How Gamification Influences User Acceptance of the Metaverse: An Empirical Study Based on SOR Theory

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Date: 2023-08-29T00:00:00+00:00

Abstract

Abstract: Purpose/Significance With the advancement of digital technologies and the demands of real-world applications, the metaverse is gradually emerging. As enterprises compete to enter this domain, fostering interest among ordinary users to understand the metaverse and enhancing their acceptance becomes critically important. Methods/Process This study adopts a gamification perspective, leveraging the cultural metaverse activity launched by the Central China Normal University Library as a research context. It employs a scenario-based experimental method to collect data from participating users and investigates the influence mechanism of gamification on metaverse acceptance through empirical approaches. Results/Conclusion The findings demonstrate that gamification positively impacts metaverse acceptance via the mediating role of affect. Specifically, gamification influences affect through both direct and indirect pathways: on the one hand, gamification directly affects users' affect, with sense of achievement serving as a moderator in this process; on the other hand, gamification positively influences users' immersion, which facilitates the generation of novel experiences and indirectly affects users' affect.

Full Text

Preamble

How Gamification Affects User Acceptance of the Metaverse: An Empirical Study Based on SOR Theory

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Abstract

[**Purpose/Significance**] With the advancement of digital technologies and evolving real-world needs, the metaverse has gradually emerged as a significant phenomenon. As enterprises rush to enter this domain, fostering ordinary users' interest in understanding the metaverse and enhancing their acceptance becomes critically important. [**Method/Process**] This study adopts a gamification perspective, leveraging a cultural metaverse activity launched by the Central China Normal University Library as a research opportunity. Using a scenario experiment method, we collected data from participating users and employed empirical analysis to explore the influence mechanisms of gamification on metaverse acceptance. [**Result/Conclusion**] The findings demonstrate that gamification positively influences metaverse acceptance through the mediating role of emotion. Specifically, gamification affects emotion both directly and indirectly: on one hand, it directly impacts user emotion, with a sense of accomplishment serving as a moderator in this process; on the other hand, gamification positively influences user immersion, which facilitates novel experiences and indirectly affects user emotion.

Keywords: gamification; metaverse; emotion; immersion; novel experience; sense of accomplishment

1. Introduction

With the widespread application of digital technologies and increasingly complex real-world changes, the metaverse has become both technically feasible and capable of meeting users' practical needs, gradually gaining prominence both domestically and internationally in recent years. The year 2021 has been widely termed the metaverse inaugural year, marked by a series of notable events. Among them, Roblox became the first company centered on the "metaverse" to go public successfully, and Facebook announced its rebranding to Meta, further propelling the term "metaverse" into widespread public and social media discourse and making it a hot topic [2,3]. As of 2023, research interest in the metaverse continues unabated and is expected to remain an important academic focus for the foreseeable future [4].

Chinese local governments have also shown increasing attention to the metaverse, incorporating it into governmental planning documents and introducing supportive policies. For instance, municipal governments in Shanghai, Beijing, Chengdu, Wuhan, Hangzhou, Xiamen, Chongqing, and Guangzhou have successively announced action plans related to the metaverse [5,6]. In the first quarter of 2022 alone, investment in metaverse-related fields in China' s primary market exceeded 6.6 billion RMB, representing a year-on-year increase of 108% [7]. It

is projected that by 2025, China' s metaverse industry scale will reach nearly one trillion RMB [8].

Supported by these governmental policies, various industries are striving to integrate the metaverse with their existing operations. In the industrial sector, enterprises are applying the metaverse to daily tasks and production guidance to better deliver product services [9]. In the public sector, the metaverse is being utilized to reduce public costs and alleviate resource constraints [7]. In the consumer domain, the primary focus lies in entertainment and social interaction, aiming to enhance user experience [10]. As evident from these examples, the metaverse has exerted significant influence across industrial, commercial, and other production and life domains, becoming a crucial pathway for enterprise digital transformation [11,12] and playing a vital role in rapid enterprise development, upgraded consumer demands, and interactions between users and enterprises.

