

Valuation, Accounting Principles, and Classification of Assets in the Metaverse

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Abstract— This study explores the valuation methods, accounting principles, and asset classification systems needed for accurate financial reporting in the Metaverse. The unique characteristics of virtual assets in the Metaverse pose challenges for traditional valuation methods and require the development of comprehensive and adaptable approaches. This study utilizes qualitative research methods, including in-depth interviews with accounting professionals in Bath and Bristol, UK. Fourteen accountants were selected based on their expertise in accounting and their understanding of the Metaverse. The findings reveal that effective governance, regulatory mechanisms, and community-driven protocols influence asset values in the Metaverse. It is shaped by factors such as engagement, scarcity, and competition. Tailored accounting principles should address legal recognition, accurate tracking, jurisdictional restrictions, and risk management. Compliance with regulations, transparent reporting, and collaboration with regulatory authorities are crucial, alongside integrating innovative technologies like blockchain for robust accounting practices.

Keywords— Metaverse, Virtual Assets, Accounting Practices, Asset Valuation, Asset Classification

I. INTRODUCTION

The emergence and rapid advancement of digital technologies have led to the creation of virtual worlds known as the Metaverse. The Metaverse is a collective virtual shared space which is created by the convergence of virtually enhanced physical reality and physically persistent virtual reality [1]. It includes a wide range of immersive experiences, including virtual reality (VR), augmented reality (AR), and mixed reality (MR), where users can interact with each other and the virtual environment in real-time [2]. As the Metaverse continues to evolve and gain popularity, it is crucial to develop comprehensive and adaptable valuation methods, accounting principles, and asset classification systems to accurately represent the financial aspects of this virtual realm.

This study aims to investigate the valuation methods used in the Metaverse and propose universally accepted accounting principles tailored specifically for this digital area. Additionally, it seeks to identify a robust classification system for assets originating from the Metaverse to ensure accurate representation in financial statements. By addressing these key aspects, this research aims to contribute to the understanding and development of financial reporting standards for the Metaverse.

Valuation methods play a critical role in determining the worth of assets and liabilities in any financial system.

However, the unique characteristics of the Metaverse pose challenges in applying traditional valuation methods [3]. Unlike physical assets, virtual assets in the Metaverse are intangible and can be easily replicated or modified. Therefore, traditional valuation methods used in the physical world may not be applicable in the context of the Metaverse. Moreover, the value of these assets is often subjective and influenced by factors such as user demand, scarcity, and perceived utility [4]. Therefore, it is essential to develop comprehensive and adaptable valuation methods that consider these unique characteristics and provide accurate and reliable estimates of asset values.

To accurately determine the value of Metaverse assets, new valuation models and approaches need to be developed. These models should consider factors such as the scarcity, utility, and demand for virtual assets within the Metaverse [4,5,6]. Additionally, the potential for real-world economic transactions involving Metaverse assets should be taken into account.

Accounting principles serve as the foundation for financial reporting and provide a framework for recording, measuring, and presenting financial information. The existing accounting principles primarily focus on physical assets and traditional business models, which may not adequately address the complexities of the Metaverse [7]. Therefore, there is a need to formulate universally accepted accounting principles tailored specifically for the Metaverse.

Designing accounting rules for the Metaverse requires a thorough understanding of the unique characteristics and challenges of this virtual world. For instance, the concept of ownership [8] and transferability of virtual assets [9] may differ significantly from that of physical assets. Additionally, the potential for fraudulent activities [1] and the need for transparency [10] in the Metaverse pose additional challenges that must be addressed through appropriate accounting rules. By doing so, financial statements can accurately reflect the financial position and performance of entities operating in the Metaverse.

Asset classification is another crucial aspect of financial reporting. A robust classification system is necessary to categorize assets originating from the Metaverse and ensure their accurate representation in financial statements [3]. The classification system should consider the nature of virtual assets, their underlying technologies, and their economic characteristics [8,11]. Additionally, it should account for the



dynamic and evolving nature of the Metaverse, where new types of assets and interactions constantly emerge [7]. By establishing a comprehensive classification system, financial statements can provide users with a clear understanding of the types and characteristics of assets held by entities operating in the Metaverse.

In this study, below research questions were investigated.

Research Question 1: How can we accurately determine the value of assets in the Metaverse?

This research question aims to explore the various factors that contribute to the value of assets in the Metaverse and propose appropriate valuation methods.

Research Question 2: How should the accounting rules be specifically designed for dealing with transactions and assets in the Metaverse?

This research question aims to explore the necessary modifications and adaptations required in existing accounting rules to ensure they are suitable for the Metaverse.

Research Question 3: How do we categorize and report assets from the Metaverse in financial statements, and what criteria help us classify them according to accounting standards?

The question aims to investigate the methodologies and criteria employed in categorizing and reporting virtual assets from the Metaverse in financial statements.

II. LITERATURE REVIEW

Metaverse assets possess distinctive characteristics that set them apart from traditional capital assets [14,15]. Firstly, they are non-fungible which means each asset possesses a uniqueness that cannot be replaced by another asset [5]. This is in contrast to fungible digital assets like Bitcoin [16]. Secondly, metaverse assets exhibit interoperability, allowing their use across various metaverse platforms and enabling users to transport assets between virtual worlds [1]. This fosters a continuous virtual experience for users. Finally, metaverse assets are decentralized, residing on a decentralized blockchain network rather than under centralized control. This decentralized nature ensures transparent ownership and value, making them impervious to manipulation [8]. The value of metaverse assets hinges largely upon rarity and demand within the metaverse community, rendering them attractive for investment purposes [6]. According to Yemenici [17], the metaverse economy has the potential to reach a significant dollar value in the near future. It emphasizes the importance of the Metaverse for organizations and investors who are looking to invest in this virtual world.

The valuation of assets in the Metaverse is a complex issue influenced by various factors. Huang et al. [12] emphasize the importance of considering both intrinsic and extrinsic factors, such as design, rarity, and market forces. Building on this, Chen and Cheng [13] and Kalyvaki [14] further explore the metaverse economy, highlighting the role of property rights, scarcity, and blockchain technology. Lee [18] contributes by discussing the imperative of managing the hype surrounding the Metaverse to ensure its sustainable growth by highlighting the importance of adopting a balanced and cautious approach.

