UNSOLVED PROBLEM

Framework for Ethically Designed Microtransactions in the Metaverse

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ABSTRACT Microtransactions, small in-app purchases within virtual environments, have become increasingly prevalent in modern gaming, often leading to addictive behaviors and financial burdens, particularly among young male players. The potential consequences of such microtransactions within the metaverse extend beyond gaming, as they provide companies with unprecedented control over user experiences and the ability to capitalize personal data for targeted advertising and manipulative practices. This article presents a comprehensive framework for the ethical analysis and design of microtransactions in the metaverse to address these concerns. This three-dimensional framework explores Motivation, Engagement, and Fairness to evaluate the impact of microtransactions on user autonomy, social interactions, and overall fairness. Additionally, the paper conducts a running example on World of Warcraft to assess the alignment of its microtransaction design choices with the proposed ethical principles. By shedding light on these issues, this article aims to raise awareness among consumers, developers, and policymakers about the need for responsible practices, consumer protection, and privacy preservation in the metaverse. It emphasizes fostering collaboration and transparency to safeguard users from misuse while promoting a user-centric metaverse ecosystem.

INDEX TERMS Design, ethics, metaverse, microtransactions, video games.

I. INTRODUCTION

The rise of the metaverse has sparked a lot of excitement and speculation, capturing the imagination of technologists, researchers, and consumers alike. While the metaverse remains a nebulous concept, its potential impact on our digital lives and society cannot be ignored. In exploring the implications associated with microtransactions within this evolving landscape, it is essential to draw upon the experiences and lessons learned from the realm of video games.

Video games, especially massively multiplayer online (MMO) games, have long provided a glimpse into the dynamics of virtual ecosystems and how people interact within them [1]. These immersive digital worlds have served as testing grounds for microtransaction models, offering insights into the effects on player behavior, addictive tendencies, and financial implications [2]. Understanding the impact of microtransactions in the gaming industry provides a valuable foundation for analyzing their potential ramifications in the metaverse.

While the metaverse promises a more encompassing and immersive experience, tempering the hype and novelty surrounding it is crucial. Notable figures like Gabe Newell have expressed skepticism, highlighting the importance of recognizing the depth and complexity already present within MMOs [3]. That is why the metaverse should include the valuable lessons learned from the virtual communities that have flourished in gaming environments.

This article aims to bridge the gap between the current understanding of microtransactions in video games and their potential manifestation within the metaverse.

The associate editor coordinating the review of this manuscript and approving it for publication was Derek Abbott.

By acknowledging the rich experiences and interactions facilitated by MMOs, we can better grasp the possibilities associated with microtransactions and their broader implications in a virtual realm where the boundaries between reality and digital spaces blur.

By exploring the parallels between video games and the metaverse, we gain insights into the potential challenges that may arise. Leveraging this understanding, we can evaluate the impact of microtransactions on user behavior, economic structures, and social dynamics within the metaverse. Furthermore, we emphasize the need for caution, ethical considerations, and consumer protections as this new frontier takes shape.

This paper is structured as follows: Section II delves into a comprehensive understanding of the metaverse and its components. In Section III, we provide a background on the current landscape of microtransactions in virtual environments and discuss a taxonomy, business models, motivations, and their relation with addictive behaviors. To guide ethical analysis and design, Section IV presents a framework that evaluates microtransactions based on dimensions such as Motivation, Engagement, and Fairness. The framework serves as a foundation for the running example conducted in Section V, which examines microtransactions in World of Warcraft. In Section VI, we engage in a broader discussion on the implications of our findings and their relevance in the broader context of the metaverse. Finally, the paper concludes in Section VIII by summarizing the key insights and suggesting future directions for the ethical design of microtransactions in the metaverse.

II. WHAT IS THE METAVERSE?

Inspired by the visionary world of science fiction, the metaverse concept has taken shape through a growing body of research and discourse. Neal Stephenson's science fiction novel "Snow Crash," published in 1992, introduced the term "metaverse" and sparked imaginations about interconnected virtual realms [4]. Scholars and researchers have explored various dimensions of the metaverse in recent years, providing diverse insights into this evolving virtual landscape.

Weinberger [5] presents a comprehensive definition of the metaverse, synthesized from existing literature, describing it as "an interconnected web of ubiquitous virtual worlds partly overlapping with and enhancing the physical world." Al-Ghaili et al. [6] offer a chronological review of metaverse development, illustrating a pyramid architecture encompassing virtual, augmented, mixed, and extended realities. Almoqbel et al. [7] conduct a systematic literature review to map scholarly definitions, revealing overlapping themes while identifying nuanced differences. Their classification of metaverse definitions encompasses users and roles, content creation, technical specifications, and the involved spaces. Mozumder et al. [8] provide a technology roadmap for the metaverse, incorporating IoT, blockchain, Artificial Intelligence (AI) techniques, and medical domain activities.

These studies collectively portray the metaverse as an interconnected, immersive, and persistent virtual world that enhances the physical world.

In the context of its components, Park and Kim [9] emphasize the hardware, software, and content as integral elements of the metaverse. Additionally, Chen and Cheng [10] propose that the metaverse's economic system may mirror that of the real world, encompassing functional, hedonic, social, and programmable values. They emphasize the user's central role as a content consumer and producer, shaping economic activity within the metaverse. Yang et al. [11] stress the significance of property rights and monetary systems in ensuring a smooth-functioning metaverse economy, leading to an increasing reliance on blockchain technology for these aspects. Lastly, Facebook's intention to create a metaverse has been analyzed as a potential radical business model innovation. However, Kraus et al. [12] suggest that the shift will likely be incremental.

III. BACKGROUND

As we explore the ethical implications of microtransactions in the metaverse, it is essential to ground our analysis in a comprehensive understanding of this evolving virtual landscape. In the previous section, we delved into various scholarly perspectives on the metaverse, highlighting its interconnected virtual worlds and potential to enhance the physical realm. Now, we provide a comprehensive overview of the foundational elements underpinning the study of microtransactions in video games and virtual environments. We begin by delving into the taxonomy of microtransactions (see Section III-A), where we categorize these in-game purchases into distinct groups based on their impact on gameplay and player experiences. Subsequently, we explore various business models game developers adopt to monetize their products (see Section III-B), ranging from non-competitive cosmetic offerings to competitive pay-to-win mechanics. Furthermore, we delve into the motivations for microtransaction purchases (see Section III-C), drawing insights from psychological theories like the Self-Determination Theory and the Fear of Missing Out phenomenon. Understanding these core aspects is crucial for building a solid foundation to analyze the ethical implications of microtransactions in the metaverse.