In analyzing the metaverse, "people" are regarded as the core element [1]. The metaverse should consistently emphasize user dominance [13], highlighting co-creation, collaboration, and sharing with users [9]. This process must prioritize user needs, making user acceptance and participation essential for constructing a more complete metaverse ecosystem. However, as the metaverse remains in its early stages with overly broad and rich conceptual connotations, many users still have limited understanding of it [1]. This necessitates selecting a more popularized perspective that enables users to better understand and accept the metaverse through actual experiences, leading this study to adopt gamification as its entry point.

The term "gamification" was coined by consultant Nick Pelling in 2010 and officially entered public discourse at the 2011 GDC (Game Developer Conference), attracting attention from the gaming industry and other sectors. Over the past decade, gamification has gained increasing popularity and been applied across various industries [14]. Gamification can enhance services through various game elements, allowing users to experience gameplay-like engagement and generate further behavioral outcomes [15]. Investigating factors that positively influence users' behavioral intentions toward the metaverse, such as acceptance, holds significant importance for its development and promotion. However, few studies have examined whether gamification can better satisfy user needs in the metaverse and influence user acceptance. Therefore, this study investigates the impact of gamification on metaverse acceptance and the mediating factors between them.

Based on SOR theory, this study employs scenario experimentation for empirical analysis. The results demonstrate that gamification positively influences metaverse acceptance. Gamification' s positive impact on emotion makes users more willing to understand and accept the metaverse. Specifically, novel experience mediates the relationship between gamification and emotion, while immersion mediates the path from gamification to novel experience. Additionally, a sense of accomplishment moderates the direct path from gamification to emotion. This

study innovatively explores the mechanism through which gamification influences metaverse acceptance, extending frontier research on gamification and the metaverse, while providing insights for metaverse enterprises on how to use gamification to guide users toward greater acceptance.

2. Literature Review

2.1 The Metaverse

Since 2021, the term "metaverse" has rapidly become a hot topic, attracting widespread global attention in both academic research and commercial applications, where it is presented to users in various forms [1]. Currently, there is no unified definition of the metaverse. In the context of this study, the metaverse refers to an environment that integrates virtual and physical realities, enabling physical spaces to carry interactive information and creating experiences where virtual and real information are fused [16]. Digital humans in the metaverse represent a key service form, utilizing AI technology to achieve multi-modal interaction through voice, gestures, and expressions to provide services in virtual scenarios [17].

The metaverse continues to develop rapidly, involving multiple digital technologies with increasingly broad application domains and scenarios. It has been applied in education, social interaction, healthcare, and other fields, creating new user demands and providing new ideas for metaverse enterprises to develop products and services [6]. For example, the education sector represents one of the primary application domains of the metaverse, creating new learning spaces and modes for students [18,19] and promoting comprehensive dimensional upgrades in digital education [20]. Additionally, the metaverse offers new forms for digital cultural tourism and the dissemination of Chinese culture [21,22]. Furthermore, the virtual-physical integration of the metaverse diversifies online consumption while invigorating offline consumption, with online and offline consumption mutually reinforcing and integrating to constitute a new consumption format [11]. In summary, the metaverse provides a new path for enterprise digital development, attracting more enterprises to attempt integration with the metaverse.

Despite rapid developments in metaverse research across academia and industry, public understanding of the metaverse still varies to some extent [1]. Current academic discussions on the metaverse focus either on ontological research explaining its concepts [12] and technologies [23], or on applications in education, sports, gaming, and other domains [24]. These studies either directly analyze the metaverse itself or explore its applications based on the premise that users already understand it. However, few studies have focused on users newly exposed to the metaverse or empirically investigated their willingness to accept this new application and the factors influencing their acceptance. Therefore, this study explores the factors influencing user acceptance of the metaverse, such as gamification.