Furthermore, Tlili et al.'s [19] review of metaverse implementation across various industries sheds light on the necessity for international collaboration and proactive consideration of potential ethical and regulatory concerns. These studies collectively emphasise the multifaceted nature of asset valuation in the Metaverse and the need for a holistic approach that considers both economic and user-related factors.

According to Huang et al. [12] the process of valuing assets in the Metaverse is a complicated and continually developing procedure and explores various methodologies including market-based, income-based, and cost-based approaches. However, there is a need for further research to refine these methods and develop more nuanced valuation techniques that adequately capture the unique attributes of Metaverse assets. Deng et al. [20] characterize the Metaverse as a post-reality universe by emphasizing its integration of diverse technologies and social interactions. This integration is poised to disrupt service marketing and management as suggested by Gursoy et al. [21], who explore the potential impacts on the creation and delivery of service experiences. Additionally, Tlili et al. [19] discuss the broader implications of Metaverse adoption across various industries by highlighting the opportunities and challenges it presents.

The literature suggests that the emergence of the Metaverse poses significant challenges for accounting and auditing practices, primarily due to the inadequacy of traditional standards in capturing the complexities inherent in virtual assets [3]. Pandey and Gilmour [7] and Zadorozhnyi et al. [3] advocate for the development of new accounting standards specifically designed to address the unique characteristics of virtual assets, such as their intangibility and transferability. These calls for new standards reflect the growing recognition within the academic community of the limitations of current accounting practices in accurately valuing and reporting virtual assets within the Metaverse.

Additionally, Karyagdi [22] emphasizes the need for updated audit methodologies tailored to the Metaverse environment. With the decentralized and digital nature of transactions in this area, traditional audit methods may struggle to effectively verify the accuracy and reliability of financial information. Therefore, there is a need to explore innovative audit approaches that can adapt to the dynamic and complex nature of transactions within the Metaverse.

Furthermore, Muravskiy et al. [8] highlight the importance of enhancing the accounting and auditing of electronic transactions in the Metaverse. Given the prevalence of digital transactions and the potential for fraud and manipulation in virtual environments, improving the transparency and accuracy of financial reporting is crucial for maintaining trust and confidence in the Metaverse economy.

The proposition of developing distinct accounting standards tailored for the Metaverse [23] is a multifaceted endeavour that requires meticulous consideration. Such standards would need to encompass the recognition and treatment of non-current intangible assets, non-fungible tokens (NFTs), and cryptocurrencies within the accounting framework. Pandey and Gilmour [7] and Rosenberg [23]

further emphasise the essential of new standards to accurately assess the value of these assets for financial reporting purposes. However, the absence of a regulatory framework and the fragmented nature of jurisdictions in the Metaverse present formidable hurdles.

Despite these challenges, Kalyvaki [14] also clarifies the potential for personalized marketing promotion within the Metaverse by suggesting an avenue for businesses to explore. Providing a broader contextual backdrop, Flores-Galea [24] depict the Metaverse as a post-reality universe and a networked array of immersive environments by offering a foundational understanding of the discussions surrounding the development of accounting standards in this evolving digital landscape.

The categorization and reporting of assets originating from the Metaverse present remarkable hurdles due to their intangible and virtual nature [3,25]. These challenges are exacerbated by the absence of a regulatory framework and the diverse legal jurisdictions within the Metaverse. Pandey and Gilmour [7] further underscores the necessity for new standards aimed at assessing the value of these assets for financial reporting purposes by indicating a persistent need for regulatory clarity and standardized practices in this field.

In addition to accounting and financial considerations, the legal landscape of the Metaverse poses its own complexities [8, 14,22]. Challenges related to intellectual property, privacy, and jurisdiction further compound the already intricate environment of the Metaverse. The particular concern is the application of legislation pertaining to intellectual property within the Metaverse, which presents unique challenges and requires interdisciplinary approaches for effective resolution [14]. This highlights the necessity for collaborative efforts between legal scholars, policymakers, and industry stakeholders to navigate the complex legal terrain of the Metaverse.

Kud [25] provides a categorization framework for virtual assets within the Metaverse by delineating them into virtual currencies, virtual goods, and virtual real estate, each necessitating distinct criteria for classification. Also, it delves deeper into the phenomenon of virtual assets within the economic and legal contexts, emphasizing the imperative of a clear understanding and systematic classification. Additionally, Kalyvaki [14] delves into the legal complexities of the Metaverse, particularly regarding intellectual property, privacy, and jurisdiction, advocating for interdisciplinary approaches and the development of specific laws and regulations tailored to the unique challenges posed by virtual environments.

III. METHODOLOGY

A. Research Design

This study utilizes qualitative research methods to explore the perspectives and insights of accounting professionals concerning Metaverse assets. Qualitative research is appropriate for this study as it allows for an in-depth exploration of participants' viewpoints and experiences, providing a comprehensive understanding of accounting practices within the Metaverse. The research design is based

on conducting in-depth interviews with accounting professionals in Bath and Bristol in the UK.

Table 1 shows the topic related to the interview and its connection to the research questions.

TABLE I. TOPICS RELATED TO THE INTERVIEW

RQ1: <i>How can we accurately determine the value of assets in the Metaverse?</i>	Virtual real estate and its value in the metaverse.
	Factors influencing asset prices within the metaverse, such as popularity, rarity, competition, quality, Availability, demand, and market conditions.
	The impact of external factors on asset prices in the metaverse, such as economic trends, geopolitical events, and changes in technology.
RQ2: <i>How should the accounting rules be specifically designed for dealing with transactions and assets in the Metaverse?</i>	Valuation and measurement
	Jurisdictional and virtual world considerations
	Metaverse Regulation
RQ 3: <i>How do we categorize and report assets from the Metaverse in financial statements, and what criteria help us classify them according to accounting standards?</i>	Legal and Accounting Considerations
	Various types of assets exchanged and purchased within the Metaverse consist of digital assets, currencies, tokens, and collectibles.
	Various types of assets exchanged and purchased within the Metaverse consist of digital assets, currencies, tokens, and collectibles.
	Tracking and reporting

A. Participants

Fourteen accountants working in Bath and Bristol, UK were selected as participants for this study. The accountants who demonstrated a genuine interest and some level of understanding of metaverses and digital assets, alongside their accounting expertise, were selected for this research. This approach ensured that the study benefited from the perspectives of individuals who were not only seasoned accountants but also had a degree of insight into the unique challenges and dynamics of managing assets within the metaverse.

