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An Overview of the Challenges Facing Accounting in the Metaverse

Faezeh Khodadadi[1,*], Ali Lal Bar[1]

[1] Department of Accounting, Islamic Azad University, Arak, Iran; faeze0527@gmail.com; for_lalbar@yahoo.com.

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Abstract

This research investigates the challenges confronting the accounting field in the emerging metaverse era, aiming to identify existing obstacles and propose solutions for enhancing and developing accounting systems within virtual environments. Employing a systematic review methodology, relevant articles and studies were collected from reputable databases and analyzed to categorize key challenges. The findings reveal significant issues related to the accounting treatment of virtual assets—such as digital currencies, virtual lands, and digital objects—stemming from the absence of specific standards and global consensus. Additionally, the unique nature of income and expenses generated in the metaverse poses complexities for taxation frameworks. Auditing in virtual environments introduces additional challenges, including accessing financial data, evaluating internal controls, and ensuring the accuracy and integrity of financial information, which necessitate innovative tools and approaches. The study also highlights the increased risk of fraud and deception in the metaverse, emphasizing the need for robust mechanisms to detect and prevent such activities. Furthermore, safeguarding user privacy and protecting sensitive financial information from unauthorized access emerge as critical concerns. By addressing these multifaceted challenges, this research contributes to the ongoing discourse on adapting traditional accounting practices to the dynamic and evolving metaverse landscape, offering insights to guide future regulatory and technological advancements in the field.

Keywords: Metaverse, Accounting challenges, Virtual assets, Taxation, Auditing, Fraud prevention, Privacy protection.

1 | Introduction

The metaverse represents a new frontier in human and business interactions, bringing about transformative changes across numerous industries, including accounting. This emerging virtual space introduces novel financial risks, such as extreme volatility in the value of virtual assets, fraud, and money laundering. Accountants are tasked with identifying, assessing, and managing these risks to safeguard organizational

Corresponding Author: faeze0527@gmail.com

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interests. As economic activities within the metaverse expand, the demand for transparent and reliable financial information will inevitably increase. Accountants must ensure financial data related to metaverse activities is accurately reported and made accessible to shareholders, investors, and other stakeholders.

Addressing the challenges of accounting in the metaverse requires the development of innovative tools and technologies. These may include Artificial Intelligence (AI)-based accounting software, blockchain systems for transaction tracking, and Virtual Reality (VR) platforms for conducting audits. Accountants must also acquire new skills to operate effectively in this evolving environment. Such skills encompass knowledge of emerging technologies, proficiency in analyzing big data, and a comprehensive understanding of the digital economy [1]. Given the nascent nature of the metaverse, regulatory frameworks governing financial activities in this domain are still under development. Accountants must remain vigilant about updates to laws and regulations to ensure compliance.

Despite the challenges, the metaverse also presents significant opportunities for the accounting profession. Accountants can serve as advisors, helping organizations design and implement financial strategies tailored to the metaverse. They can also contribute to the development of new financial products and services, leveraging blockchain and digital currency technologies. In summary, examining the challenges facing accounting in the metaverse is essential not only for maintaining organizational financial health but also for fostering the sustainable growth of the digital economy. By addressing these challenges, the accounting profession can harness the full potential of the metaverse and pave the way for a brighter future.

2 | The Metaverse: A New Frontier in Human Interactions

The metaverse is a rapidly emerging concept that is reshaping our digital landscape. Derived from the words "Meta" (Meaning beyond) and "Universe," the term refers to a world that transcends the physical realm. The metaverse can be described as a three-dimensional, persistent virtual space where individuals interact through personalized avatars, engaging in activities such as work, play, and socialization. Enabled by cutting-edge technologies like VR, Augmented Reality (AR), and blockchain, the metaverse facilitates complex and immersive interactions. By eliminating the physical limitations of the real world, it allows users to access this virtual environment at any time and from anywhere. This capability opens up unprecedented opportunities in education, business, entertainment, and social interaction. For instance, students can participate in 3D virtual classrooms and collaborate with peers worldwide, while companies can conduct interactive business meetings in virtual settings [2].

One of the most distinctive features of the metaverse is its decentralized nature. Unlike traditional digital platforms, the metaverse has no central authority governing the data and content within it. Users can interact independently and without intermediaries, fostering the creation of a new digital economy where individuals can buy, sell, and trade digital assets. However, the metaverse also faces significant challenges, including concerns over user privacy, data security, and ethical considerations. Additionally, the infrastructure required to build a global metaverse demands substantial investment. Despite these obstacles, the metaverse holds immense potential to revolutionize how people live, work, and connect, offering unparalleled opportunities to create a cohesive and interactive global society. To fully realize this potential, existing challenges must be addressed, and appropriate legal and regulatory frameworks must be established for this novel environment [3].