A. TAXONOMY OF MICROTRANSACTIONS

In the evolving landscape of virtual experiences, microtransactions have emerged as a significant aspect of user engagement and revenue generation. A microtransaction in video games is characterized by its small-scale nature, typically involving the purchase of virtual goods or services using real-world currency. Unlike traditional transactions, which might encompass purchasing a full game license or a subscription granting access to a game for a specified period, microtransactions are often incremental and recurrent, allowing players to acquire specific in-game benefits. These include cosmetic alterations like character
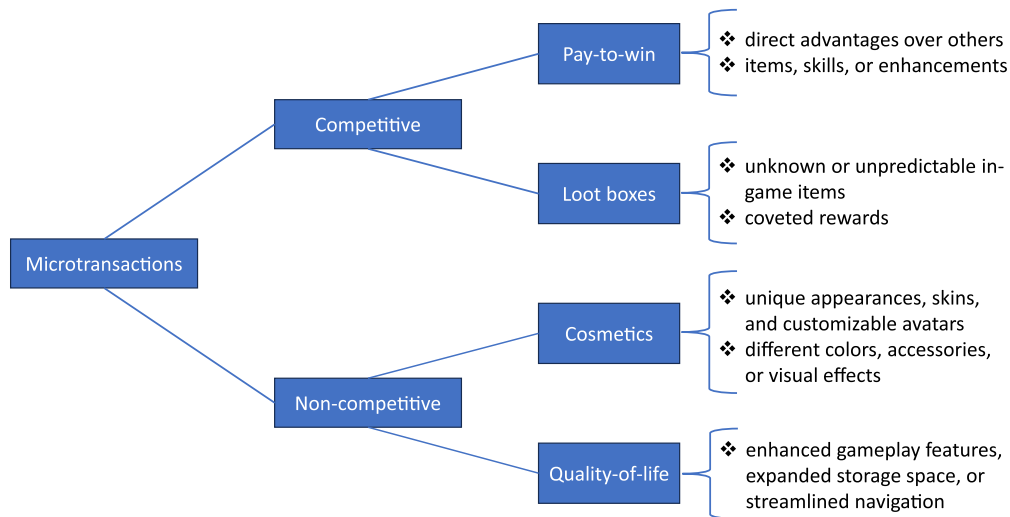
FIGURE 1. Taxonomy of microtransactions.

skins, avatars, gameplay enhancements, or exclusive content. The "micro" prefix in "microtransaction" emphasizes the often minimal cost and the specific, targeted nature of the purchase, distinguishing it from larger, one-time purchases or ongoing subscription fees [13]. This business model has emerged from the evolution of video games from standalone products to continuous services, where ongoing player engagement is facilitated and monetized through these small-scale transactions [14]. For a better understanding of microtransactions, we propose a taxonomy that groups them together (see Figure 1).

We can broadly classify microtransactions into two main groups: competitive and non-competitive. On the one hand, *competitive* microtransactions directly impact the gameplay dynamics and player competition. The *pay-to-win* microtransactions constitute one controversial subset, as they offer players the option to gain direct advantages over others through monetary means. These transactions allow the acquisition of items, skills, or enhancements that grant a significant advantage in competitive scenarios. While pay-to-win microtransactions are often criticized for their potential to create imbalances and diminish skill-based gameplay, they remain present in certain virtual environments [15].

One more form of *competitive* microtransactions is the purchase of *loot boxes*. These randomized packages contain unknown or unpredictable in-game items, ranging from common to rare or exclusive. Players acquire these loot boxes to obtain coveted rewards that may provide a competitive edge. However, the unpredictable nature of loot boxes raises concerns regarding gambling-like mechanics [16].

On the other hand, the *non-competitive* category focuses on enhancing personalization and convenience within video games. One prominent subset of non-competitive microtransactions is *cosmetics*. These transactions allow users to acquire unique appearances, skins, and customizable avatars, enabling them to express their individuality and

style in the virtual realm. Additionally, options for aesthetic customization, such as different colors, accessories, or visual effects, fall under this category [17].

Another subdivision of *non-competitive* microtransactions is those categorized as *quality-of-life*. These purchases provide players with enhanced gameplay features, expanded storage space, or streamlined navigation, ultimately improving their overall user experience.

In considering the taxonomy of microtransactions presented in Figure 1, it is essential to acknowledge the dynamic nature of these transactions within different gaming contexts. The categorization into *competitive* and *non-competitive* microtransactions provides a broad framework for understanding their impact. However, it is essential to note that this classification may vary depending on the specific characteristics of a game. For instance, microtransactions like *loot boxes* exemplify this variability. In certain gaming environments, such as the game *Hearthstone*, loot boxes introduce competitive elements, as they offer players the opportunity to gain advantageous in-game items through chance-based mechanics, potentially affecting their performance in matches. In contrast, the same loot box concept can take non-competitive attributes in games like *League of Legends*, where these items are purely cosmetic and do not affect gameplay. These distinctions can become more nuanced in the metaverse, where social interactions and competitive elements may coexist. As such, the taxonomy should be viewed as a guide rather than a rigid classification system, allowing for flexibility in interpretation based on the unique dynamics of each virtual world.

B. BUSINESS MODELS

The implementation of microtransactions in the gaming industry has sparked significant controversy, exposing the fine line between player satisfaction and profit-driven practices. While microtransactions can provide additional revenue

streams and support ongoing game development, certain *greedy* models have taken advantage of players, particularly in the mobile gaming sector, targeting vulnerable audiences and employing manipulative tactics [18].

Examples, such as the *Star Wars Battlefront II* fiasco, serve as cautionary tales highlighting the detrimental impact of prioritizing profit over player satisfaction [19]. The game's launch was marred by technical issues, leading to accusations that microtransactions were employed to compensate for its shortcomings rather than focusing on delivering a high-quality experience. This incident intensified the debate surrounding greedy practices and raised questions about the relationship between microtransactions and overall game quality [20].

In contrast, the *freemium* model, exemplified by games like *Path of Exile*, offers a different approach. With *freemium* games, players can play the game from start to finish without paying a cent [21]. However, they also have the option to purchase additional content or features that enhance their gameplay experience. While the *freemium* model can be seen as more consumer-friendly than greedy practices, it still raises questions regarding the necessity of certain purchases.