B. Data Collection

Semi-structured interviews were conducted with the selected accountants to gather qualitative data. The interviews were held in-person to facilitate candid discussions and foster an environment conducive to open dialogue. In-person interviews were chosen to allow for non-verbal cues and to establish rapport with the participants. Open-ended questions were utilized to explore a wide range of topics, including but not limited to the definition of Metaverse assets, challenges in their valuation, accounting standards and practices in virtual environments, and the potential impact of Metaverse assets on traditional accounting practices.

Each interview session lasted approximately 20 to 30 minutes, allowing sufficient time for participants to express their opinions and insights. The interviews were audio-recorded with the participants' consent to ensure accurate data transcription and analysis.

C. Data Analysis

Thematic analysis was employed to extract meaningful themes, patterns, and insights from the interview transcripts. Thematic analysis is a widely used qualitative data analysis method that allows for the identification of recurring concepts and emerging themes within the data. This process aims to uncover nuanced perspectives and key challenges faced by accountants in accounting for assets within the Metaverse.

The recorded interviews were transcribed precisely to ensure the accuracy and completeness of the data. The transcripts were investigated to gain familiarity with the data and to identify initial codes and categories. The coding process involved systematically assigning labels or codes to segments of data that represent meaningful concepts or ideas. These codes were then grouped into categories based on their similarities and relationships.

IV. FINDINGS AND DISCUSSION

The three main research questions were investigated via this research.

Research Question 1: *How can we accurately determine the value of assets in the Metaverse?*

The results of the study indicate that the determination of asset values within the metaverse is a complex process influenced by various factors, as shown in Table 2.

One of the key factors identified in this study is spatial positioning within virtual environments. Accountant 3 emphasizes that spatial positioning is a critical factor influencing asset visibility and desirability in the Metaverse. This finding is supported by Lee et al. [1], who discuss the significance of strategic placement in enhancing asset visibility and desirability. This suggests that assets located in prime positions within virtual environments are more likely to be perceived as valuable.

Another factor identified is the level of user interaction with assets. Accountant 5 indicates that assets with high levels of user interaction are perceived as more valuable. This view is similar to the findings of Ahn et al. [4], who highlight the importance of user engagement in driving up demand for specific assets. Therefore, it can be said that assets that offer a high level of user interactivity are more likely to be valued highly.

Furthermore, Accountant 8 emphasizes the pivotal role of underlying demand from virtual communities in asset valuation. This finding aligns with research by Chen and Cheng [13], which highlights the importance of assets catering to specific demographics. This implies that assets that meet the specific demands of virtual community members are more likely to be valued highly.

Scarcity or abundance of similar assets is also identified as a critical factor shaping asset values. Accountant 6

mentions that scarcity adds exclusivity and drives up asset value, which is supported by Pamucar and Biswas [6] and Huang et al. [12]. According to accountant 11, an oversupply of similar assets can lead to decreased value due to heightened competition. This finding is aligned with Damasevicius' findings [11]. Thus, scarcity and exclusivity can contribute to higher asset values, while oversupply can lead to decreased values.

The observations made by Accountant 14 regarding competitive dynamics and differentiation align with previous findings by Lee [18] and Chen and Cheng [13], indicating that assets that differentiate themselves from competitors are more likely to be highly valued. Accountant 4's focus on perceived quality and craftsmanship influencing asset valuations is supported by Beigman et al. [15], advising that assets with high perceived quality and craftsmanship are more likely to be highly valued. Accountant 7's observations on the drivers of asset values, such as economic conditions and market sentiment, are consistent with research conducted by Huang et al. [12], demonstrating that external factors can significantly impact asset values in the metaverse.

The observations of Accountant 1 and Accountant 3 both support the idea that scarcity and meeting specific user demands can drive the value of assets. Accountant 1's observation aligns with Huang et al. [12] that limited access or availability can lead to higher prices due to perceived rarity and exclusivity. Accountant 3's emphasis on meeting specific user demands highlights the importance of catering to the diverse preferences and needs of virtual environment users. Niche assets that effectively address these demands are likely to be valued more highly. It is supported by Chen and Cheng [13].

Accountant 6's insight suggests that users are willing to pay more for high-quality assets due to their superior performance, durability, or aesthetic appeal. This concept is supported by Kalyvaki [14], who emphasizes the importance of asset quality in the metaverse business landscape. Accountant 9 highlights the significance of asset differentiation in competitive markets, emphasizing the need for strategic positioning and branding to capture users' attention and drive demand. This aligns with research by Chen and Cheng [13], which discusses the importance of assets catering to specific demographics. Differentiation strategies can influence users' perceptions of value and willingness to pay.

Accountants 2 and 7 emphasize the sophisticated relationship between external economic factors and asset valuation within virtual environments. Accountant 2's statement regarding the impact of economic stability is similar to Huang et al. [12], which discusses how fluctuations in real-world economic conditions directly influence user spending habits and asset prices in virtual economies. This empirical evidence supports the idea that economic stability is a crucial determinant of asset valuation within virtual environments.

In addition to the above, Accountant 7's observation on the correlation between real-world market patterns and user behavior in the metaverse aligns with research by Chohan [5], who investigates the impact of cryptocurrency values on

consumer behavior in virtual economies. It highlights that changes in real-world market sentiment can greatly affect user spending behavior and asset prices in virtual environments. This evidence supports the argument that external economic forces significantly shape asset valuation dynamics in the metaverse, emphasizing the need to consider these factors in decision-making processes.