2.2 Gamification

Academia has defined gamification from different perspectives. One perspective views gamification as a design process from a game systems standpoint, emphasizing the introduction of game elements and mechanics into non-game environments to improve user engagement and behavioral outcomes [25]. Another perspective approaches it from the user experience angle, viewing gamification as a way to create engaging, enjoyable, and motivating experiences, emphasizing how game elements stimulate user participation, pleasure, and a sense of accomplishment [26,27]. These definitions indicate that gamification must not only emphasize game design and element integration but also focus on user needs and experience. Research shows that through game elements like badges and leaderboards, along with incentive mechanisms, gamification can provide users with novel gaming experiences and generate positive behavioral outcomes [15].

Various gamification elements exist. In the context of this study, we focus on competition as the gamification element. Competition refers to the idea of challenging and competing with others, resulting in possible victory for one player or group while others lose [28]. Based on existing definitions of gamification [25], this study defines gamification as the introduction of competitive elements and mechanics from games into non-game environments to improve user engagement and behavior.

During its development, gamification has been applied to numerous fields such as marketing, e-commerce, tourism, and work performance due to its ability to promote user engagement and provide positive services [29]. From a business perspective, the ultimate goal of creating gamified experiences is to stimulate "enterprise-favorable user behaviors" [30]. Regarding the metaverse as a new phenomenon, exploring user acceptance is an urgent issue because it significantly impacts the practical promotion and application of the metaverse. Therefore, this study aims to mobilize users'positive emotions through gamified experiences, thereby hoping to increase user acceptance of the metaverse environment and facilitate its further promotion and application.

2.3 Gamification and the Metaverse

Gaming represents one of the primary application scenarios of the metaverse [16] and is considered its prototype, sharing certain similarities with it in many aspects [20]. However, viewing the metaverse simply as a large-scale game is one-sided, as the metaverse is not merely an ordinary game but also drives the current wave of gamification [31]. The metaverse breaks the center of traditional game design, allowing users to make autonomous choices and decisions [32]. Game objectives have become part of the metaverse, meaning that social division of labor within the metaverse needs to be realized through gamified interaction goals [33].

The digital age is human-centered, and the metaverse further emphasizes this characteristic, focusing on meeting user needs to a higher degree [13]. More-

over, users are both consumers and creators of the metaverse [17]. The metaverse is primarily constructed by ordinary people (non-metaverse enterprises or specialized researchers, referring to metaverse users in this study). Within the metaverse, users' dual identities significantly enhance their participation, making them the main creators of value [7]. Furthermore, existing literature indicates that gamification can influence user experience and emotion [34,35,36]. Therefore, this study, adhering to a human-centered approach and combining the research context, posits that from a metaverse perspective, the core of gamification lies in creating value through users while emphasizing user experience value throughout this process.

2.4 Theoretical Foundation

This study is based on the Stimulus (S)-Organism (O)-Response (R) framework. The SOR model posits that stimuli trigger individuals' cognitive and emotional states, subsequently prompting responses and behaviors [37]. In the S-O-R framework, stimulus serves as an antecedent, while organism represents the mediating process between stimulus and behavioral response [38]. In this study, the mediating process is user emotion [39].

Based on SOR theory, this study proposes the research model shown in Figure 2-1. We hypothesize that the stimulus (S) is gamification; the organism (O) is the mediating process between gamification and user response, which includes gamification (S) increasing immersion and perception of novel experiences, while immersion also influences novel experiences, subsequently affecting consumer emotion (O) in the metaverse environment; and the response (R) refers to user acceptance of the metaverse environment (R) based on the aforementioned emotional influences.

