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What is Required to Implement Financial Services in Metaverse Ecosystem?

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ABSTRACT

With the development of technology and the increasing use of the Metaverse in various industries, it is significant for different businesses to know and understand this environment. This research has identified the important components for implementing national services in the metaverse environment. Using a systematic review of reliable databases, we conducted a search and screened the articles. After the screening process, we selected 45 articles for review. The criteria for selecting the articles were the keywords "financial services" and "Metaverse." The knowledge required to implement financial services in the Metaverse ecosystem was divided into 10 knowledge categories, including Virtual Economics and Digital Currencies, Blockchain Technology, Cybersecurity and Data Privacy, User Behavior and Experience, Regulatory Compliance, Cross-platform Interoperability, Artificial Intelligence and Machine Learning, Virtual Governance and Decentralization, Financial Inclusion and Accessibility, Market and Economic Research. The findings provide valuable insights and recommendations that can assist stakeholders in developing secure, efficient, and user-centric financial solutions within the rapidly evolving virtual landscape.

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Introduction

The Metaverse is a concept to describe the next generation of the Internet which provides people to engage all five of their senses with immersive technologies called the internet of experience. This concept appeared in Neal Stephenson's 1992 science fiction novel Snow Crash (Xiang, 2022). It is a digital universe where users can immerse themselves in interconnected virtual environments, interact with others, and engage in various activities ranging from social interactions to gaming and commerce in real time through avatars (Sanak-Kosmowska, 2023) and seeks to replicate the physical world through technologies (Chang, 2023).

As this virtual realm continues to expand and attract a massive global audience, its potential impact on our society, economy, and daily lives cannot be overlooked. One key aspect that deserves attention in this ever-evolving Metaverse is the integration and implementation of financial services.

The Metaverse should be a vast and dynamic economic landscape (Potts, 2023), hosting a myriad of virtual businesses, marketplaces, and digital assets. Financial services such as virtual banking, digital payment systems, cryptocurrency exchanges, and asset management platforms are critical components that facilitate economic transactions (Nguyen Thanh et al., 2023), wealth management, and user participation within the Metaverse. Therefore, with increasing the number of users, the need for an enhanced secured financial infrastructure becomes evident. Understanding the role of financial services and their integration is essential to unlocking the full potential of this emerging digital universe.

Recently, there have been numerous studies in the field of financial services in Metaverse. The financial services industry seeks to use virtual reality (VR) and augmented reality (AR) for better interaction with customers (Seth & Seth, 2022). These technologies, behind the metaverse, lead to an interactive, immersive, and collaborative virtual 3D universe and may be able to integrate the individual worlds into each other (Wohlgenannt, Simons, & Stieglitz, 2020). Some studies state that the metaverse is the potential for changing the banking industry and promoting financial inclusion (Lyoussi & Kouchih, 2023; Zainurin et al., 2023), and since customers prevent visiting physical bank locations, neo-banking is presented in the metaverse as a financial service (Reepu, 2023). This technology become a tangible reality through the convergence of advanced virtual reality technologies, artificial intelligence, and blockchain.

While the incorporation of financial services in the Metaverse presents numerous opportunities, it also comes with unique challenges. Security concerns, including identity theft, virtual asset theft, cyberbullying, and privacy invasion in the Metaverse, risk of virtual asset theft and fraud (Li et al., 2023), demand innovative solutions. Additionally, issues related to cross-platform interoperability (Kshetri, 2022; Huang et al., 2022), regulatory compliance, and user privacy require careful consideration. However, by addressing these challenges, the Metaverse holds the potential to revolutionize real-world financial systems as well as virtual interactions.

This scientific paper aims to provide a comprehensive analysis of the importance and implementation of financial services in the Metaverse. Through a systematic review, we examine effective components of implementing financial services within Metaverse platforms and identify the required structures that have been studied by researchers in this process.

Furthermore, the study explores hot and emerging trends that will shape the future of financial services in the Metaverse. By shedding light on this critical aspect of the virtual universe, we hope to contribute to a deeper understanding of the Metaverse's transformative potential and assist stakeholders in making informed decisions to ensure a thriving and sustainable digital ecosystem.