Accountant 11's discussion focuses on monitoring geopolitical developments in relation to virtual asset valuation. It demonstrates the impact of geopolitical events on virtual economies which leads to market volatility and uncertainty. Additionally, observation includes the regulatory challenges in the metaverse. It indicates that regulatory actions can influence investor sentiment and asset values. These findings align with Damasevicius [11] and Rosenberg [23]. It can be said that external economic and geopolitical forces are interconnected with asset valuation dynamics in the metaverse. Recognizing the potential impact of these factors allows organizations to understand uncertainty sources and incorporate risk management strategies into decision-making processes. Accurately assessing asset values and navigating the complexities of the metaverse economy requires considering these factors.

The importance of regulatory clarity and transparent governance frameworks in the metaverse is highlighted by Accountant 4. This aligns with Flores-Galea [24] and Zadorozhnyi et al. [3] findings that emphasize the role of effective governance mechanisms in shaping virtual environments. These frameworks are essential for defining ownership rights, ensuring transactional transparency, and resolving disputes, ultimately fostering trust and confidence among users and investors. Accountant 9 emphasizes the importance of community-driven protocols in governance frameworks which aligns with Lee et al. [1]. Actively engaging users and stakeholders in decision-making processes ensures that the governance structures of the metaverse reflect the diverse interests and needs of its participants, contributing to the stability and growth of the virtual economy. Effective regulatory mechanisms, community-driven protocols, and platform policies provide a solid foundation for the metaverse to thrive and safeguard the value and integrity of virtual assets.

Accountant 6 indicates the importance of cultural alignment in determining asset value within the metaverse. This discussion is supported by Lee et al. [1]. Assets that resonate with cultural preferences tend to be highly desirable and lead to increased value. Additionally, Accountant 11 emphasizes the need to adapt to evolving social dynamics, which is crucial for maintaining asset relevance and value. Chen and Cheng [13] confirm this by highlighting the importance of staying attuned to shifts in social trends. Together, these insights emphasize the critical role of cultural and social considerations in shaping the perceived value of assets within virtual environments.

Accountant 2's emphasis on the transformative impact of technological innovations such as blockchain integration. It aligns with Zadorozhnyi et al. [3] who discuss how blockchain technology enhances asset security and transparency by contributing to increased perceived value

within virtual environments. Additionally, Accountant 7's highlighting of the importance of interoperability is supported by Zainab et al. [2], which emphasize the significance of assets capable of seamless interaction across various virtual platforms. These findings collectively underscore the pivotal role of technological innovation and interoperability in shaping asset valuation dynamics within the evolving metaverse landscape.

Accountant 5 indicates the significance of user engagement in driving up demand for assets. It is supported by Chen and Cheng [13] who discuss how heightened levels of user interaction contribute to increased demand for specific assets within virtual environments, consequently enhancing their value. Additionally, Accountant 10's emphasis on collective perceptions aligns with research findings by Andrade and Brandalise [9], which highlight the role of community preferences and trends in shaping the perceived value of assets. These findings collectively highlight the pivotal role of user-generated content, social interactions, and collective perceptions in influencing asset demand and valuation within the metaverse.

Accountant 13's emphasis on the importance of understanding user preferences, engagement patterns, and community dynamics aligns with existing research in the field. Studies such as those by Pandey and Gilmour [7] and Flores-Galea [24] highlight the significant influence of user behavior and community dynamics on asset values within virtual environments. By adapting to evolving user behavior and community trends, assets can maintain their relevance and perceived value in the dynamic landscape of the metaverse. This indicates the critical role of user-centric approaches in accurately assessing and predicting asset values within virtual environments.

Table 2 summarises the key themes from the research question 1.

TABLE II. THE KEY THEMES FROM THE RESEARCH QUESTION 1

Valuation Factors in the Metaverse: Spatial positioning, engagement, demand, scarcity, competition, quality, economy.
Intrinsic Metaverse Dynamics: Accessibility, demand, quality, competition within virtual markets.
External Economic and Geopolitical Forces: Economic fluctuations, market trends, geopolitical events, regulatory actions.
Emerging Metaverse Governance Frameworks: Regulatory mechanisms, community-driven protocols, ownership rights.
Cultural and Social Contexts: Cultural preferences, social norms, emerging trends in user groups.
Technological Innovation and Interoperability: Blockchain, AR, VR advancements, interoperability between platforms.
User Behavior and Community Dynamics: User-generated content, social interactions, collective perceptions.

In the rapidly evolving background of the metaverse, asset valuation is subject to constant change due to various dynamic factors. For example, technological advancements such as the integration of blockchain, augmented reality (AR), and virtual reality (VR) continually reshape the virtual environment, impacting the perceived value of assets. Moreover, market trends such as shifts in consumer behavior or fluctuations in cryptocurrency values can lead to rapid changes in asset prices. Regulatory changes, such as the introduction of new

laws governing virtual economies or platforms, also contribute to the dynamism of asset valuation. Accountants recognize the need for continuous monitoring and adaptive strategies to effectively respond to these shifting dynamics and optimize asset values over time.

User demand is a central driving force behind asset valuation within the metaverse. It reflects the preferences, behaviors, and interactions of virtual community members. For instance, assets that offer unique features or experiences tailored to user preferences tend to attract higher demand and command higher prices. Additionally, community dynamics, such as the formation of virtual economies or social networks within specific platforms, influence the perceived value of assets. Accountants emphasize the importance of understanding user behavior and leveraging community dynamics to optimize asset value and market positioning within virtual ecosystems.

Asset valuation within the metaverse requires a holistic approach that considers both internal and external factors. Internal factors, such as the characteristics of assets, platform dynamics, and user interactions, interact with external influences such as economic conditions, regulatory frameworks, and socio-cultural trends to collectively shape asset values. For example, economic downturns may lead to decreased user spending power, impacting asset demand and prices. Similarly, changes in regulatory frameworks or cultural trends can affect the perceived value of assets within virtual environments. Accountants emphasize the importance of integrating diverse dimensions to gain deeper insights into asset dynamics and identify opportunities for value enhancement.