Stimulate (S) → Organism (O) → Response (R)
Gamification → Emotion → Metaverse Acceptance

[Figure 2: see original paper]

Figure 2-1 Research Model

3. Hypotheses Development

3.1 Gamification

Research defines immersion as "the holistic experience felt when people are completely involved in an activity" [40], while other scholars define it as a psychological state where users become immersed in academic blogs [41]. Based on these studies, this paper defines immersion as a state where users are completely absorbed in the metaverse. Games provide enjoyment while enabling users to become immersed [34,42]. For example, research indicates that challenges in games may promote players' sense of flow and immersion [43]. Juho Hamari [44] argues that game challenge and proficiency positively impact engagement

and immersion in games. Shernoff' s [45] research also demonstrates that higher challenges lead to stronger engagement or immersion. Gamification is the application of game elements and mechanics in non-game systems [25]. Many scholars have used gamification to increase immersion to improve user behavior; for instance, Doumanis [35] suggests that increasing immersion through gamification can make online courses more engaging. In summary, gamification helps provide users with higher levels of immersion. Therefore, this study proposes:

H1: Gamification positively influences user immersion.

Novel experience refers to the positive emotions such as excitement and pleasure generated during the experience, subsequently triggering positive flow experiences [46]. Although few studies have directly explored the relationship between gamification and novel experience, literature indicates that gamification exhibits a "novelty effect," where novel experiences gradually diminish with prolonged application. For example, Clark [47] argues that continuous exposure to gamified systems transforms novel experiences into ordinary ones, causing users to lose initial excitement. Ortiz-Rojas et al. [48] also suggest that gamification may gradually lead to loss of novelty. While the sustainability of novel experiences warrants discussion, this indirectly reflects that gamification can generate novel experiences, with the strongest novelty occurring initially. In non-game contexts, gamification typically increases perceived enjoyment, making daily work more "fun" [49]. In summary, this study posits that for users newly exposed to the metaverse, gamification can generate strong novel experiences. Therefore, this study proposes:

H2: Gamification positively influences user novel experience.

Based on the preceding discussion of H1, when users experience gamification, they become immersed. Moreover, existing research demonstrates that immersive experiences can bring pleasant and novel feelings to experiencers [36]. Currently, immersion has been applied in many contexts to provide novel experiences. For example, immersive tourism performances provide users with a three-dimensional novel experience [50]. In summary, this study proposes:

H3: Immersion positively influences user novel experience.

Furthermore, based on the literature review above—where gamification influences immersion, and immersion brings novel experiences—this study proposes:

H4: Immersion mediates the relationship between gamification and novel experience.

3.2 User Emotion

Emotion refers to the attitudinal experience formed by individuals toward objective things based on whether they satisfy their needs [51]. Werbach and Hunter proposed the DMC pyramid, categorizing game elements into Dynamics, Mechanics, and Components, and argued that games can enhance consumers' sense

of engagement and emotion [52]. Gamification is the application of game elements and mechanics in non-game systems [25]. Research shows that in gamified systems, users experience various emotions [14,27]. When users are immersed in the gamified environment, they are more likely to experience emotional changes. Current emotion research focuses on its triggering mechanisms; for example, sensory stimulation can directly generate emotional responses such as liking and pleasure [53], and different levels of gamification elements (badges) also affect emotional engagement [34]. Moreover, gamification can influence user behavior through emotion. When users are immersed in gamification, they generate positive emotions and enhanced user stickiness [54]. For instance, gamified behaviors like "stealing water" and "watering" can enhance interactions among friends and bring pleasant emotional experiences [52]. Therefore, this study proposes:

H5: Gamification positively influences user emotion.

Based on the preceding discussion of H2, gamification brings novel experiences to users. Previous research has proven that perception of novel experiences influences user emotion [55]. For example, the University of Memphis in Tennessee proposed that novel experiences can stimulate participants' strong emotions. Clark [47] argued that users' experiences of novel phenomena make them feel excited. In summary, this study proposes:

H6: Novel experience positively influences user emotion.

Additionally, based on the literature review above—where gamification influences novel experience, and novel experience influences emotion—this study proposes:

H7: User novel experience mediates the relationship between gamification and emotion.