In MMOs, a *hybrid* model often emerges as a potential alternative. Games like *World of Warcraft* and *Final Fantasy XIV* operate on a subscription approach while incorporating microtransactions. This approach allows players to access core game content through a subscription fee while providing optional cosmetic or convenience-based microtransactions to enhance their gameplay experience.

Nevertheless, discussions have focused on the impact of cosmetic microtransactions. While cosmetic purchases may initially appear harmless, criticisms have arisen regarding the disproportionate investment of developer time and resources into creating visually appealing cosmetics compared to other in-game assets obtainable through gameplay [22]. This discrepancy has sparked debates about the perceived value of skill-based progression and fair competition, as it suggests that financial gains are prioritized over individual or group player achievements.

The gaming industry can navigate the landscape more effectively by understanding the controversies surrounding microtransactions, including *greedy*, *freemium*, and *hybrid* models. Striking a balance between financial viability, player satisfaction, and ethical considerations is crucial for fostering a healthy and sustainable virtual ecosystem.

C. MOTIVATIONS FOR MICROTRANSACTION PURCHASES

Understanding the motivation behind microtransaction purchases is a complex and multifaceted topic that delves into the psychology of gamers and the underlying drivers that lead them to engage in these transactions.

The Self-Determination Theory (SDT) claims that individuals have three basic psychological needs: autonomy, competence, and relatedness. These needs have a significant impact on individuals' motivation and behavior [23]. In the context

of gaming and microtransactions, satisfying these needs becomes crucial. Gamers seek autonomy and self-expression, and microtransactions that offer cosmetic enhancements or personalization options fulfill these desires [15]. Customizing characters, avatars, or in-game items give players a sense of uniqueness and control over their gaming experience. By investing in these microtransactions, gamers can showcase their individuality and create a more personalized gameplay experience. For example, the massively multiplayer online battle arena (MOBA) game *League of Legends* offers a range of cosmetic microtransactions, allowing players to express their autonomy and personalize their characters' appearance.

Furthermore, SDT highlights the importance of competence and mastery. Players strive to improve their skills, overcome challenges, and achieve a sense of accomplishment. Microtransactions that offer gameplay advantages, such as faster progression or access to exclusive items, can tap into gamers' desire for competence. These purchases provide a shortcut to success, granting players a competitive edge or facilitating their progression in the game [24]. The "gacha" game category is worth mentioning, named after the Japanese vending machines filled with collectibles and small toys typically enclosed in plastic capsules. A prime example of the "gacha" genre is the role-playing action game *Genshin Impact*, where players can purchase in-game currency to acquire rare characters or powerful items, providing a shortcut to success and enhancing their competence. While microtransactions offer a faster progression, players can still obtain these items through gameplay, albeit requiring more time and effort. Usually, this is called "pay-to-fast".

Moreover, let us consider a scenario that illustrates how people are motivated to make microtransactions when they do not have much time for gaming, i.e., the *ethos* of the "pay-to-fast" model [25]: a gamer who is also a parent may struggle to balance their work and family commitments, leaving them with little time for gaming. However, since they have a good job, they can afford to make purchases in the game. In this case, they may find microtransactions that offer instant rewards very appealing. By buying these rewards, they can save precious time and quickly catch up with other players in the game, despite their busy schedule. This scenario shows how microtransactions are oriented to people who are short on time but still want to stay competitive in the gaming world.

Additionally, the need for relatedness or social connection plays a significant role in gamers' motivations. Many modern games feature multiplayer components, where players can interact, collaborate, or compete with others. Microtransactions that enhance the social aspect of gaming, such as purchasing virtual gifts for friends or participating in cooperative challenges, satisfy this need for relatedness. These purchases can strengthen social bonds, foster community, and create shared experiences among players [24]. Notably, *Final Fantasy XIV* includes an option for two characters to partake in a virtual wedding ceremony, which exemplifies the game's emphasis on fostering social connections.

In addition to SDT, the Fear of Missing Out (FoMO) phenomenon is a powerful motivator for microtransaction purchases. FoMO is characterized by the apprehension of being left out or skipping out on enjoyable experiences or rewards others relish. Game developers leverage this fear by introducing limited-time offers, exclusive items, or time-limited events that might create a sense of urgency and scarcity. Players may feel compelled to make microtransaction purchases to avoid missing out on unique or time-limited content, encouraging a sense of completion, exclusivity, or collection [26]. In games such as *Pokémon GO*, limited-time events introduce exclusive items or experiences only available for a short period.

While SDT provides insights into the motivations behind microtransaction purchases, the Uses and Gratifications Theory (UGT) offers a broader perspective on why players generally engage with video games. UGT postulates that media consumers seek out specific sources to fulfill certain needs or desires, emphasizing that the audience actively engages with media to achieve specific gratifications [27]. UGT provides insights into why players are drawn to certain titles or features in video games. A study applied UGT to examine motivations behind user engagement in multiplayer video games [28]. It identified enjoyment, fantasy, social interaction, achievement, and self-presentation as significant factors affecting the continuance intention of playing titles in this genre, with enjoyment being the most influential. The study also highlighted the moderating effects of age and gender on these relationships. Other research has shown that recreational motivation, gratification, peer relationships, and caring predict adolescents' playing intensity [29]. Additionally, social interaction and recreation have been identified as positive predictors of gameplay [30]. These motivations align with the principles of SDT, suggesting a convergence in the underlying psychological drivers that lead players to engage in both gameplay and microtransactions.

Relatedly, the domain of persuasive technology and gamification offers insights into the mechanisms that can influence player behavior in video games. Persuasive technology refers to systems designed to change attitudes or behaviors through persuasion and social influence, but not through coercion [31]. Gamification, conversely, involves applying game-design elements in non-game contexts, aiming to enhance user engagement and motivation [32]. These techniques can encourage specific player actions in video games and enhance the overall gaming experience. For instance, rewards, challenges, and feedback loops, common in gamified systems, can be linked to the basic psychological needs of autonomy, competence, and relatedness as posited by SDT [33]. However, it is crucial to approach these techniques with caution. Many mobile games employ notifications to remind players of everyday rewards, enticing them to open the app daily. While some games allow players to claim these rewards immediately, others require some gameplay, ensuring users remain engaged. Have they forgotten a reward? Microtransactions often provide a solution, allowing players to purchase what they missed. This intertwining of persuasion (keeping the player hooked) and gamification (disguising purchases as game features) raises questions about their implications. Many of these tactics are found in games targeted at young children, such as those developed by *Toca Boca*.