With the evolution of the metaverse, the establishment of effective governance frameworks becomes increasingly crucial in shaping asset values. Regulatory mechanisms, community-driven protocols, and platform policies define ownership rights, transactional transparency, and dispute-resolution mechanisms, influencing the perceived value and stability of virtual assets. For instance, clear regulations that protect users' rights and ensure fair transactions can foster trust and confidence in virtual asset markets, leading to increased asset values. Accountants emphasize the importance of developing and adopting robust governance frameworks to promote trust, stability, and investor confidence within the metaverse.

Cultural and social contexts exert a significant influence on asset valuation within the metaverse. It suggests the preferences, norms, and trends of virtual communities. For instance, assets that align with cultural preferences or cater to emerging social trends are likely to be more desirable and command higher prices. Additionally, social interactions and collective perceptions within virtual communities shape the demand for certain assets, driving their value up or down. Accountants highlight the importance of understanding and adapting to cultural and social dynamics to effectively establish and maintain asset values within the metaverse, as they influence user perceptions, preferences, and behaviors in virtual environments.

Table 3 shows the identified patterns based on the Research Question 1.

TABLE III. IDENTIFIED PATTERNS IN RESEARCH QUESTION 1

Dynamic Nature of Asset Valuation: Rapid fluctuations, user behavior, technology, regulations
Centrality of User Demand: Engagement, preferences, driving prices.
Integration of Internal and External Factors: Attributes, interactions, economic conditions, regulations.
Emergence of Governance Frameworks: Ownership rights, transparency, regulations, stability.
Impact of Cultural and Social Contexts: Community dynamics, perceptions, behaviors, adaptation.

Research Question 2: *How should the accounting rules be specifically designed for dealing with transactions and assets in the Metaverse?*

Six key themes emerged from the analysis of the interviews with fourteen accountants in Table 4. Each theme is discussed in detail below.

Accountant 3 highlighted the importance of legal recognition in establishing a framework for understanding the rights and obligations associated with virtual assets which is crucial for investor confidence. Similarly, Accountant 8 indicated the necessity of consistent valuation methodologies to provide accurate financial information. This view was supported by Accountant 12, who emphasized the need for valuation approaches capturing the unique characteristics of virtual assets. Compliance with standards was highlighted by Accountant 6, promoting transparency and comparability in financial reporting. Accountant 10 reinforced this by observing that transparent valuation practices foster trust and credibility, attracting a broader investor base.

These perspectives are supported by research such as that of Rosenberg [23], which delves into the regulatory landscape of the metaverse, emphasizing the importance of legal recognition for virtual assets. Additionally, the study by Huang *et al.* [12] provides insights into valuation analysis methods in the metaverse, corroborating the significance of consistent valuation methodologies. Furthermore, Kalyvaki [14] discusses the implications of asset quality on metaverse business which aligns with Accountant 6's emphasis on the importance of compliance with standards for transparency and comparability in financial reporting. Similarly, the research by Chen and Cheng [13] sheds light on the economic aspects of the metaverse, supporting the notion that transparent valuation practices are essential for attracting investors.

Accountant 2 emphasized the use of blockchain or distributed ledger technology for precise monitoring of asset ownership and transactions. Accountant 7 supported this by discussing the enhancement of audit capabilities and the reliability of financial reporting. Furthermore, Accountant 11 emphasized the need for consistent reporting practices across jurisdictions, in compliance with standards and regulatory requirements. These measures collectively enhance the integrity and dependability of financial information, fostering trust among stakeholders.

Flores-Galea [24] discusses the transformative potential of blockchain technology in enhancing the security and transparency of transactions within the metaverse, supporting Accountant 2's emphasis on its utility. Additionally, Pandey and Gilmour [7] explore the implications of integrating blockchain in accounting practices, aligning with Accountant 7's perspective on improved audit capabilities. Furthermore, the study by Rosenberg [23] delves into the regulatory landscape of the metaverse, reinforcing the importance of consistent reporting practices for regulatory compliance.

Accountant 3 highlighted complexities surrounding custody requirements and asset segregation, while Accountant 8 emphasized adherence to specific laws governing virtual transactions. Addressing regulatory compliance considerations, as mentioned by Accountant 6, is crucial for mitigating legal risks and ensuring adherence to applicable laws. These efforts are essential for fostering trust and legitimacy in metaverse asset transactions.

These observations align with existing literature. Zadorozhnyi *et al.* [3] discuss the challenges of accounting and auditing in the metaverse, shedding light on custody requirements and legal complexities. Similarly, Andrade and Brandalise [9] explore the regulatory landscape of virtual currencies, supporting Accountant 8's emphasis on adherence to specific laws [26]. Moreover, the study by Rosenberg [23] provides insights into the regulation of the metaverse, reinforcing the importance of regulatory compliance for trust and legitimacy.

Accountant 4 emphasized factors such as fair market value and projected lifespan in asset evaluation and classification, while Accountant 9 highlighted revenue potential. Continuous monitoring and reassessment of asset values, as indicated by Accountant 13, are crucial for accurately reflecting changes in market conditions and user preferences. Robust valuation methodologies and ongoing evaluation processes maintain the relevance and reliability of asset information in financial reporting.

Beigman *et al.* [15] discuss the dynamic nature of fair value measurement in cryptocurrency markets, aligning with Accountant 4's emphasis on fair market value. Additionally, Pamucar and Biswas [6] propose a hybrid decision-making framework for comparing market performance of metaverse crypto assets, providing insights into revenue potential, as highlighted by Accountant 9. Furthermore, the study by Muravskiy *et al.* [8] delves into accounting and audit practices in electronic transactions in metaverses, supporting the importance of robust valuation methodologies and ongoing evaluation processes.

Accountant 2 highlighted the critical role of independent audits in verifying the completeness, accuracy, and validity of metaverse asset transactions and valuations. Accountant 6 emphasized comprehensive reviews of blockchain records and assessment of internal controls to enhance transparency and accountability. Rigorous audit standards, mentioned by Accountant 9, ensure consistency and compliance in financial information related to metaverse assets. Providing assurance on financial information enhances trust among stakeholders.

Flores-Galea [24] discusses the importance of regulatory solutions for large-scale consumer platforms in the metaverse, emphasizing the need for comprehensive audits. Additionally, Damasevicius [11] explores the role of social engineering in the metaverse environment, highlighting the importance of internal controls in ensuring transparency. Furthermore, Pandey and Gilmour [7] delve into the intersection between the real and virtual worlds in accounting, supporting the need for rigorous audit standards and assurance practices in the metaverse.