2.1 | Differences between the Metaverse and the Current Internet

While both the metaverse and the current internet serve as digital spaces for communication and interaction, there are fundamental distinctions between them, positioning the metaverse as the next evolutionary phase of the internet. The current internet operates as a global network of computers transmitting information via various protocols. It primarily functions as a platform for accessing information and services, with users interacting in a two-dimensional manner. Websites, emails, social networks, and other online services are all built on this framework. In contrast, the metaverse represents a three-dimensional, interactive, and persistent

virtual space where users exist as avatars and engage with their surroundings. Leveraging technologies such as VR, AR, and blockchain, the metaverse enables users to work, shop, play, and even meet with friends and colleagues in a virtual environment [4].

Key differences between the metaverse and the current internet include:

Dimensions: The current internet is predominantly two-dimensional, whereas the metaverse offers a three-dimensional space that provides users with a sense of physical presence.

Interaction: While interactions on the current internet are primarily mediated through screens, the metaverse supports diverse forms of engagement, including body movements, voice commands, and even tactile feedback.

Economy: The metaverse fosters an independent virtual economy where users can buy and sell digital assets, unlike the current internet's reliance on physical currency.

Persistence: The metaverse is designed as a persistent environment where changes are permanent, whereas content on the current internet can be easily modified or deleted.

User experience: The metaverse delivers a richer and more personalized user experience compared to the current internet [5].

In essence, the metaverse represents a natural evolution of the internet, with the potential to transform how we communicate, work, and play. However, significant challenges remain in its development and implementation, necessitating further research and innovation.

2.2 | History of the Metaverse

The concept of the metaverse—a three-dimensional, persistent virtual world where individuals interact through avatars—was first introduced in Neal Stephenson's 1992 science fiction novel Snow Crash. In this visionary work, Stephenson depicted a world where humans immersed themselves in a virtual space, living parallel lives. What seemed far-fetched at the time gradually became a reality as technological advancements and interest in virtual worlds continued to grow. Early steps toward the metaverse can be traced back to multiplayer online games, such as Second Life, which was released in the early 2000s. These games allowed users to create avatars and interact within a virtual environment, demonstrating the feasibility of constructing such a world.

The rise of VR and AR technologies has significantly heightened interest in the metaverse. These innovations enable users to immerse themselves in virtual environments, providing a sense of presence. Major corporations, such as Meta (Formerly Facebook) and Microsoft, have signaled their commitment to the metaverse by making substantial investments, underscoring its potential as the future of the internet [6].

Blockchain technology has also emerged as a cornerstone in the development of the metaverse. By facilitating the creation of stable and secure virtual economies, blockchain allows users to manage digital assets in a decentralized manner. The COVID-19 pandemic further accelerated the adoption of virtual experiences, driving increased momentum in metaverse development. Although the full realization of the metaverse remains a distant goal, recent advancements suggest that this vision is closer than ever [7].

2.3 | Technologies Used in the Metaverse

The metaverse is a complex amalgamation of advanced technologies working synergistically to create a virtual world where users can interact, work, and play. Below is an overview of the key technologies underpinning the metaverse:

Virtual Reality (VR) and Augmented Reality (AR): These technologies form the foundation of the metaverse. VR creates fully immersive virtual environments, while AR overlays digital elements onto the real world, enabling users to interact with virtual objects and spaces.

Blockchain: As a distributed ledger technology, blockchain serves as the economic backbone of the metaverse. It facilitates the creation of unique digital assets (e.g., NFTs), secure payment systems, and trusted virtual environments.

Artificial Intelligence (AI): AI plays a pivotal role in personalizing user experiences within the metaverse. Algorithms analyze user behavior to generate tailored content, while AI-driven virtual characters enhance realism and interactivity [8].

3D reconstruction: This technology enables the creation of realistic virtual environments by digitally reconstructing real-world objects and spaces using 3D scanning and modeling software.

Internet of Things (IoT): Internet of Things (IoT) connects physical devices to the internet, enhancing interactivity within the metaverse. For example, users can control smart home devices in the virtual world using VR headsets.

Cloud computing: Cloud computing ensures scalability, allowing users to access the metaverse from any device. It also processes the vast amounts of data required to create realistic virtual worlds.