Another motivation stems from players' desire to support their favorite developers and game studios. By engaging in microtransactions, players feel they are actively contributing to ongoing game development, updates, and the creation of new content. This sense of loyalty and gratitude towards developers often drives players to willingly make purchases, considering it a form of financial support [24]. For instance, the already mentioned *Path of Exile* provides a free-to-play experience with the option to purchase cosmetic microtransactions. Players who enjoy the game and want to contribute to its continued development can make these purchases as a form of support and appreciation.

D. MICROTRANSACTIONS AND ADDICTION

The realm of video games has witnessed a significant shift in monetization strategies, with microtransactions becoming a dominant force. These in-game purchases raised concerns due to their potential association with digital addiction. For instance, in the game *Fortnite*, players can purchase "V-Bucks" (virtual currency) to buy loot boxes containing in-game items. By March 2019, *Fortnite* boasted over 250 million registered users, and its microtransactions contributed over $1 billion in revenue since its 2017 launch [34].

However, the allure of microtransactions extends beyond mere cosmetic or gameplay enhancements. A systematic review identified a positive relationship between microtransactions, particularly loot boxes, and Internet Gaming Disorder and Gambling Disorder. This association was more pronounced with loot boxes, with risky loot box use potentially mediating these relationships [35]. Such findings are further underscored by a case study of a U.S. Veteran who, after engaging in the *Candy Crush Saga* game, escalated his in-game spending to nearly 40% of his monthly income within six months [36].

The blurred boundaries between gaming and gambling become even more evident when considering the physiological arousal associated with microtransactions. A study focusing on opening loot boxes in video games found that players experience increased physiological arousal, akin to the thrill derived from gambling. This arousal, measured through heart rate and galvanic skin response, was particularly evident when purchasing loot boxes, emphasizing the addictive potential of such in-game mechanics [37].

The global gaming market, which generated $159.3 billion in 2020, is expected to encompass over 3 billion gamers by 2023 [35]. As the industry grows, microtransactions' ethical implications and potential risks cannot be
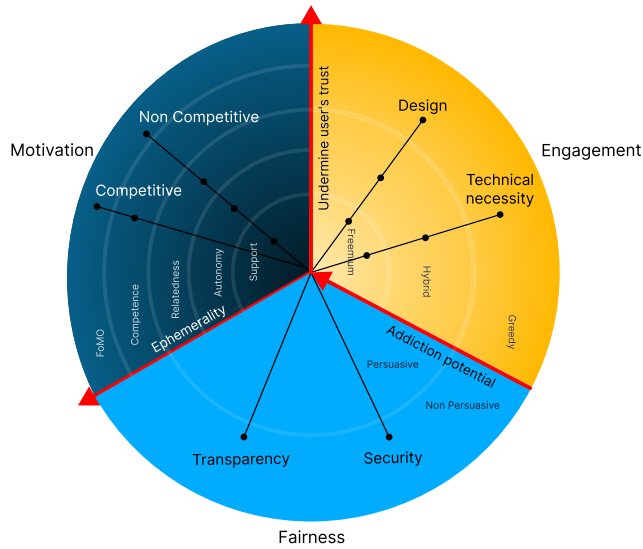
FIGURE 2. Framework for ethical analysis and design of microtransactions.

ignored. Regulatory bodies in countries like Belgium and the Netherlands have already taken steps to classify loot boxes as illegal gambling, highlighting the urgent need for a broader discourse on the impact of microtransactions on player behavior and well-being [37].

IV. FRAMEWORK FOR MICROTRANSACTIONS

In order to comprehensively examine the ethical dimensions surrounding microtransactions in the metaverse, we first establish a solid background section that sheds light on the various facets of these in-game transactions. This contextual understanding lays the groundwork for our proposal, that serves as a lens through which we analyze the impact of microtransactions on players and the broader gaming community.

The framework encompasses three dimensions: Motivation, Engagement, and Fairness, providing a holistic understanding of microtransactions in the metaverse and offering valuable insights for analysis and design purposes (see Figure 2). We present clear definitions, illustrative examples of improper practices, and thought-provoking reflection questions within each dimension. By delving into these dimensions, developers can gain a deeper understanding of ethical considerations and work towards implementing mechanisms that prioritize user experience and discourage greedy models.

A. MOTIVATION DIMENSION

This dimension focuses on understanding the underlying motivations that drive users to engage in microtransactions. In addition to including the two main classifications of microtransactions in our taxonomy: competitive and non-competitive (see Figure 1), it encompasses five levels of motivation: Supporting Developers, Autonomy, Relatedness, Competence, and FoMO.

1) SUPPORTING DEVELOPERS

At the foundational level, microtransactions are driven by users' desire to support developers and contribute to ongoing game development. This motivation arises from a sense of loyalty, gratitude, or a desire to sustain a free-to-play model. By offering microtransactions that allow users to support developers financially, ethical considerations include transparency in how these funds are utilized and the impact on the overall gaming experience.

a: QUESTIONABLE PRACTICE

The game *Path of Exile* implements a microtransaction system where players can purchase additional inventory tabs and storage upgrades, limiting the number of in-game items they can acquire without making purchases. This would seem a good thing in principle, as players support the game's development, which is offered free of charge. However, this restricts players' gameplay experience and creates a perception that basic inventory functionality is being withheld for monetary gain.

b: REFLECTION QUESTIONS
- MQ1: How can developers create a supportive microtransaction system that allows players to contribute financially without compromising fair competition and gameplay balance?
- MQ2: Can alternative methods be emphasized to encourage player support while maintaining fairness?
- MQ3: How can transparency be maintained to ensure players understand the purpose and impact of their financial contributions?

2) AUTONOMY

Moving up the motivation scale, microtransactions address to users' need for autonomy and self-expression. Cosmetic purchases allow users to customize their in-game avatars, appearances, or items to showcase their individuality and create a personalized gaming experience. Ethical considerations involve ensuring a fair pricing structure for cosmetic items, avoiding misleading practices, and providing clear information about the nature and value of these purchases.

a: QUESTIONABLE PRACTICE

In *Reddit*, users can purchase microtransactions that offer exclusive and highly detailed avatar customization options. However, the platform restricts the availability of basic avatar customization options, leaving players with limited choices unless they make additional purchases.

b: REFLECTION QUESTIONS
- MQ4: How can developers provide a wide range of free character customization options while offering attractive cosmetic microtransactions that enhance players' autonomy and self-expression?
- MQ5: Can in-game achievements or unlockable customization options be implemented to provide a sense

of progression and reward for players who choose not to make microtransaction purchases?