Accountant 5 highlighted the importance of identifying and assessing risks specific to virtual environments, such as cybersecurity threats and regulatory uncertainties. Accountant 10 emphasized transparent disclosure of significant risks and uncertainties in financial statements to enhance transparency and foster trust among investors. Integrating robust risk management frameworks and disclosure requirements into financial reporting practices, as discussed by Accountant 8, addresses unique challenges and uncertainties associated with metaverse assets.

Rosenberg [23] discusses the regulation of the metaverse and the importance of addressing cybersecurity threats and regulatory uncertainties to protect asset values. Additionally, Kud [25] provides a comprehensive classification of virtual assets by highlighting the need for transparent disclosure of risks in financial reporting. Moreover, Beigman *et al.* [15] explore fair value measurement of cryptocurrency and emphasize the significance of integrating robust risk management frameworks into financial reporting practices.

TABLE IV. THE KEY THEMES FROM THE RESEARCH QUESTION 2

Legal Recognition and Valuation: Legal recognition, valuation methodologies, regulatory compliance, clarity, classification, treatment, financial instruments.
Tracking and Reporting: Tracking, reporting, transparency, accountability, blockchain technology, distributed ledger, auditability, reliability, consistency, financial reporting.
Jurisdictional and Virtual World Restrictions: Compliance, jurisdictional regulations, virtual environment rules, challenges, limitations, custody requirements, asset segregation, legal risks, trust, legitimacy.
Evaluation and Classification: Evaluation, classification, fair market value, projected lifespan, revenue potential, continuous monitoring, robust valuation methodologies, relevance, reliability.
Auditing and Assurance Practices: Auditing, assurance practices, independent audits, completeness, accuracy, validity, blockchain records, internal controls, transparency, accountability.
Risk Management and Disclosure Requirements: Risk management, disclosure requirements, cybersecurity threats, regulatory uncertainties, informed decision-making, investor protection, transparency, trust.

The result highlights the significance of metaverse assets complying with legal and regulatory requirements in Table 5.

Accountants indicate the significance of legal and regulatory compliance within the metaverse by highlighting the importance of adhering to established standards and guidelines. By obtaining recognition from governing entities and ensuring compliance with accounting norms and reporting requirements, virtual assets can be properly

classified and treated within a framework that promotes transparency and trust in financial reporting.

Ensuring consistency and reliability in financial reporting is paramount for metaverse assets. Accountants emphasize the need for accurate tracking, reporting, and auditing procedures supported by blockchain or distributed ledger technology. Standardized reporting practices across jurisdictions enhance comparability and facilitate informed decision-making, ultimately contributing to transparent and accountable financial reporting practices.

Professionals engage in categorizing metaverse assets based on factors such as user engagement, market demand, and technological obsolescence to assess their fair market value and expected lifespan accurately. Categorization and appraisal methodologies inform investment decisions and provide insights into the financial health of entities operating within the metaverse, guiding strategic planning and resource allocation.

Accountants recognize the necessity of adopting innovative technologies like blockchain or distributed ledger technology to ensure accurate tracking and reporting of metaverse assets. These technologies offer secure and transparent means of recording asset ownership and transactions, enhancing auditability and reliability. The transformative potential of emerging technologies streamlines financial processes and bolsters the integrity of financial information associated with metaverse assets.

Prioritizing transparency and disclosure regarding risks associated with metaverse assets is crucial for accountants. Transparent disclosure of significant risks and uncertainties in financial statements allows stakeholders to evaluate the impact of risk factors on asset valuation and financial performance. Enhanced transparency fosters trust among investors and stakeholders and facilitates informed decision-making in virtual asset markets.

TABLE V. IDENTIFIED PATTERNS IN RESEARCH QUESTION 2

Legal and Regulatory Compliance: Standards, recognition, adherence, transparency, governance, reporting requirements, classification, framework.
Consistency and Reliability in Financial Reporting: Accuracy, dependability, tracking, auditing, blockchain, accountability, standardized practices, comparability.
Categorization and Appraisal of Metaverse Assets: Current, non-current, fair market value, lifespan, user engagement, investment decisions, financial health.
Adoption of Innovative Technologies: Blockchain, distributed ledger technology, secure, transparent, recording, auditability, transformative potential.
Enhanced Transparency and Disclosure: Risks, uncertainties, disclosure, assessment, valuation impact, trust, informed decision-making.
Continuous Monitoring and Evaluation: Adaptation, reassessment, market dynamics, opportunities, risk mitigation, asset transactions.

Accountants stress the importance of continuous monitoring and evaluation of metaverse assets to adapt to evolving market conditions and user preferences. Regular reassessment of asset values and updates to categorization and appraisal methodologies reflect changes in market dynamics,

enabling entities to identify emerging opportunities and mitigate potential risks associated with metaverse asset transactions.

Research Question 3: *How do we categorize and report assets from the Metaverse in financial statements, and what criteria help us classify them according to accounting standards?*

Accountant 1 emphasizes the necessity of staying updated on evolving regulatory frameworks, noting their significant impacts on accounting practices. Similarly, Accountant 2 highlights the importance of complying with legislation directly affecting data management and financial reporting. Accountant 3 observes that regulatory compliance is vital for navigating legal risks associated with virtual assets by emphasizing the need for proactive measures to ensure adherence to evolving standards.

These perspectives align with the literature on metaverse regulation. Flores-Galea [24] explores the regulatory roadmap for the metaverse, emphasizing the risks and solutions for large-scale consumer platforms. Additionally, Andrade and Brandalise [9] discuss the volatility behavior of virtual currencies in relation to regulatory challenges. The insights from Accountants 1, 2, and 3 strengthen the critical role of compliance and staying informed about evolving regulations in navigating the complex landscape of the metaverse.

Accountants present the paramount importance of compliance with regulatory requirements and effective risk management strategies in the metaverse. They emphasize the necessity of adhering to evolving frameworks to mitigate risks such as fraud, theft, and data breaches. Transparent disclosure of risks in financial statements is deemed indispensable for fostering investor confidence, highlighting the critical need for robust compliance programs and risk management frameworks tailored to the metaverse's unique dynamics.