3.3 The Moderating Role of Sense of Accomplishment

Sense of accomplishment refers to the honor users feel after overcoming difficulties and completing challenges [56]. In gamification, whether through badges, leaderboards, or other gamification elements, reasonable gamification design [14,27,52] and user interactions [57] can give users a sense of accomplishment after successfully passing levels or achieving goals. Therefore, in this study' s experiment, user participation in gamification may produce two outcomes: one where users successfully pass levels, with top performers ranking high on leaderboards and earning rare badges, giving them a sense of accomplishment. For example, Ant Forest uses gamification design to give users a sense of personal accomplishment [54], which fills users with pleasure during gameplay [56]. In this study' s context, when participants successfully pass levels, they gain a sense of accomplishment, which positively influences or strengthens the effect of gamification on emotion. The alternative outcome is level failure, leaving users without a sense of accomplishment. In this study' s context, failing levels likely causes frustration and diminishes the effect of gamification on emotion.

Therefore, this study posits that sense of accomplishment moderates the path between gamification and emotion. Specifically, when users have a sense of accomplishment, they generate more positive emotions. Conversely, when users lack a sense of accomplishment, the effect of gamification on emotion weakens. Thus, this study proposes:

H8: Sense of accomplishment positively moderates the path from gamification to emotion.

3.4 Emotion and the Metaverse

As a psychological theory, the Tripartite Model of Attitude (TMA) primarily explains how people form and change attitudes toward specific things. TMA argues that cognition and emotion play important roles in attitude formation, and that changing cognition and emotion can influence attitudes and subsequently alter behavior [17]. For example, customers' behavioral intentions toward AI robots are directly influenced by their emotions toward them [58]. Therefore, based on TMA and existing research, this study proposes:

H9: User emotion positively influences user acceptance of the metaverse.

4. Methodology

4.1 Scale Design

This study involves five variables, with each variable (except sense of accomplishment) comprising 3-4 measurement items. All measurement items were adapted from existing literature to ensure content validity and were appropriately modified according to Chinese expression habits to fit this study' s specific context, ensuring content effectiveness. Specifically, gamification items were adapted from Huang and Zhou [59] and N Xi et al. [60], such as "I compared my ranking with others" ; immersion items were adapted from Shin, D [61], such as "I was immersed in this metaverse scenario" ; novel experience items were adapted from Bello and Etzel [62] and Yim et al. [63], such as "At the beginning of the experience, when the digital human Boyu explained the activity introduction, this experience was completely new" ; emotion items were adapted from David Watson and Lee Anna Clark [64], such as "excited" and "happy" ; metaverse acceptance items were adapted from Lu, L et al. [65], such as "I am willing to accept the metaverse." All items were measured using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

4.2 Data Collection

This study used the "Gamified Knowledge Quiz Competition in Metaverse Environment" as the research setting. Participants were recruited to follow the process shown in Figure 4-1: First, follow the "Central China Normal University Library" WeChat official account and click on "Bokan Meta Reading" in the

resource reading section to enter the metaverse space. In this space, participants could experience online explanations from virtual digital humans and appreciate the charm of Chinese culture. Then, by clicking on the 3D view, they could find four challenge levels: Shuowen Jiezi (Explaining Characters), Shishu Gujin (Poetry Through Ages), Xi Yi Cheng Su (Established Customs), and Shihua Jieqi (Poetry of Solar Terms), each containing three questions. Participants could attempt the levels in different sequences according to personal preference, with three total attempts available. The game ended when all levels were passed or all three attempts were used up. Participants could then "view the leaderboard" to see individual and institutional rankings. Additionally, those who successfully passed all levels received random-amount red envelopes, while top-three users on the leaderboard received medals. After the game, participants were required to complete a questionnaire immediately based on their actual experience. A total of 198 questionnaires were collected. After data screening, 10 questionnaires with obviously careless responses or excessively short completion times were eliminated, leaving 188 valid questionnaires for subsequent analysis.