- **MQ6**: How can the balance be maintained between offering enticing cosmetic microtransactions and avoiding misleading practices that pressure players into excessive purchases?

3) RELATEDNESS

The next level of motivation addresses users' desire for social connection and relatedness within the gaming community. Microtransactions that enhance the social aspect of gaming, such as gifting virtual items or participating in cooperative challenges, foster a sense of community and shared experiences. Ethical considerations involve promoting positive social interactions, avoiding greedy practices, and safeguarding against practices that promote spending to maintain social status.

a: QUESTIONABLE PRACTICE

Games such as *Fortnite* and *World of Warcraft* implement battle passes, i.e., an in-game progression system that offers various rewards. These games often notify users when their friends have purchased the pass while they have not, resulting in the missed opportunity to obtain valuable rewards.

b: REFLECTION QUESTIONS

- **MQ7**: How can developers foster social connections and meaningful interactions among players without creating artificial limitations that encourage microtransactions?
- **MQ8**: Can additional in-game activities or shared experiences be implemented to promote social bonding and engagement without relying solely on microtransaction purchases?
- **MQ9**: How can the in-game economy support social interactions while maintaining fairness and inclusivity for players who choose not to make purchases?

4) COMPETENCE

The competence motivation involves microtransactions that offer gameplay advantages, enabling users to progress faster, gain skills, or obtain exclusive in-game items. Ethical considerations revolve around balancing the competitive landscape, ensuring fair and skill-based gameplay, and avoiding pay-to-win scenarios that create imbalances and diminish the experience for more casual players.

a: QUESTIONABLE PRACTICE

The online game *Honkai: Star Rail* offers microtransactions that provide powerful equipment and abilities, creating a significant advantage for players who make these purchases. This leads to an imbalanced competitive environment that favors monetary power over skill-based progression.

b: REFLECTION QUESTIONS

- **MQ10**: How can developers ensure fair competition and skill-based progression while offering microtransactions that satisfy players' desire for progression?

- **MQ11**: Can alternative paths for acquiring in-game advantages be provided, such as earning them through gameplay achievements or events, to balance the competitive landscape?
- **MQ12**: How can the impact of microtransaction-acquired advantages be carefully balanced to avoid creating insurmountable gaps between paying and non-paying players?

5) FOMO

At the highest level of motivation, the fear of missing out on limited-time offers, exclusive content, or rewards drives users to engage in microtransactions. Ethical considerations include providing clear information on the availability and duration of time-limited content, avoiding opaque practices that indulge in users' fear and urgency, and maintaining fairness in offering rewards and opportunities.

a: QUESTIONABLE PRACTICE

Genshin Impact regularly introduces limited-time events where players can purchase exclusive characters and consumables through microtransactions. The game uses alluring marketing tactics and limited availability to create FoMO and urge players into impulsive purchases.

b: REFLECTION QUESTIONS

- **MQ13**: How can developers create a sense of excitement and exclusivity without taking advantage of players' FoMO and encouraging impulsive spending?
- **MQ14**: Can alternative reward systems or periodic events be implemented to ensure that players who cannot or choose not to make microtransaction purchases still have opportunities for unique rewards?
- **MQ15**: How can limited-time events be designed to be more inclusive and rewarding for all players rather than creating a sense of urgency that promotes impulsive spending?

B. ENGAGEMENT DIMENSION

This dimension explores the models of microtransaction-based business strategies. It examines two critical elements: Design and Technical Necessity.

1) DESIGN

This element explores how user interfaces and interaction design influence users' purchasing behavior. It encompasses persuasive design patterns, user experience considerations, and creating an engaging environment encouraging microtransaction purchases. Ethical considerations involve avoiding manipulative techniques, providing transparent information on pricing, and ensuring that design elements do not create an addictive environment.

a: QUESTIONABLE PRACTICE

The mobile game *Diablo Inmortal* uses manipulative design elements, such as deceptive pricing, aggressive pop-up

notifications, and misleading visual cues, to pressure players into making unintended or excessive microtransaction purchases. This exploitative design undermines the player trust and can lead to unintended and regretful spending.

b: REFLECTION QUESTIONS

- EQ1: How can developers ensure that design elements are user-friendly, transparent, and do not manipulate players into making unintended purchases?
- EQ2: Can ethical design principles, such as clear and non-deceptive notifications, be implemented to promote informed decision-making and prevent unintended spending?
- EQ3: How can the game's design foster a sense of trust and respect for the player's autonomy in purchasing decisions?

2) TECHNICAL NECESSITY

This element addresses the practice of withholding essential features or functionalities and offering them as microtransactions. It raises questions about the fairness of gating crucial aspects of the game behind paywalls. Ethical considerations involve evaluating the necessity of unavoidable microtransactions, providing alternative paths for non-paying users to access essential features, and ensuring that microtransactions do not disrupt the overall gameplay experience.

a: QUESTIONABLE PRACTICE

In the popular game *Destiny 2*, players can purchase microtransactions that provide in-game currency for acquiring powerful weapons and items. The game's progression and difficulty are designed to create bottlenecks and encourage players to make microtransaction purchases to progress more quickly or obtain rare items.

b: REFLECTION QUESTIONS

- EQ4: How can developers design gameplay features to promote engagement without making microtransactions a central aspect of progression?
- EQ5: Can alternative methods, such as balancing the game's difficulty curve or providing more generous in-game rewards, be implemented to avoid creating a perception of technical necessity for microtransaction purchases?
- EQ6: How can developers effectively convey the benefits of microtransactions in a manner that enhances player engagement without overshadowing the core gameplay experience?

C. FAIRNESS DIMENSION

This dimension focuses on ensuring fairness and transparency in the implementation of microtransactions. It consists of two crucial elements: Transparency and Security.