Pandey and Gilmour [7] discuss the intersection of accounting and the metaverse by emphasizing the importance of addressing regulatory challenges. Similarly, Muravskiy *et al.* [8] explore the accounting and audit of electronic transactions in metaverses by underlining the need for robust risk management frameworks. The alignment between the perspectives of accountants and the findings of these studies emphasizes the importance of proactive compliance and risk management strategies in navigating the complexities of the metaverse.

Accountants highlight the challenge of balancing governmental legislation and GAAP in handling metaverse assets. They indicate the importance of maintaining transparency and compliance by aligning financial reporting practices with both legal frameworks and GAAP standards. Consistency in reporting is emphasized to uphold credibility and reliability by highlighting the complexity of navigating regulatory landscapes while adhering to established accounting principles in the metaverse.

Andrade and Brandalise [9] discuss the volatility behavior of virtual currencies, shedding light on the intricacies of regulatory compliance in emerging digital asset markets. Additionally, Gursoy *et al.* [21] examine the implications of

the metaverse in services marketing, highlighting the need for aligning accounting practices with evolving regulatory environments. The alignment between the perspectives of accountants and the findings of these studies highlights the complexity of harmonizing governmental legislation and GAAP standards in the context of the metaverse.

Accountants encourage for the development of emerging standards and best practices tailored to the complexities of the metaverse. They emphasize collaborative efforts among industry stakeholders, regulatory bodies, and standard-setting organizations to establish comprehensive guidelines. Standardized asset classification criteria and transparent disclosure requirements are deemed essential to enhance investor confidence and foster transparency in virtual asset markets.

These recommendations align with the findings of academic research. Lee *et al.* [1] discuss the challenges and open questions surrounding the metaverse, highlighting the need for standardized frameworks to address emerging issues. Similarly, Flores-Galea [24] explores the business opportunities propelled by metaverse technologies, emphasizing the importance of transparent and reliable financial reporting practices. The convergence between the insights of accountants and the perspectives presented in these studies underscores the imperative of developing robust standards and best practices to address the unique challenges of the metaverse and promote transparency and credibility in virtual asset markets.

Accountants recognize the pivotal role of auditing and assurance in upholding the reliability and accuracy of financial reporting for metaverse assets. They mention the importance of independent audits and assurance engagements in verifying the completeness, accuracy, and validity of financial information. Rigorous audits are deemed necessary to ensure compliance with regulatory requirements and accounting standards by emphasizing the critical role of auditing and assurance practices in bolstering transparency and trust in financial reporting within the metaverse.

Beigman *et al.* [15] discuss dynamic principal market determination and fair value measurement of cryptocurrency by highlighting the importance of rigorous audit practices in ensuring the accuracy of financial information. Similarly, Pamucar and Biswas [6] propose a hybrid decision-making framework for comparing the market performance of metaverse crypto assets, emphasizing the need for comprehensive audits to enhance transparency and accountability. The alignment between the insights of accountants and the findings of these studies underscores the critical role of auditing and assurance practices in promoting transparency, credibility, and trust in financial reporting within the metaverse.

The results of the analysis reveal several patterns (Table 7) in the responses of accountants regarding the impact of specific legislation and the emphasis on accounting standards in the context of the metaverse. These patterns provide valuable insights into the importance of understanding and complying with relevant laws and following established

accounting principles in the accounting and reporting of metaverse assets.

TABLE VI. THE KEY THEMES FROM THE RESEARCH QUESTION 3

The Evolving Regulatory Landscape: Regulation, Technological advancements, Legal challenges, EU's General Data Protection Regulation (GDPR), Computer Fraud and Abuse Act (CFAA), Electronic Communications Privacy Act (ECPA), Compliance measures.
The Importance of Compliance and Risk Management: Compliance, Risk management, Fraud, Theft, Data breaches, Transparent disclosure, Investor confidence, Robust compliance programs, Regulatory compliance.
The Integration of Governmental Legislation and Generally Accepted Accounting Principles (GAAP): Governmental legislation, GAAP, Classification, Presentation, Legal aspects, Financial statements, Reporting, Valuation methodologies.
Emerging Standards and Best Practices: Emerging standards, Best practices, Collaboration, Industry stakeholders, Regulatory bodies, Standard-setting organizations, Categorization, Presentation, Transparency, Comparability.
Auditing and Assurance Considerations: Auditing, Assurance, Independent audits, Financial reporting, Completeness, Accuracy, Validity, Regulatory requirements, Internal controls, Transparency.

Reference to specific legislation, such as the General Data Protection Regulation (GDPR), Computer Fraud and Abuse Act (CFAA), and Electronic Communications Privacy Act (ECPA), is crucial for professionals operating within the metaverse. These laws dictate standards for data privacy, cybersecurity, and electronic communications, making compliance essential to mitigate legal risks. Stakeholders must remain informed about these regulations and implement proactive measures to ensure alignment with applicable laws and regulations. This recognition underscores the importance of understanding and adhering to specific legal requirements, emphasizing the need for comprehensive compliance strategies tailored to the unique challenges of the metaverse.

Accountants consistently emphasize the importance of adhering to accounting standards, particularly the Generally Accepted Accounting Principles (GAAP), in the context of the metaverse. GAAP provides guidance for accounting procedures and reporting practices related to virtual assets, ensuring consistency and transparency in financial statements. By following GAAP principles, stakeholders can effectively classify assets, determine valuation methodologies, and disclose relevant information, thereby enhancing investor confidence and facilitating informed decision-making in virtual asset markets. This pattern highlights the critical role of accounting standards in maintaining integrity and reliability in financial reporting within the dynamic environment of the metaverse.