[Figure 4: see original paper]

Figure 4-1 Experimental Flowchart

5. Results and Analysis

This study employed Partial Least Squares (PLS) to test the research hypotheses, primarily for three reasons: First, PLS is suitable for theoretical model exploration [66] and does not impose strict sample size limitations [67]. Second, in PLS-SEM, the sample size should be at least "10 times the maximum number of formative indicators measuring a single construct" and "10 times the maximum number of structural paths directed at a particular construct" [68]. Based on the number of paths in this study' s model, the selected sample size is appropriate. Third, all constructs in this study are reflective indicators, making them suitable for PLS testing. Therefore, this study sequentially tested the measurement model and structural model using PLS.

5.1 Measurement Model Testing

This study first tested the measurement model for reliability and convergent validity. Since this study includes only reflective indicators, only reflective indicator principles were applied for evaluation. The criteria were: (1) factor loadings, Cronbach' s Alpha (CA), and Composite Reliability (CR) should be greater than 0.7 [69]; (2) Average Variance Extracted (AVE) should be greater than 0.5 [70]. Table 5-1 presents the measurement model results. The data show CA values ranging from 0.844 to 0.963 and CR values from 0.891 to 0.976, all exceeding 0.7 [69]; AVE values range from 0.672 to 0.930, all greater than 0.5 [70]; and all variable loadings exceed 0.7 [69]. Therefore, all variables meet the standards.

Table 5-1 Reliability and Convergent Validity Test Results

Discriminant validity of the measurement model was then analyzed. The Fornell-Larcker criterion principle states that the square root of each variable' s AVE score should exceed the correlation between that variable and other variables (Hair et al., 2017). As shown in Table 5-2, the minimum square root of AVE values for the five factors is 0.820, greater than the maximum inter-factor correlation coefficient of 0.768. Additionally, this study examined cross-loadings to assess discriminant validity [68]. Table 5-3 results show that each item loads higher on its own construct than on others. In summary, these tests confirm the discriminant validity of the measurement model.

Table 5-2 Fornell-Larcker Criterion Test Results
Note: Bolded diagonal elements are the square roots of AVE values for each measure

Table 5-3 Cross-Loading Test Results

5.2 Structural Model Validation

This study used PLS-SEM to predict key target constructs of the new theoretical model. The research model was drawn in SmartPLS 4.0 software, and Bootstrapping was used to obtain the test results shown in the figure. Figure 5-1 displays the path coefficients and R^2 significance. In this model, the R^2 values for immersion, novel experience, and metaverse acceptance are 54.4%, 54.5%, and 56.3% respectively, all exceeding 50%, indicating moderate explanatory power for these three constructs. The R^2 for emotion is 77.0%, indicating strong explanatory power for this construct.

$R^2 = 0.544 \rightarrow R^2 = 0.545 \rightarrow R^2 = 0.770 \rightarrow R^2 = 0.563$
Gamification → Immersion → Novel Experience → Emotion → Metaverse Acceptance

[Figure 5: see original paper]

Figure 5-1 Research Model Test Results
Note: $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$*

The empirical analysis results in Figure 5-1 show that hypotheses related to gamification are supported. When testing H1, this study found that gamification significantly promotes immersion among users in the metaverse environment ($\beta = 0.737$, $t = 14.305$, $p = 0.000$, $R^2 = 0.544$, $f^2 = 1.191$), supporting H1. This indicates that during user participation in gamification, it helps them develop high immersion in the metaverse. H2 is also supported: gamification positively influences user novel experience ($\beta = 0.424$, $t = 4.295$, $p = 0.000$, $R^2 = 0.545$, $f^2 = 0.180$). This result shows that gamification is an important factor in helping users gain novel experiences in the metaverse environment. Overall, in metaverse environments with gamification, gamification plays an important role in promoting user immersion and their perception of novel experiences. Additionally, H3 results confirm that immersion positively influences user novel experience ($\beta = 0.368$, $t = 3.683$, $p = 0.000$, $R^2 = 0.545$, $f^2 = 0.136$). This

indicates that when users are immersed in a gamified metaverse environment, they experience a sense of novelty.