5G and 6G networks: These high-speed networks provide the bandwidth and low latency necessary for seamless VR and AR experiences, enabling real-time interactions within the metaverse.

Game engines: Game engines are used to create interactive 3D environments and animated characters, empowering developers to design complex and engaging virtual worlds [9].

As technology continues to advance, the metaverse is expected to evolve rapidly, unlocking new applications and transforming the way we live and work.

2.4 | Applications of the Metaverse

The metaverse, as an emerging paradigm, has the potential to revolutionize various aspects of daily life. This 3D virtual space enables users to interact, work, play, and even reside as digital avatars. Below are some of the most significant applications of the metaverse:

Education: The metaverse can transform teaching methodologies by enabling immersive virtual classrooms. Students can engage with peers globally, interact with complex scientific and historical concepts, and benefit from realistic simulations that deepen their understanding and enhance learning experiences.

Commerce and business: The metaverse offers new avenues for businesses, including virtual storefronts, interactive customer engagement, and remote business meetings. Companies can connect with colleagues and clients seamlessly, regardless of location [10].

Entertainment and gaming: The metaverse holds immense potential for the gaming industry, providing highly interactive and engaging experiences through VR and AR. It also serves as a platform for social events, concerts, and exhibitions.

Health and medicine: Applications in healthcare include medical education, remote surgeries, patient consultations, and psychological therapies. Patients can connect with others and access resources within the metaverse.

Real estate: The metaverse could redefine the real estate market by enabling users to purchase virtual land, construct virtual homes, and showcase properties for sale, allowing customers to explore interiors and exteriors before making a purchase.

Art and culture: Artists can utilize the metaverse to create virtual galleries, sell their artwork, and connect with their audiences. It also serves as a venue for cultural and artistic events [11].

Socialization: The metaverse provides a novel social space for connecting with friends and family, participating in groups and forums, and organizing events.

Government and public services: Governments can leverage the metaverse to deliver public services, facilitate voting, and enable citizens to communicate with officials.

It is important to note that the metaverse is still in its infancy, and many of its applications remain unexplored. As technology advances and adoption increases, new and innovative use cases are likely to emerge.

3 | The Metaverse and Accounting Connection

The metaverse is rapidly emerging as a transformative frontier in human and business interactions. This three-dimensional virtual world, where individuals can interact, transact, and work online, holds significant potential to reshape industries, including accounting [12]. This section explores the intricate relationship between the metaverse and accounting, highlighting their mutual impacts and implications.

3.1 | Creation of Digital Assets and Accounting Challenges

One of the most significant aspects of the metaverse is the emergence of digital assets, such as NFTs. These assets represent ownership of unique items within the virtual world, introducing novel challenges in the field of accounting. Key questions arise regarding how these assets should be valued, classified, and reported. For instance, should digital assets be categorized as fixed or current assets? Addressing these questions requires careful consideration of valuation methodologies and the development of standardized accounting practices tailored to the unique characteristics of digital assets.

3.2 | New Business Models and Accounting Complexities

The metaverse fosters innovative business models rooted in the digital economy and the exchange of virtual assets. These models introduce complexities into traditional accounting processes. For example, identifying and measuring revenue generated from the sale of goods and services in the metaverse presents significant challenges. Similarly, allocating costs associated with developing and maintaining virtual assets requires innovative approaches to ensure accurate financial reporting [13].

3.3 | Auditing in the Metaverse

Auditing, a cornerstone of the accounting profession, will also transform the metaverse. Auditors must develop new methodologies to assess and verify financial information in virtual environments. Key challenges include verifying the authenticity and validity of blockchain-based transactions, as well as ensuring that digital assets are accurately identified and valued. These tasks necessitate the integration of advanced technologies and tools to maintain the integrity and reliability of financial data.

3.4 | New Opportunities for Accounting

Despite the challenges posed by the metaverse, this technology also offers unprecedented opportunities for the accounting profession. By leveraging AI and big data analytics, accountants can automate routine processes, increasing both accuracy and efficiency. VR can be utilized to create interactive educational experiences, enabling accountants to enhance their skills and stay current with technological advancements.

3.5 | The Role of Accountants in Shaping the Future of the Metaverse

Accountants will play a pivotal role in shaping the future of the metaverse. By participating in the development of new accounting standards for digital assets and virtual business models, they can help establish a transparent and trustworthy financial environment. Additionally, accountants can assist businesses operating in the metaverse by providing strategic advice on managing financial risks and improving decision-making processes [1].