Method

The aim of this scientific paper is to identify the key requirements and factors necessary for successfully implementing financial services in the Metaverse. To achieve this objective, a systematic review approach was employed to gather and analyze relevant literature, and research articles, pertaining to the integration of financial services within virtual environments. The systematic review methodology enables a comprehensive and unbiased assessment of existing knowledge in this emerging field, providing valuable insights and evidence-based recommendations for stakeholders involved in the development of financial services for the Metaverse.

Research Question and Inclusion Criteria

The research question guiding this systematic review is as follows: "What is required to implement financial services in the Metaverse?" To ensure a focused and relevant review, inclusion criteria were established. Studies eligible for inclusion encompassed publications from reputable scientific databases, peer-reviewed journals, conference proceedings, and expert reports published up to the knowledge cutoff date of April 2023. Articles discussing the technological, regulatory, economic, and user-centric aspects of financial services in the Metaverse were considered relevant to the review.

Search Strategy

A comprehensive search strategy was devised to identify relevant literature. Databases including IEEEXplore, Google Scholar, and Scopus were searched using a combination of keywords and controlled vocabulary terms related to "financial services," "Metaverse," "virtual economics," and other relevant concepts. The search strategy aimed to be sensitive enough to capture a broad range of articles while being specific enough to ensure the inclusion of highly relevant publications.

Study Selection

Two independent reviewers conducted the initial screening of the search results based on titles and abstracts. Studies that met the inclusion criteria were selected for full-text review. Any disagreements between the reviewers were resolved through discussion and consensus. The final selection of articles was documented, and reasons for exclusion were recorded. After screening the papers, nineteen papers were held in the study process.

Data Extraction and Synthesis

Data extraction was performed to extract relevant information from the selected articles. Key data elements included the study's focus, methodology, findings, and implications for the implementation of financial services in the Metaverse. The data were synthesized to identify common themes, critical factors, and challenges related to the integration of financial services in virtual environments.

Quality Assessment

The quality of the selected studies was assessed to ensure the credibility and reliability of the information synthesized. A standardized quality assessment tool appropriate for systematic reviews was used to evaluate the methodological rigor and potential biases in the studies.

Table 1. *kappa coefficient*

Coefficient	Value
Cohen’s kappa coefficient	0.838
P-VALUE	0.001

Findings

The findings from the included studies were qualitatively analyzed and summarized to address the research question. The synthesis of results aimed to identify the key requirements and considerations for implementing financial services in the Metaverse. The implications of the findings for stakeholders, including developers, policymakers, and financial institutions, were also discussed.

The implementation of financial services in the Metaverse requires a multidisciplinary approach that encompasses various domains of knowledge. By reviewing and scanning papers, we tried to classified some terms in the knowledge groups. Here are some key areas of knowledge that are crucial for successfully integrating financial services into the Metaverse:

Table 2. *key areas of knowledge for integrating financial services into the Metaverse*

Knowledge	Reasons
Virtual Economics and Digital Currencies	• Understanding New Financial Systems (Buzagia & Hadoud, 2022) • Managing Digital Assets (Cheng et al., 2022) • Navigating Decentralized Finance (DeFi) (Far et al., 2023) • Mitigating Risks and Security Concerns (Di Pietro & Cresci, 2021) • Capitalizing on Investment Opportunities (Cheng et al., 2023) • Fostering Cross-Platform Transactions (Huang et al., 2022) • Addressing Regulatory Compliance (Faraboschi et al., 2022) • Analyzing Market Trends (Nadini et al., 2021; Bhat et al., 2023) • Ensuring Financial Inclusivity (Bremers, 2023; Vergallo & Mainetti, 2022) • Strategic Business Planning (Moro-Visconti, 2022)
Blockchain Technology	• Decentralized Finance (DeFi) Applications (Far et al., 2023) • Security and Transparency (Haleem et al., 2021) • Digital Asset Management (Bhat et al., 2023) • Cross-Border Transactions (Bhat et al., 2023) • Non-Fungible Tokens (NFTs) (Bhat et al., 2023) • Smart Contracts (Bhat et al., 2023)