H5 results confirm that gamification positively influences user emotion (β = 0.213, t = 2.489, p = 0.013, R^2 = 0.770, f^2 = 0.077), supporting H5. This shows that gamification containing challenge tasks, leaderboards, badges, and other elements can positively influence user emotion.

H6 shows that novel experience also influences users' emotional cognition (β = 0.590, t = 8.043, p = 0.000, R^2 = 0.770, f^2 = 0.773). This indicates that when users experience unprecedented novelty in a gamified metaverse environment, they are more likely to have new emotional cognitions and changes.

H8 results show that sense of accomplishment positively moderates the path from gamification to emotion (β = 0.226, t = 2.217, p = 0.027, f^2 = 0.049), supporting H8. This reveals that during gamification, when users successfully pass levels, they develop a sense of accomplishment, which in turn promotes more positive emotions. Conversely, without successful level completion, users lack a sense of accomplishment, thus weakening their emotional response.

Hypotheses related to metaverse acceptance are also supported. H9 results show that user emotion significantly influences metaverse acceptance (β = 0.751, t = 17.339, p = 0.000, R^2 = 0.563). This indicates that when users experience positive emotions such as happiness and liking, they are more likely to accept the metaverse environment.

5.3 Mediation Effect Testing

This study used the Bootstrapping method to resample the 188 data samples 5,000 times for mediation effect testing. The results are shown in Table 5-3.

This study proposed H4 and H7, thus conducting mediation tests. As shown in Table 5-3, first, the indirect effect of gamification on novel experience (a*b) *is significant (β = 0.271, t = 3.409, p = 0.001). Second, the direct effect of gamification on novel experience (c) is significant (β = 0.424, t = 4.295, p = 0.000). Moreover, the direct and indirect effects are in the same direction (*abc *is positive). Therefore, complementary mediation is confirmed. Similarly, the indirect effect of gamification on emotion (*ab) is significant (β = 0.250, t = 4.728, p = 0.000), and the direct effect of gamification on emotion (c) is significant (β = 0.213, t = 2.489, p = 0.013). Consistent with the above analysis, the direct and indirect effects are in the same direction (a*b*c is positive), confirming complementary mediation. Therefore, this study supports H4 and H7.

In summary, all hypotheses are supported.

Table 5-3 Mediation Effect Test Results

6. Discussion

6.1 Results Discussion

Based on SOR theory and using the metaverse experience activity launched by Central China Normal University Library as an opportunity, this study collected user data through scenario experimentation and empirically analyzed the influence mechanism of gamification on metaverse acceptance, specifically verifying the mediating role of emotion between gamification and metaverse acceptance and the mediating role of novel experience between gamification and emotion. The following conclusions are drawn:

(1) This study finds that gamification has a significant positive effect on emotion, with sense of accomplishment playing a moderating role in this process, and emotion positively influences metaverse acceptance. Emotion mediates the relationship between gamification and metaverse acceptance. Existing research has found that gamification elements (badges) affect emotional engagement [34], and the Tripartite Model of Attitude posits that emotion influences attitude [17], consistent with this study' s results. This indicates that gamification can be used to generate positive user emotions, thereby increasing metaverse acceptance.

(2) This study finds that gamification has a significant positive effect on novel experience, and novel experience positively influences user emotion. Combined with conclusion (1) that gamification significantly affects emotion, novel experience mediates the relationship between gamification and emotion. Previous research has found that users' experiences of novel phenomena make them feel excited [47], consistent with this study' s findings. This shows that gamification can influence user emotion by generating novel experiences.

(3) This study finds that gamification has significant positive effects on both immersion and novel experience, while immersion also positively influences novel experience, and immersion mediates the relationship between gamification and novel experience. Existing research has found that gamification brings higher levels of immersion and novel experience [35,47], and that immersive experiences can bring pleasant and novel feelings to experiencers [36], consistent with this study' s results. This indicates that gamification can be used to provide users with higher levels of immersion and novel experience, thereby increasing metaverse acceptance.