The integration of technological innovations, such as blockchain and distributed ledger technology, is a pivotal focus for stakeholders operating within the metaverse. These advanced technologies offer significant potential to revolutionize accounting practices by improving the accuracy, transparency, and security of financial transactions and reporting processes. By leveraging blockchain and distributed ledger technology, stakeholders can streamline accounting procedures, enhance auditability, and effectively

mitigate risks associated with virtual asset transactions. This emphasis on technological innovation underscores the recognition of its transformative power within the accounting domain, highlighting the importance of staying abreast of emerging trends and leveraging technological advancements to navigate the complexities of the metaverse effectively. As the metaverse continues to evolve, the integration of these innovations will play a crucial role in shaping the future of accounting practices and ensuring operational efficiency and integrity within virtual asset markets.

Accountants discuss the importance of collaboration with regulatory authorities and standard-setting organizations in developing comprehensive guidelines for accounting practices within the metaverse. This collaboration is seen as essential for addressing emerging challenges and ensuring alignment with evolving regulatory frameworks. By engaging in dialogue with regulatory bodies, industry stakeholders can contribute to the establishment of clear and consistent standards for asset classification, valuation, and disclosure. This, in turn, enhances transparency and comparability in financial reporting within the dynamic landscape of the metaverse. Such collaboration reflects a proactive approach to navigating the complexities of regulatory compliance and promoting confidence and trust in virtual asset markets.

Continuous education and professional development are emphasized by stakeholders to stay updated with evolving regulatory requirements and accounting practices within the metaverse. This pattern highlights the need for accountants and finance professionals to invest in ongoing training and development initiatives to enhance their understanding of virtual asset markets and regulatory compliance obligations. Stakeholders recognize the value of staying informed about industry trends, best practices, and emerging technologies to maintain competence and effectiveness in navigating the complexities of the metaverse. By prioritizing continuous learning, professionals can adapt to changes in the regulatory landscape and leverage new opportunities in virtual asset markets, ultimately contributing to their professional growth and the overall success of their organizations.

TABLE VII. IDENTIFIED PATTERNS IN RESEARCH QUESTION 3

Reference to Specific Legislation: GDPR, CFAA, ECPA, legal requirements, regulatory frameworks, data privacy, cybersecurity, electronic communications, proactive compliance measures
Emphasis on Accounting Standards: GAAP, accounting procedures, financial reporting, asset classification, valuation methodologies, disclosure requirements, consistency, transparency, investor confidence, informed decision-making.
Integration of Technological Innovations: Blockchain, distributed ledger technology, accuracy, transparency, security, financial transactions, reporting processes, technological advancements, auditability, risk mitigation.
Collaboration with Regulatory Authorities: Regulatory authorities, standard-setting organizations, comprehensive guidelines, industry stakeholders, dialogue, emerging challenges, alignment, clear standards, transparency, comparability.
Continuous Education and Professional Development: Ongoing training, development initiatives, virtual asset markets, regulatory compliance, industry trends, best practices, emerging technologies, competence, effectiveness, professional growth.

V. CONCLUSION

The findings and discussions presented in this paper provide valuable insights into the determination of asset values, the generally accepted accounting principles (GAAP) for assessing metaverse assets, and the categorization and presentation of assets originating from the metaverse in financial statements. The analysis of the interview data revealed several key themes and patterns that shed light on these research questions.

The research findings underline the multifaceted nature of asset valuation within the metaverse, revealing a diverse range of factors that influence asset values. These include spatial positioning, user engagement, demographic demand, scarcity, competition, perceived quality, economic conditions, and regulatory actions. Effective governance frameworks, regulatory mechanisms, and community-driven protocols are crucial in shaping asset values and stability.

Furthermore, cultural preferences, emerging trends, and technological innovations contribute significantly to asset valuation dynamics. Transitioning to accounting practices, the study explores the development of tailored Generally Accepted Accounting Principles (GAAP) for the metaverse, highlighting main key themes. These themes encompass legal recognition, accurate tracking, jurisdictional restrictions, asset evaluation, auditing practices, and risk management.

Accountants emphasise the importance of legal compliance, transparent reporting, and continuous monitoring to ensure regulatory adherence and investor confidence. The integration of governmental legislation, GAAP, and innovative technologies like blockchain is essential for robust financial reporting practices within the metaverse. Collaboration with regulatory authorities and ongoing professional development are emphasized to navigate the evolving regulatory landscape and technological advancements effectively.

One limitation of this qualitative study lies in its geographic scope, focusing solely on Bath and Bristol in the UK, and interviewing a limited number of fourteen experienced accountants from this specific region. The study's findings and perspectives may not encompass a broader global understanding of Metaverse accounting practices, potentially limiting the generalizability of the conclusions. Additionally, the qualitative nature of the research, although offering depth and richness in insights, might not provide quantitative or statistically significant data, limiting the ability to draw universally applicable conclusions. The evolving nature of the Metaverse and its regulatory landscape poses another limitation, as the study's findings may become outdated due to rapid changes in technology, regulations, or accounting practices in this emerging field. These constraints emphasize the need for future research to encompass diverse geographical locations, larger sample sizes, and ongoing analysis to keep pace with the continuously evolving Metaverse environment.

This paper provides valuable insights into the determination of asset values, the generally accepted accounting principles for assessing metaverse assets, and the categorization and presentation of assets originating from the

metaverse in financial statements. The findings highlight the complex and dynamic nature of the metaverse market and the need for comprehensive frameworks and guidelines to ensure accurate and transparent financial reporting. The insights gained from the interview data contribute to the existing literature on metaverse accounting and can guide standard-setting bodies in formulating appropriate regulations for this emerging field. Overall, the research presented in this paper contributes to a better understanding of the metaverse and its implications for asset valuation and accounting practices.

This study briefly mentions external influences as one of the factors to consider in determining asset values within the Metaverse. Future research could delve deeper into understanding how external factors such as technological advancements, regulatory changes, and market trends affect the valuation of assets in this virtual landscape. This study highlights the need for comprehensive methodologies and principles tailored to the Metaverse. Further research could focus on identifying the specific challenges faced by standard-setting bodies in formulating GAAP for these virtual assets. Additionally, exploring the opportunities and potential benefits of developing standardized accounting principles for the Metaverse could be beneficial.

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AUTHORS` CONTRIBUTIONS

All authors have participated in drafting the manuscript. All authors contributed equally to the manuscript and read and approved the final version of the manuscript.

CONFLICT OF INTEREST

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

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