	• Tokenomics and Monetary Policies • Tokenized Securities • Interoperability and Ecosystem Integration
Cybersecurity and Data Privacy	• Knowledge of cybersecurity best practices (Douha et al., 2023) • Encryption techniques (Wadho et al., 2023; Eldosouky, & Saad, 2018) • Data privacy regulations (Hepworth et al., 2022; Zhu, 2022)
User Behavior and Experience	• Understanding how users interact with virtual assets (Davarpour & Ahmadinia, 2022) • Make transactions (Sanjaya et al., 2022) and manage their virtual finances
Regulatory Compliance	• Financial regulations and compliance standards (Zetzsche et al., 2023) • Knowledge of relevant laws and regulations (Johan, 2022; La Barbera, 2023) related to virtual assets, cryptocurrencies, and financial transactions • Knowledge to avoid legal pitfalls and ensure a compliant financial ecosystem (Anggara et al., 2022; Chatterjee et al., 2023)
Cross-platform Interoperability	• Knowledge of interoperability standards and technologies (Kshetri, 2022; Turi, 2023; Stubbs et al., 2023)
Artificial Intelligence and Machine Learning	• Utilized for fraud detection, risk assessment, and personalization of financial services (Guo et al., 2022; Bharadiya, 2023) • Building AI algorithms and their ethical implications (Cheng et al., 2022; Kostick-Quenet & Rahimzadeh, 2023; Jain et al., 2023)
Virtual Governance and Decentralization	• Need for virtual governance (Atherton, 2023) • Knowledge of decentralized governance models (Namakshenas, 2023) • Community-driven mechanisms (Ray, 2023)
Financial Inclusion and Accessibility	• Understanding the challenges and opportunities (Bremers, 2023; Kaur et al., 2023)
Market and Economic Research	• Identifying trends (Nguyen et al., 2023; Polas, 2022) • potential growth areas, and areas of improvement (Aydın etal., 2023; Yathiraju & Dash, 2023).

Discussion

1. Virtual Economics and Digital Currencies

The phrase “digital currencies” is used in the narrow sense of “cryptocurrencies”. This definition excludes physical currencies such as notes, coins, and local currencies. It excludes also both deposits with central and commercial banks and electronic money, which is recorded electronically on a stored-value card or other device, although both of them are kept like digital currencies in a digitalized format (Pfister, 2017). Virtual economics is actually highly influenced and driven by economic factors in the real world. This is because there is a single common denominator between the two worlds. That is human beings (Chambers, 2011).

Understanding virtual economics is essential for comprehending the dynamics of virtual marketplaces, virtual asset valuation, and virtual currency systems. Knowledge of digital currencies, including cryptocurrencies and stablecoins, is also necessary as they may play a significant role in facilitating transactions and cross-platform interactions within the Metaverse.

2. Blockchain Technology

As the importance of technology for many virtual currencies and assets, blockchain plays a pivotal role in Fintech due to providing security, transparency, and decentralization (Bhat et al., 2023). Understanding blockchain's technical aspects, smart contracts, and potential scalability solutions is crucial for developing robust financial services within the Metaverse.

3. Cybersecurity and Data Privacy

Given the importance of virtual assets and personal information in Metaverse ecosystem, Knowledge of cybersecurity best practices, encryption techniques, and data privacy regulations is essential to protect users from potential threats and ensure their trust in the financial services provided. In other word, cybersecurity and data privacy is of issues which needs to be studied to find out how technologies can address them. Cybersecurity include blockchain and cryptocurrencies which are considered since financial risk and losses by individuals (Zhu, 2022).

4. User Behavior and Experience

Some studies have mentioned the user behavior and experience in Metaverse ecosystem given the development of DeFi and Metaverse platforms (La Barbera, 2023; Jung & Pawlowski, 2014). Recognizing user behavior and preferences can help designing user-friendly and efficient financial services.

5. Regulatory Compliance

Regulatory compliance can be influenced by Metaverse (Kumar, 2023) and companies can ensure compliance with government regulations more effectively (Yathiraju, N., & Dash, 2023). Finally, as in the real world, regulatory compliance and laws are required even if the legal foundation or norms are different from the real world (Faraboschi et al., 2022).