The metaverse is fundamentally transforming the business landscape, and accounting is no exception. To thrive in this evolving environment, accountants must adapt by acquiring skills in information technology, data analytics, and cryptocurrencies. While this transformation presents challenges, it also creates

opportunities for accountants to make meaningful contributions to the future of the digital economy. Ultimately, the relationship between the metaverse and accounting is reciprocal, with each influencing the other's evolution.

4 | Applications of the Metaverse in Accounting

As a groundbreaking advancement in human and digital interactions, the metaverse brings immense potential to the accounting field. By integrating VR, AR, and the internet, this technology creates an interactive, three-dimensional environment that enables accounting processes to be conducted in innovative and efficient ways.

4.1 | Interactive and Engaging Training

The metaverse facilitates the creation of virtual classrooms and interactive training workshops. Accountants can utilize this platform to present complex accounting concepts visually and interactively, thereby enhancing learners' understanding. Realistic simulations of accounting work environments allow trainees to practice and refine their skills in a controlled setting, fostering practical expertise.

4.2 | Improved Collaboration and Communication

As a collaboration platform, the metaverse enables real-time communication and effective interaction among accountants, auditors, and stakeholders. Virtual meetings, interactive presentations, and remote audits are all feasible within the metaverse environment. These capabilities lead to increased productivity, reduced travel costs, and improved decision-making quality.

4.3 | Advanced Data Visualization and Analytics

The metaverse enhances data visualization by enabling financial information to be presented in graphical and 3D formats. This enables accountants to identify and analyze complex patterns and trends easily. Furthermore, AR tools can overlay financial data onto real-world contexts, providing deeper insights into an organization's financial health [15].

4.4 | Process Automation and Error Reduction

Many accounting processes, such as transaction recording, report preparation, and data reconciliation, can be automated using AI technologies in the metaverse. Automation reduces human error, increases process speed and accuracy, and frees accountants to focus on more complex, value-added tasks.

4.5 | Creating New Experiences for Customers

The metaverse enables the personalization and interactivity of accounting services. Clients can virtually visit an accountant's office using avatars and receive advice in real-time. Additionally, the metaverse can be used to create virtual showrooms and provide interactive dashboards for clients, enhancing their engagement and satisfaction.

4.6 | Developing Innovative Business Models

The metaverse presents new opportunities for developing innovative business models in the accounting field. For example, accountants can offer virtual financial advice, specialized training programs, and online marketplaces for buying and selling digital assets. These innovations have the potential to expand the scope and impact of accounting services.

4.7 | Improved Data Security

The metaverse can enhance the security of financial data through the use of blockchain and cryptographic technologies. These tools ensure that sensitive information is stored and transmitted securely, protecting it from unauthorized access [16].

By providing new tools and capabilities, the metaverse has the potential to revolutionize the accounting industry. Accountants who effectively leverage this technology can increase their productivity, improve service quality, and contribute to the long-term success of their organizations.

5 | Challenges Facing the Metaverse in Accounting

While the metaverse presents transformative opportunities, it also introduces unique challenges for accountants. Below is a comprehensive overview of these challenges:

5.1 | Definition and Standardization of Digital Assets

One of the most pressing challenges in metaverse accounting is the lack of standardized definitions and valuation methods for digital assets, such as virtual land, digital objects, and cryptocurrencies. These assets are inherently volatile, with values influenced by factors such as demand, market fluctuations, and technological advancements. Developing reliable valuation frameworks and appropriate accounting standards is a complex task [17].

5.2 | Revenue Recognition and Measurement

In the metaverse, the concept of revenue has expanded significantly. Revenue may be generated through the sale of virtual land, provision of services, creation of digital assets, or advertising. Accurately identifying and measuring these revenues, especially when payments are made in cryptocurrencies or NFTs, requires innovative accounting approaches.

5.3 | Managing Technology-Related Risks

The dynamic nature of the metaverse, coupled with its rapidly evolving underlying technologies, introduces various risks, including security vulnerabilities, technological disruptions, and legal uncertainties. Accountants must be equipped to identify, assess, and mitigate these risks to ensure the accuracy and reliability of financial reporting [18].

5.4 | Compliance with Laws and Regulations

The absence of specific laws and regulations governing the metaverse poses significant challenges for accountants. Tax laws, digital asset regulations, and data protection policies require adaptation and interpretation in the context of the metaverse. Moreover, given its global nature, harmonizing laws and regulations across jurisdictions remains a formidable challenge.