6.2 Theoretical Contributions

This study extends frontier research on the metaverse, with main theoretical contributions as follows:

(1) This study constructs a theoretical model of how users increase metaverse acceptance through gamification from a metaverse perspective. Unlike previous studies that mostly focused on "the impact of metaverse applications

on users," this research focuses on the factors influencing user acceptance of the metaverse, providing theoretical reference for the widespread dissemination of the metaverse.

(2) From a gamification perspective and based on SOR theory, this study uses empirical methods to explore how gamification influences user acceptance of the metaverse, providing important reference for investigating user acceptance. Previous conceptual research on the metaverse mostly involved direct exposition and discussion, which can be too abstract and dull for ordinary users, making it difficult to generate real-life interest. This study adopts an ordinary user' s perspective, aiming to explore how to make users more willing to understand and accept the metaverse in daily life. By introducing gamification to attract user participation and experience, it seeks to improve metaverse acceptance through emotional changes brought about by these experiences.

(3) This study explores the internal mechanism between gamification and metaverse acceptance—the mediating role of emotion. This provides new insights into the "black box" between gamification and user acceptance of the metaverse. Using emotion as a mediator, this study investigates how gamification can influence user emotion, while also exploring emotion' s antecedents (novel experience) and novel experience' s antecedents (immersion). These antecedents provide important theoretical foundations for better improving user emotion. Moreover, emphasizing emotion as a mediating variable positively influences user acceptance of a novel topic or domain—the metaverse.

6.3 Managerial Implications

This study provides the following practical insights for enterprises on how to make users more willing to understand and accept the metaverse:

(1) This study' s results show that gamification makes users more willing to accept the metaverse. Therefore, metaverse service providers should emphasize the application of gamification from a metaverse perspective. Enterprises can attempt to develop gamification mechanisms containing competitive elements like leaderboards and badges, as well as novel and interesting designs, to attract more user participation. Although this may increase initial costs, attracting users who are completely unfamiliar with or uninterested in the metaverse will undoubtedly yield greater long-term benefits for metaverse enterprises. For users who have never experienced the metaverse, gamification is an effective way to promote understanding and acceptance.

(2) Since emotion mediates the path from gamification to metaverse acceptance, user emotion needs attention. This also reflects a human-centered approach. Therefore, metaverse enterprises must adopt an ordinary user' s perspective, carefully designing the gamification process based on meeting

user needs, to better showcase the metaverse' s appeal to the public in simple, accessible, and novel ways, while emphasizing the cultivation of user emotion. Additionally, enterprises can track and manage emotional changes after users experience gamification for reasonable regulation and continuous improvement of user emotion.

(3) Given the important roles of "immersion," "novel experience," and "sense of accomplishment" in the path from gamification to emotion, enterprises should emphasize user gamification experience when designing gamified systems. First, through the design of gamification elements and processes, users should truly feel as if they are in the actual environment. Only when users are genuinely invested in the gamified metaverse environment can they have deeper emotions. Second, enterprises need to continuously innovate to maintain users' sense of novelty; otherwise, when users remain in the same gamified environment for extended periods and lose novel experiences, their emotions may be weakened or dulled. Finally, gamification design should not be overly complex, and difficulty should be moderate. When game levels are too easy or too difficult, users' sense of accomplishment decreases, affecting their emotions. Therefore, gamification design requires proper calibration to achieve unexpected effects.

6.4 Research Limitations and Future Directions

This study advances frontier research on gamification in the metaverse domain, proposes a theoretical model, and uncovers meaningful content for enterprises and users. However, limitations remain: First, this study selected only one experiment—a metaverse activity about Chinese traditional culture dissemination launched by Central China Normal University Library—without exploring metaverse environments enhanced by other gamification elements (such as interactive and collaborative elements). Future research should investigate other gamified metaverse environments to improve the generalizability of findings. Second, this study used cross-sectional data without considering temporal factors. Future research could adopt longitudinal panel data to explore whether user emotion changes over time and how emotion influences metaverse acceptance.

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Note: Figure translations are in progress. See original paper for figures.