6. Cross-platform Interoperability

To achieve data interconnectivity, interoperability standards would be required (Tan et al., 2022). It has been argued that imposing interoperability standards on corporative virtual worlds may harm innovation people can choose into interoperable worlds if they tend to. There are consortia of gaming and tech firms where working on standards. One is the Metaverse Standards Forum which "provides a venue for cooperation between standards organizations and companies to foster the development of interoperability standards for an open and inclusive metaverse, and accelerate their development and deployment through pragmatic, action-based projects." (Stubbs et al., 2023) Therefore, having knowledge of interoperability standards and technologies is vital for users to engage with financial services regardless of their chosen virtual environment.

7. Artificial Intelligence and Machine Learning

Financial management is a vital aspect of businesses and entails the strategic planning, direction, and control of financial endeavors. Risk assessment, fraud detection, wealth management, online transactions, customized bond scheme, customer retention, virtual assistant, and so on, are a few of the critical areas where Industry 4.0 technologies intervention are highly required for managing firms' finance (Bisht et atl., 2022). Hence, understanding AI algorithms and applying them can discover these risks and frauds in big amounts of data (Jain et al., 2023) in the Metaverse ecosystem where the foundation is on data. Using AI, ethical implications are concerned.

8. Virtual Governance and Decentralization

Virtual governance focusing on citizens and using emerging facilities to increase welfare, health, and peaceful coexistence is a foremost priority. Every social, global, regional, and national entity must be aware of and act upon its responsibility for virtual change (Hassanzadeh, 2022). Decentralized governance models have been noticed in Web 2.0 platforms, such as Wikipedia (Ahsan & Gupta, 2023). Many new decentralized governance models and services can therefore be implemented and experienced through the blockchain, without the oversight of governments (Atzori, 2015). There is a need of virtual governance and decision-making processes and knowledge of decentralized governance models which can support the development of clear and transparent financial systems within the virtual world.

9. Financial Inclusion and Accessibility

"Financial inclusion, as defined by the World Bank, involves providing individuals and businesses with access to affordable and useful financial products and services in a responsible and sustainable manner" (Bremers, 2023). The use of metaverse technology can increase financial inclusion by providing people who do not have access to traditional banking systems (Kaur et al., 2023). On the other hand, there is a strong relationship between financial inclusion and Accessibility. It means as the accessibility of the public decreases the financial inclusion level also decreases (Ijaz & Saleem, 2022). Innovation in the financial industry has an influential effect both socially and economically. Improved financial inclusion and accessibility of services have supplied options for formerly limited individuals to control their finances better. In addition, changes in spending patterns and consumer behavior are also occurring in response to advances in financial technology, enabling consumers to adopt more efficient and technology-based spending patterns (Pujihastuti, 2023).

10. Market and Economic Research

The nature of new trends in business is economic research on consumer behaviors, habits, and routines, and getting foresight on what's next (Lodhi et al., 2022). Using AI, there will be a possibility of identifying market trends and implementing corrective measures (Polas, 2022). Conducting market and economic research can help financial service providers adapt to the unique characteristics of the virtual economy and user demands. By leveraging knowledge from these areas and collaborating across disciplines, developers, economists, technologists, and policymakers can work together to implement financial services that meet the needs of the growing Metaverse community and contribute to its sustainable development.

Conclusion

By employing a systematic review methodology, this study provides a comprehensive and evidence-based exploration of the essential factors required to implement financial services in the Metaverse. The findings offer valuable insights and recommendations that can guide stakeholders in developing secure, efficient, and user-centric financial solutions within the rapidly evolving virtual landscape. Moreover, the systematic review serves as a foundation for future research and innovations in the realm of virtual economies and financial technologies. Moreover, it can be said that most features

can be developed and applied in most fields. Due to the high number of articles in the field of Metaverse, the systematic review tried to decrease the limitations caused by the restricted scope of literature available up to the search date and possible publication biases through a comprehensive search strategy and a transparent and unbiased selection process with the focus on the financial aspect.

Declaration of Competing Interest

The author declares that he has no competing financial interests or known personal relationships that would influence the report presented in this article.

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