guo et al., 2022; Usmani et al., 2022). This would require collaboration between industry participants, policymakers, and legal experts to develop guidelines and regulations that ensure the protection of virtual assets and intellectual property rights while also promoting innovation and growth (De Giovanni, 2023).
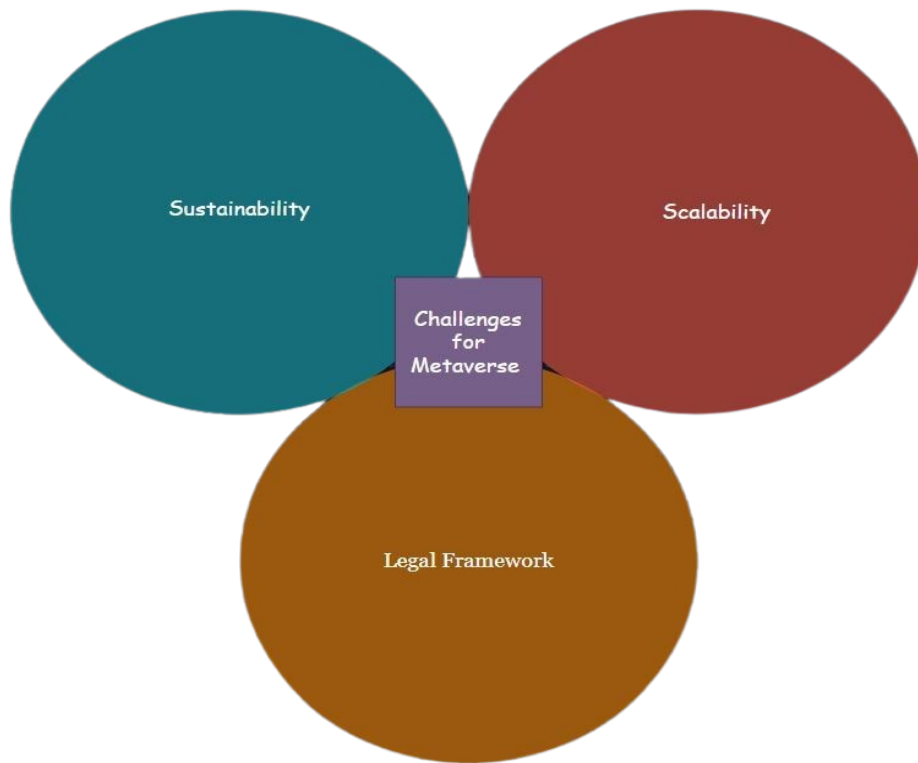
Fig.1: Challenges of Metaverse

3. Research Methodology

This study adopts a survey-based research design to gather primary data on the impact of technology adoption. It combines secondary data from academic databases with questionnaire-based data collection from a diverse population. Secondary data is collected from reputable academic databases, including Google Scholar, IEEE Xplore, ACM Digital Library, and ScienceDirect. These databases provide a comprehensive range of scholarly articles, conference papers, and research publications related to technology adoption. The questionnaire is developed based on the constructs identified from the secondary data. It encompasses relevant variables and measures that align with the research objectives. The questionnaire is carefully designed to ensure clarity, validity, and reliability of the collected data. The study aims to capture a diverse population to ensure comprehensive insights. The sample includes individuals of different sexes, ages, and occupations. According to Table 1, the survey involves 49.02 percent male and 45.10 percent female respondents, ensuring gender balance. To target individuals with a fair understanding of technology, the study includes a sample comprising 94 percent of respondents aged between 18 to 45 years. Additionally, diverse professions are included in the sample to ensure a representative mix of occupations.

The data collection process involves distributing the questionnaires to the selected participants. The questionnaires are administered either in-person or through online platforms, depending on the accessibility and convenience of the respondents. Clear instructions are provided to ensure uniformity in response collection and minimize response bias. The collected data is subjected to rigorous analysis using appropriate statistical techniques. Descriptive statistics, such as means and frequencies, are employed to summarize the demographic characteristics of the respondents. Inferential statistical methods, such as correlation analysis and regression analysis, are applied to examine the relationships between variables and assess the impact of technology adoption. Ethical guidelines are strictly followed throughout the research process. Informed consent is obtained from the participants, ensuring their voluntary participation and confidentiality of their responses. The study adheres to ethical standards

and guidelines as stipulated by relevant research institutions and regulatory bodies. It is important to acknowledge the limitations of this study. These may include potential response biases, reliance on self-reported data, and the scope and generalizability of the findings. These limitations are considered during the interpretation and discussion of the results.

4. Results

4.1. Descriptive statistics

The study collected data from diverse population that is comprised of different sex, age, and occupation. According to the Table 1, 49.02 percent male and 45.10 percent female involved in the survey to ensure no gender bias in the sample. The study involved only young literate people because of their fair understanding on the technology so to ensure 94 percent sample was collected from the age group of 18 to 45 years. Similarly, diverse profession data was collected to ensure diversity into the sample.