1) TRANSPARENCY

This element involves providing clear and explicit disclosure of the probabilities associated with acquiring specific items from chance-based mechanics like loot boxes or random reward systems. It addresses concerns related to gambling-like mechanics and ensures that users are fully aware of the odds and risks involved. Ethical considerations include providing comprehensive information on the contents and chances of acquiring items, avoiding persuasive practices, and preventing users from experiencing disproportionate losses.

a: QUESTIONABLE PRACTICE

In *Star Wars Battlefront II*, players could purchase loot boxes containing in-game items with undisclosed probabilities. This lack of transparency led to frustration and criticism as players felt manipulated and unable to make informed purchase decisions.

b: REFLECTION QUESTIONS

- FQ1: How can developers ensure transparency in the odds or probabilities of obtaining specific items or rewards through microtransactions?
- FQ2: Can alternative methods, such as clearly defined item tiers or fixed pricing for specific items, be implemented to provide more transparency and avoid the negative perception of unfair randomness?
- FQ3: How can developers communicate the value and rarity of items within the microtransaction system to help players make informed decisions without resorting to deceptive marketing tactics?

2) SECURITY

This element emphasizes the need for robust cryptographic measures and secure systems to protect users' personal information, financial transactions, and in-game assets. It also highlights the importance of offering clear options and configurations regarding data privacy, consent, and control. Ethical considerations involve safeguarding user data from unauthorized access or exploitation through persuasion, preventing fraudulent activities, and ensuring user trust and confidence in the microtransaction system.

a: QUESTIONABLE PRACTICE

Fallout 76 players could purchase microtransactions to obtain premium in-game currency, but the game suffered from significant security breaches that exposed players' personal and financial information. This security breach undermined trust and raised concerns about the safety of engaging in microtransactions.

b: REFLECTION QUESTIONS

- FQ4: How can developers ensure the highest data security and protection standards for players engaging in microtransactions?
- FQ5: Can alternative payment methods, such as utilizing trusted third-party payment processors or implementing additional security measures like two-factor

authentication, be implemented to enhance the security of microtransaction?

- **FQ6**: How can developers build trust and reassure players that their personal and financial information will be secure and not misused or exposed to potential threats?

V. RUNNING EXAMPLE: WORLD OF WARCRAFT

In this section, we examine the MMORPG (Massively Multiplayer Online Role-Playing Game), *World of Warcraft* (WoW), through the lens of our framework. Microtransactions have become an integral part of modern gaming experiences, and WoW, developed by Blizzard Entertainment, is no exception. We chose WoW for two reasons: The first is that there are still no applications that can be considered part of the metaverse, at least not strictly in terms of interaction and reality augmentation that we explored above (see Section II). Thus, the second reason is that, as discussed in Section I, the experiences inherent in MMORPGs are the closest thing to a persistent virtual world with hedonic, social, and functional values. In addition, WoW, in particular, has been classified as an essential event that has contributed to the conceptualization of the metaverse [38].

By applying our framework, we aim to gain insights into how WoW's microtransactions align with user needs, ethical considerations, and long-term sustainability. By analyzing each dimension and considering the implications of these design principles, we can provide an assessment of the impact of microtransactions in WoW.

A. MOTIVATION DIMENSION

Players are not primarily motivated to support developers, as the game already requires a subscription and additional payments for expansions. Instead, the primary motivations for microtransaction purchases in WoW are autonomy, relatedness, and FoMO, as players can acquire, regularly or seasonally, cosmetic items for personal expression or engage in social interactions by gifting items to others.

However, certain aspects related to autonomy and relatedness motivations can be problematic. The most significant one is the presence of the "WoW Token" (which allows players to exchange real money for in-game gold or game time) can create a pay-to-win scenario. Players with financial means can gain an advantage by purchasing powerful items or services, potentially causing imbalances and diminishing the skill-based gameplay experience. Moreover, the ability to buy "carries", i.e., hire other players for assistance in obtaining rewards, raises concerns about fairness and the merit of in-game achievements.

1) AUTONOMY

Users can purchase mounts, pets, and other cosmetic items to personalize their in-game characters and enhance their experience. The game also provides achievements and unlockable customization options that players can earn

through gameplay, providing a sense of progression and rewards for those who choose not to make microtransaction purchases. Table 1 shows the answers to the reflection questions for this element.

TABLE 1. Reflection questions for autonomy in WoW.

Question	Answer
MQ4	Offering a variety of cosmetic items that are available through both microtransactions and gameplay.
MQ5	Yes, a way to encourage that is to make it easy for players to earn in-game currency through gameplay, so that they can purchase cosmetic items without spending real money.
MQ6	Developers could introduce exclusive cosmetic items or in-game rewards where a percentage of the proceeds goes directly towards supporting game development or charitable causes. Moreover, setting limits on the amount of in-game currency that can be purchased with real money can prevent excessive and compulsive spending by players.

2) RELATEDNESS

WoW incorporates multiplayer elements that allow players to interact, collaborate, and compete with others, fostering social connections within the game. While microtransactions themselves may not directly impact social interactions, players can use cosmetic items as virtual gifts for friends, creating shared experiences and strengthening bonds. Table 2 presents the responses to the reflection questions related to this element.

TABLE 2. Reflection questions for relatedness in WoW.

Question	Answer
MQ7	WoW already facilitates social interactions through various in-game activities. However, to enhance social connections further, developers should implement activities accessible to a broader player base, ensuring that acquiring new items or gear does not become a limiting factor, so that they can aspire to bigger challenges.
MQ8	Yes, creating more activities that aim to foster camaraderie and be meeting points to socialize and have fun would cause players to have more possibilities to interact with each other to create then groups that make more challenging content.
MQ9	Limiting any purchase that involves real money and items that increase the player's power.

3) FOMO

In WoW, limited-time events, seasonal rewards, and exclusive content create a sense of excitement and exclusivity among players, encouraging them to engage in microtransactions to avoid missing out on unique opportunities. The reflection questions concerning this element are addressed in Table 3.

B. ENGAGEMENT DIMENSION

In WoW, the microtransaction design is quite prominent, with various elements enticing players to engage in purchases. The design of the microtransaction system is relatively invasive, with options available both in the game launcher

TABLE 3. Reflection questions for FoMO in WoW.

Question	Answer
MQ13	While things like cosmetics and toys might be available through other strategies, completing a seasonal event could grant players an achievement that would otherwise be impossible to obtain. This way, not all rewards are lost, and players can aim for something exclusive.
MQ14	Developers can adopt a system similar to *Final Fantasy XIV*, where seasonal event rewards are exclusively earned in-game. However, past season rewards can be purchased with real money. This way, players who missed out on certain items during specific events can still have the opportunity to obtain them through microtransactions without compromising the exclusivity of current event rewards.
MQ15	Events should focus on creating meaningful experiences and memories for players beyond just offering items and microtransactions. By crafting events that encourage participation and collaboration, players can feel more engaged and rewarded through the enjoyment of the event rather than feeling pressured to spend impulsively to acquire time-sensitive rewards.

and character selection screen. Additionally, players receive promotional emails and in-game offers, encouraging them to explore the microtransaction store further.