5.5 | Developing Information Systems

Managing the complexities of accounting in the metaverse necessitates the development of robust and flexible information systems. These systems must be capable of processing vast amounts of data, managing complex transactions, and generating timely financial reports. Achieving this requires substantial investment in IT infrastructure and specialized human resources.

5.6 | Lack of Skilled Labor

A critical challenge in metaverse accounting is the shortage of skilled professionals. Accountants must possess deep knowledge of technologies such as blockchain, smart contracts, and cryptocurrencies. Addressing this gap requires comprehensive training programs and continuous professional development [19].

5.7 | Ethical and Social Issues

The metaverse also raises significant ethical and social concerns, including data privacy, intellectual property rights, digital inequality, and its potential societal impacts. Accountants, as key stakeholders, must actively engage in addressing these issues to ensure that they maintain ethical and responsible practices.

6 | The Future of the Metaverse in Accounting

The metaverse represents the next frontier of technological innovation, poised to transform industries, including accounting. Its integration into the accounting arena will revolutionize finance, auditing, and education processes. One of the most significant impacts of the metaverse is the creation of interactive and virtual learning environments. Accountants can engage with accounting software in VR environments, participate in virtual classes, and collaborate with colleagues worldwide. This enhances learning efficiency, enabling accountants to adopt cutting-edge technologies and methodologies quickly.

In the future, the metaverse could serve as a powerful tool for auditing. Auditors can fully access and examine clients' information systems using VR and conduct virtual meetings with company managers and employees to gather necessary information [20]. This will streamline the audit process, making it faster, more accurate, and more transparent.

Additionally, the metaverse can improve organizational accounting processes. Smart contracts and blockchain technologies enable the automation of many accounting tasks, reducing human errors and enhancing transparency. Financial data can be securely stored and shared on distributed networks, fostering trust in financial reporting.

However, the adoption of the metaverse in accounting also presents challenges. A robust infrastructure is required to support virtual environments, and special attention must be paid to data privacy and information security. Accountants must acquire new skills to operate effectively in virtual settings.

Overall, the metaverse holds immense potential to transform the accounting profession. With the integration of advanced technologies, accounting can become more accurate, efficient, and transparent. To realize this potential, existing challenges must be addressed through appropriate solutions. In the near future, accountants will be able to access companies' accounting records in 3D using VR glasses, interact with data dynamically, and collaborate globally through virtual meetings. This will transform accounting from a routine and repetitive task into an exciting and dynamic activity. Given the rapid pace of technological advancements, the widespread adoption of the metaverse in accounting is imminent. Accountants must prepare for this transformation by acquiring new skills and embracing innovation [21].

7 | Discussion and Conclusion

The primary objective of this study is to comprehensively examine the challenges and opportunities that arise from integrating metaverse technology into the accounting field. Through a detailed analysis of this emerging technology and its implications, this research provides a clear vision of the future of the accounting profession.

As a transformative frontier in human interactions, the metaverse has revolutionized the way individuals, businesses, and societies connect. This three-dimensional, interactive virtual space enables users to create avatars, communicate, and engage in activities such as work, play, and commerce. Unlike the current internet, which is predominantly text- and image-based, the metaverse offers a richer and more immersive experience. Its impact on accounting is profound, as it introduces new opportunities for interaction and information exchange.

The integration of digital assets, cryptocurrencies, and smart contracts into the metaverse underscores the need for advanced accounting systems. As transactions become increasingly complex, accountants must develop the ability to analyze large datasets and adapt to the evolving demands of the digital economy. The metaverse also offers diverse applications in accounting, including interactive learning environments, virtual asset management, and innovative auditing techniques.

Despite its potential, the metaverse presents numerous challenges. The lack of standardized accounting practices for digital assets and transactions, coupled with the need for robust security measures, highlights the importance of addressing these issues. Additionally, the metaverse environment may facilitate criminal

activities such as fraud and money laundering, necessitating stringent regulatory frameworks. Determining tax obligations for metaverse transactions and digital assets further complicates the landscape.

The future of the metaverse in accounting is promising. By advancing relevant technologies and establishing appropriate standards, the metaverse can revolutionize accounting practices. Future accountants must master skills in programming, big data analytics, and AI to succeed in this dynamic environment. While challenges persist, the metaverse offers unparalleled opportunities for accountants to innovate and contribute to the digital economy. Collaboration among accountants, regulators, and technologists will be essential to creating a secure, transparent, and efficient accounting ecosystem within the metaverse.

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