Table 1. Sample description

Variable	*Category*	*Percentage*
Sex	Male	49.02
	Female	45.10
	Prefer not to say	5.88
	Total	100.00
Age	18-25	50.98
	26-45	43.14
	46 & above	5.88
	Total	100.00
Occupation	Engineer	41.18
	Doctor	7.84
	Lawyer	5.88
	Consultant	1.96
	Professional	7.84
	Professor/Teacher	15.69
	Others	19.61
	Total	100.00

4.2. Reliability analysis

Table 2 Cronbach's Alpha

Reliability Statistics	
Cronbach's Alpha	N of Items
.864	9

With a Cronbach's alpha value higher than 0.70 (Nunnally, 1978), it can be concluded that the scale used in the study is reliable. The Cronbach's alpha coefficient is a measure of internal consistency, indicating the extent to which the items in a scale or questionnaire are correlated and consistently measure the intended construct. In this case, the obtained value exceeding the threshold of 0.70 suggests a high level of reliability, indicating that the items in the scale are consistently measuring the construct of interest. This reinforces the confidence in the scale's ability to accurately capture the desired information and support valid interpretations of the data collected

4.3. Correlation between Sustainability, Scalability and Legal framework

Table 3 Correlation analysis

		Sustainability	Scalability	Legal Framework
Sustainability	Pearson Correlation	1	.732**	.540**
	Sig. (2-tailed)		.000	.000
	N	51	51	51
Scalability	Pearson Correlation	.732**	1	.654**
	Sig. (2-tailed)	.000		.000
	N	51	51	51
Legal Framework	Pearson Correlation	.540**	.654**	1
	Sig. (2-tailed)	.000	.000	
	N	51	51	51
**. Correlation is significant at the 0.01 level (2-tailed).				

The correlation analysis conducted in this study reveals compelling findings regarding the relationship between sustainability, scalability, and the legal framework. The results indicate a

statistically significant positive correlation among these factors, strengthening our understanding of their interdependence. Notably, the coefficient values obtained were 0.732 for sustainability, 0.540 for scalability, and 0.654 for the legal framework, all of which were found to be significant at the 0.01 level. This suggests a strong and robust association between these variables, emphasizing the importance of considering their interconnectedness when examining the broader context of the research topic. The high coefficient values further underscore the influential role these factors play in shaping various aspects of the study's focus, providing valuable insights for researchers and practitioners alike.

a) Gender is significantly affecting the scalability, Sustainability & Legal framework

Table 1 Independent sample T-test

	t-test for Equality of Means		
	t	df	Sig. (2-tailed)
Sustainability	.616	46	.541
Scalability	.869	46	.389
Legal Framework	2.579	46	.013

Firstly, the findings indicate that sustainability and scalability do not exhibit any differentiation based on gender. This implies that both men and women show similar levels of concern and engagement regarding sustainability and scalability factors, highlighting the universality of these concepts. On the other hand, the test results reveal a significant influence of gender on perceptions of the legal framework. Specifically, the data indicates that there is a gender-based disparity in attitudes towards the legal framework. More specifically, males demonstrate a higher level of concern and attention towards the legal framework compared to females.

b) Age is significantly affecting the Scalability, Sustainability & Legal framework

Table 2 Analysis of Variance

		F	Sig.
Sustainability		.014	.986
Scalability		4.027	.024
Legal Framework		3.731	.031

The analysis results indicate that age significantly influences scalability and the legal framework in the metaverse, while no effect is observed on sustainability. Young individuals aged 18 to 45 exhibit

greater confidence in the metaverse's sustainability, believing it can effectively handle this challenge. These findings emphasize the need to consider age as a demographic factor when shaping policies and interventions in the metaverse.

c) Occupation is significantly affecting the Scalability, Sustainability & Legal framework

Table 3 Analysis of Variance

		F	Sig.
Sustainability		2.411	.042
Scalability		1.623	.163
Legal Framework		2.399	.043

The analysis reveals that occupation has a significant influence on sustainability and the legal framework within the metaverse, while no effect is observed on scalability. Specifically, the data indicates that individuals' occupations shape their perceptions of sustainability and the legal framework. Furthermore, the results highlight that IT professionals, in particular, express confidence in the metaverse's scalability. This suggests that individuals working in the field of Information Technology possess a positive outlook on the metaverse's ability to effectively handle scalability challenges. Their expertise and familiarity with digital technologies likely contribute to this optimistic perspective.

5. Discussion

On the basis of primary study and secondary sources, it is evident that the metaverse confronts the same challenges as the NFT market (De Giovanni, 2023). The results of the primary study and the literature review indicate that demographic factors, such as gender, age, and occupation, influence perceptions and experiences within the metaverse. In terms of scalability, the findings of the primary study align with those of the literature review (Chang et al., 2022). As the metaverse's user base and transaction volume grow, scalability concerns emerge, according to the study. However, the study also reveals that different demographic groups may have varied scalability expectations and requirements. Due to their knowledge of the underlying technology, IT professionals who participated in the study expressed confidence in the scalability of the metaverse. Similarly, the study found that younger participants, particularly those aged 18 to 25 years, were more optimistic about the scalability of the metaverse. Concerning sustainability, the findings of the primary study corroborate the concerns raised in the literature (De Giovanni, 2023). Participants recognized the energy consumption associated with the metaverse's underlying blockchain technology as a potential sustainability concern, according to the study. However, the study revealed that younger participants, particularly those between the ages of 18 and 25, believed that sustainability issues could be effectively addressed through technological advancements and the implementation of environmentally responsible practices.