1) DESIGN

WoW employs persuasive design patterns to encourage microtransaction purchases while avoiding manipulative practices. The game primarily offers cosmetic items, such as mounts, pets, toys, and appearance-changing equipment, allowing players to personalize their characters and enhance their self-expression. The design emphasizes the aesthetic appeal of these items, making them attractive to players seeking greater autonomy in customizing their in-game experience. Table 4 displays the answers to the reflection questions for this element.

TABLE 4. Reflection questions for design in WoW.

Question	Answer
EQ1	Developers can conduct usability testing and gather player feedback during the design process to ensure that interfaces are intuitive and user-friendly. Transparent pricing and clear information about the nature of microtransactions should be provided to avoid manipulating players into unintended purchases. It is essential to prioritize user experience over aggressive marketing techniques.
EQ2	Yes, developers can adopt ethical design principles by displaying the actual cost of items or services upfront and avoiding hidden fees or upselling tactics.
EQ3	Developers can communicate the value and purpose of microtransactions transparently, ensuring that players understand the optional nature of these purchases. By providing clear information on what microtransactions offer, without exaggeration or misleading claims, players can make informed decisions based on their personal preferences without feeling pressured or misled.

2) TECHNICAL NECESSITY

In WoW, microtransactions do not encroach on essential gameplay features or functionalities. The game follows a

hybrid business model, where players need to purchase expansions and subscribe to play, but the core gameplay experience is accessible without additional purchases. While the game offers character services, such as race or faction changes, they are not technically necessary for the fundamental enjoyment of the game.

Although the game itself does not sell essential gameplay features, an important consideration arises concerning add-ons, i.e., third-party software integrated directly into the game, providing players with valuable information, timers, detailed statistics, and additional customization options. While many add-ons are freely available, some of them may be sold, creating a potential issue.

Players heavily rely on these add-ons to coordinate effectively during challenging battles and encounters. Although technically possible to play without them, the complexity of battles makes them practically mandatory for success. This dependence on add-ons raises questions about whether certain functionalities, essential for optimal gameplay, may effectively become microtransactions. The responses to the reflection questions for this element can be found in Table 5.

TABLE 5. Reflection questions for technical necessities in WoW.

Question	Answer
EQ4	Shopping options should be available but should never disrupt the core user experience. Developers must prioritize designing a self-contained experience that can be delivered without relying on add-ons. By considering the game and the users' needs, they can ensure that microtransactions complement the gameplay rather than overshadow it.
EQ5	Certainly, the difficulty level should be tailored to the user's experience. This does not mean creating overly simplistic content that can be easily overcome. Instead, the aim is to design challenges that, when successfully completed, instill a sense of satisfaction and accomplishment, allowing players to feel fulfilled without the necessity of relying on third-party services or microtransactions.
EQ6	The game's design should prioritize player autonomy by offering a wide variety of in-game rewards that can be earned through gameplay. Cosmetic microtransactions should complement, not overshadow, the in-game rewards. Additionally, avoiding aggressive prompts and ensuring that players have ample time and information to make decisions will foster a sense of trust and respect for players' autonomy.

C. FAIRNESS DIMENSION

The microtransactions themselves do not fall under chance-based mechanics like loot boxes, as players are fully aware of the items they are purchasing and their associated costs. However, there are fairness concerns related to other aspects of the game's design and business model.

1) TRANSPARENCY

While the microtransactions in WoW are transparent, some elements within the game lack transparency, specifically regarding the probabilities of obtaining certain items. For example, rare mounts and legendary weapons drop from enemies and bosses with undisclosed drop rates, leading

to uncertainty and frustration among players. In general, microtransactions in WoW are implemented with a non-persuasive approach, since persuasion is related to FoMo, as we described in the section above. The reflection questions pertaining to this element are summarized in Table 6.

TABLE 6. Reflection questions for technical necessities in WoW.

Question	Answer
FQ1	Developers should provide clear and explicit information about the probabilities associated with acquiring items from chance-based mechanics. For example, when offering loot boxes or random reward systems, the exact chances of obtaining specific items should be disclosed to players. By doing so, users can make informed decisions about their purchases without feeling manipulated or deceived.
FQ2	Yes, developers can adopt alternative approaches to enhance transparency. Implementing clearly defined item tiers, where players know the rarity of items in each tier, can provide a more straightforward understanding of what they can expect from their purchases. Additionally, offering fixed pricing for specific items instead of random chance-based mechanics can eliminate the feeling of uncertainty and ensure fairness in the microtransaction system.
FQ3	Developers should adopt honest and straightforward communication about the value and rarity of items. Using clear descriptions, categorizing items based on their rarity, and avoiding manipulative marketing tactics will help players make informed decisions about their purchases. By providing transparent information, developers can build trust and ensure fairness in the microtransaction process.

2) SECURITY

In terms of security, WoW does not directly face issues with microtransactions, as payment information is processed securely. However, the game's design and business model may influence player engagement and retention, leading to potential concerns about fairness. In relation to security considerations, Table 7 presents the answers to the reflection questions.

VI. DISCUSSION

The future metaverse poses numerous challenges, particularly in establishing protocols, standards, and company collaboration. Drawing from the lessons learned in video games becomes crucial as delving into microtransactions within this virtual landscape.

In the vast expanse of the metaverse, where users would seamlessly interact and explore, a question arises: How can we ensure that inter-company collaborations balances user experience and profit? Historically, such collaborations have been rare, making it imperative to critically examine the feasibility and trustworthiness of collaborative efforts in this new digital frontier [39].

Another concern is the immense computational power required to sustain the metaverse [40]. Current MMOs already grapple with server capacity and concurrency, often employing various techniques to alleviate these challenges. Companies may use microtransactions to finance and support the metaverse infrastructure considering the magnitude of resources demanded.

TABLE 7. Reflection questions for technical necessities in WoW.