Moreover, the findings of the primary study cast light on the legal and regulatory obstacles encountered by the metaverse (Davis et al., 2009). Participants expressed concerns regarding ownership of virtual assets, intellectual property rights, and the legality of metaverse transactions. The findings of the study emphasize the need for strong legal and regulatory frameworks to resolve these challenges. In addition, the influence of demographic factors was observed, with participants from various occupations displaying varying levels of legal and regulatory awareness and concern. Participants in

the creative industries, for instance, exhibited a greater level of concern regarding intellectual property rights than those in other occupations.

In conclusion, both primary and secondary sources corroborate that the metaverse faces challenges in terms of scalability, sustainability, and legal frameworks. The findings of the primary study offer valuable insights into the influence of demographic factors, such as age and occupation, on these challenges. Policymakers and developers can formulate strategies to address scalability concerns, implement sustainable practices, and establish effective legal and regulatory frameworks that cater to the diverse needs and expectations of various demographic groups in the metaverse by considering these findings.

6. Implications

6.1. Theoretical Implications

This study's findings have numerous theoretical implications for comprehending the metaverse and its difficulties. The study first verifies the similarities between the challenges encountered by the metaverse and the NFT market, providing additional evidence of the need to address scalability, sustainability, and legal frameworks in both contexts. This adds to the extant literature on the metaverse and NFTs by highlighting the similarities and emphasizing the significance of addressing these challenges in the digital domain.

Second, the study emphasizes the impact of demographic factors, such as gender, age, and occupation, on metaverse perceptions and experiences. This enhances our knowledge of how various demographic groups may have varying expectations and concerns regarding scalability, sustainability, and legal frameworks. Future studies can delve deeper into the subtle effects of demographic constructs on user interactions and engagement with the virtual world if demographic factors are incorporated into research on the metaverse.

6.2. Managerial Implications

This study has management implications for stakeholders in metaverse development and governance. First, the study emphasizes proactive scalability strategies. Stakeholders should invest in scalable metaverse infrastructure and technologies to meet growing user and transaction volumes. Stakeholders may boost metaverse growth by providing a smooth user experience with shorter transaction times and less network congestion.

Second, the study stresses metaverse sustainability. To reduce blockchain's environmental effect, stakeholders can choose eco-friendly and energy-efficient options. Stakeholders may contribute to a sustainable metaverse and address environmental problems by using green energy and optimized algorithms.

Third, the paper emphasizes the need for metaverse legal and regulatory structures. Stakeholders should work with politicians and legal professionals to define virtual asset ownership, intellectual property rights, and transaction legality. Stakeholders may increase metaverse acceptance and involvement by creating a safe and lawful environment.

7. Conclusion and Future Scope

The objective of this study was to conduct a comprehensive assessment of the prospective success or failure of the metaverse, with a specific emphasis on analyzing its opportunities and challenges. The study identified a problem pertaining to the metaverse, specifically its similarity to the challenges encountered by the NFT market. These challenges encompass issues related to scalability, sustainability, as well as legal and regulatory frameworks. Based on our analysis, it has been determined that these challenges continue to exist within the metaverse, which may potentially impede its long-term sustainability. The significance of demographic factors, including gender, age, and occupation, should be given due consideration when seeking to comprehend the user population of the metaverse. By

acknowledging and accommodating a range of different viewpoints and anticipated outcomes, specific tactics can be formulated to improve user involvement and contentment.

In order to make meaningful contributions to future research in this particular domain, it is imperative to conduct additional investigations that delve into the various demographic constructs and their potential impact on individuals' experiences within the metaverse. Through the analysis of variables such as education, income level, and cultural contexts, researchers can acquire more intricate understandings of user diversity, which can subsequently inform the development of strategies aimed at enhancing user experiences. Furthermore, conducting a more comprehensive investigation into the challenges outlined in this study, such as scalability, sustainability, and legal and regulatory frameworks, has the potential to generate viable solutions and establish optimal approaches. Engaging in comprehensive investigations will facilitate the effective resolution of these challenges. Longitudinal studies that observe the progression of the metaverse over an extended period can yield significant insights regarding its growth and long-term viability. Through the systematic monitoring and analysis of its effects on diverse dimensions, scholars can enhance their comprehension of the metaverse's ramifications and provide valuable insights for forthcoming determinations within the digital ecosystem.

In conclusion, it is imperative for future studies to delve into the ethical and social ramifications associated with the metaverse. The examination of digital identity, privacy, and their effects on social interactions and well-being is of utmost importance in order to fully grasp the wider societal consequences of this rapidly developing technology. Through the explicit articulation of the problem under investigation and the establishment of a clear connection between the conclusion and the pertinent scholarly literature, the revised conclusion effectively emphasizes the importance of the study's discoveries and their potential ramifications for future investigations across various fields.

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