Question	Answer
FQ4	Developers should implement robust cryptographic measures and secure systems to safeguard users' personal information, financial transactions, and in-game assets. Likewise, accessible and understandable menus and options for users are as or even more important than cryptographic measures.
FQ5	Yes, integrating trusted third-party payment processors and offering additional security measures like two-factor authentication can significantly enhance the security of microtransactions. These methods provide an extra layer of protection, instilling confidence in players about the safety of their financial transactions and personal information.
FQ6	Developers should be transparent about the security measures in place and regularly communicate with players about data protection and privacy policies. Offering clear options and configurations regarding data privacy, consent, and control will help reassure players that their information is in safe hands. Additionally, promptly addressing any security concerns or incidents and taking appropriate actions to rectify them will further strengthen player trust in the microtransaction system.

Nevertheless, addressing the metaverse resource allocation and collaboration challenges necessitates meticulous planning and innovative solutions [41]. Active involvement from industry leaders and regulatory bodies will be essential in creating an environment that fosters healthy competition, user empowerment, and protection.

As individuals immerse themselves in the metaverse, their digital presence, identity and activities generate a wealth of data, including personal preferences, behaviors, and even biometric information. While this data holds immense value for metaverse operators, it also raises valid privacy concerns [42]. To safeguard user privacy within this immersive realm, robust data protection measures, transparent policies, and effective user consent mechanisms must be implemented.

One significant aspect is the influence of microtransactions on user behavior within virtual environments. Lessons learned from video games indicate that microtransactions tap into players' motivations and desires, addressing to their need for autonomy, competence, and relatedness [24]. The metaverse will likely amplify these motivations, presenting new possibilities for self-expression, achievement, and social interactions.

While many ethical and economic challenges associated with microtransactions are not unique to the metaverse, this digital realm's immersive and interconnected nature can amplify specific issues. For instance, the concept of *pay-to-win* can be particularly stark. In real life, financial resources often translate to educational, health, and opportunity advantages. Philosophers like Žižek [43] have delved into the societal structures perpetuating these inequalities. However, this disparity becomes more explicit in video games, making it contentious. A player's skill might be overshadowed by another's financial capability to purchase in-game advantages. This explicitness of the *pay-to-win* model in games often leads to significant backlash from the gaming community, making companies reconsider its

implementation due to potential risks to game popularity and acceptance [44].

The running example of microtransactions in World of Warcraft illustrates how developers can provide a wide range of character customization options through both microtransactions and gameplay, fostering autonomy and self-expression for players. Additionally, in-game achievements and unlockable customization options offer a sense of progression and rewards for players who choose not to make microtransaction purchases.

Video games and the emerging metaverse inherit specific business models from the real world, such as loyalty programs designed to retain customers. However, there is a fundamental difference in these models. In traditional loyalty programs, points or rewards are often earned as a byproduct of purchases. In contrast, video games require users to directly purchase virtual currencies or points, which are then used to acquire in-game items or advantages. While ensuring continued user engagement, this direct purchase model represents a distinct approach compared to traditional loyalty-based rewards. As we transition more profoundly into the metaverse, this redefinition of value and ownership becomes even more pronounced [45]. Virtual assets acquired through microtransactions may hold significant value within the metaverse, but their legal status and protection in the physical world remain uncertain. This interplay between the virtual and real worlds, which is not exclusive to the metaverse but has been evident in video games for years [46], underscores the need for establishing appropriate frameworks for ownership rights, copyright protection, and dispute resolution mechanisms. Ensuring a fair and secure economy in the metaverse and video games will be critical as these digital realms continue to influence and intersect with our real-world experiences.

However, caution must be exercised when considering buzzwords like Blockchain, non-fungible tokens (NFTs), and Web 3.0 as solutions for the metaverse. While they hold promise, their viability has been questioned. Concerns regarding environmental impact, volatility, and actual value have cast doubt on their practicality [47]. It is imperative to critically evaluate these technologies, exploring alternative approaches that provide the necessary infrastructure and resource management without compromising user experiences or relying solely on microtransactions.

While our framework provides valuable insights, it also has its limitations. The rapidly evolving nature of technology and the metaverse may require regular updates and refinements to address emerging challenges. Moreover, cultural differences and regional regulations may impact the ethical considerations and implementations of microtransactions in various parts of the world.

VII. OPEN QUESTIONS
Our framework presents a series of questions tailored to each dimension to guide further research and exploration of microtransactions. These questions, embedded within the

dimensions, serve as focal points for the community to address, thereby advancing our understanding and potentially leading to solutions. We encourage researchers to delve into these questions, as they represent challenges and gaps in the field.

VIII. CONCLUSION
The metaverse concept holds immense potential to reshape our digital experiences, offering a vast virtual realm where users can connect, create, and explore. However, as navigating this new frontier, it is crucial to approach it with a critical mindset and address the challenges that arise.

The significance of this study lies in bridging the gap between the current understanding of microtransactions in video games and their potential manifestation within the metaverse. By employing our proposed three-dimensional framework for ethical analysis and design of microtransactions, we explored the dimensions of Motivation, Engagement, and Fairness, providing valuable insights into how microtransactions may shape user behavior, social interactions, and overall experiences in this new digital field. Privacy concerns must also be addressed through robust data protection measures and transparent policies to ensure that users have control over their personal information within the metaverse.

Through our running example of World of Warcraft, we observed how developers can enhance player autonomy and self-expression by providing a wide range of cosmetic items available through both microtransactions and gameplay. Furthermore, by implementing activities accessible to a broader player base and fostering camaraderie, developers can promote social bonding and meaningful interactions without solely relying on microtransaction purchases. Additionally, we highlighted the importance of transparency in odds and probabilities to ensure fairness in a metaverse like economy.

As microtransactions play a significant role in the metaverse, drawing from the lessons learned in video games becomes crucial. Striking the right balance between providing meaningful experiences through microtransactions and avoiding misleading practices will be essential. Learning from past mistakes is vital to cautiously explore alternative approaches that align with user interests and enhance the overall metaverse experience.

The metaverse offers a tantalizing vision of a digital world filled with endless possibilities. To ensure its success and sustainability, it is imperative that stakeholders, including companies, users, and regulatory bodies, work together to shape an inclusive, fair, and user-centric metaverse. By addressing concerns, fostering collaboration, and upholding ethical standards, we can pave the way for a metaverse that enriches our lives and reflects our collective aspirations.

Ultimately, the metaverse is not merely a technological construct but a reflection of our societal values and aspirations. It is up to us to shape it to align with our vision of a

digital future that empowers and connects individuals while safeguarding their rights and well-being.

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