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Empirical Evidence on the Role of UID Elements in Influencing Behavioral Intentions: A TAM-Based Analysis of the ZEPETO Metaverse

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With the rise of metaverse-related technologies and industries, user interface design (UID) has become increasingly important in enhancing user experience and engagement. This study focuses on the metaverse platform ZEPETO World, using the Technology Acceptance Model (TAM) as the theoretical framework to investigate the effects of UID elements on users' perceived ease of use (PEOU), perceived usefulness (PU), and behavioral intention (BI) through empirical analysis. A total of 204 valid questionnaires were collected, and multiple regression analysis was conducted to test the theoretical model. The results indicate that typography and responsiveness are the key factors significantly affecting the perceived variables, followed by color and layout. As an essential component of UID elements, aesthetics has no significant direct impact in this technical environment. Additionally, perceived ease of use has a stronger influence on user behavioral intention than perceived usefulness. This study extends the applicability of the TAM model in the metaverse virtual environment and provides both theoretical and practical guidance for the optimization of user interfaces on metaverse platforms.

Keywords: metaverse platforms, user interface design, perceived ease of use, perceived usefulness, behavioral intentions

Introduction

As an essential aspect of Web 3.0 development, the metaverse is gradually integrating into people's digital lives, propelled by technology companies (Kim, 2021). Representative metaverse applications, such as ZEPETO, have attracted a large user base by offering immersive interactive experiences and user-customizable social features. ZEPETO is a metaverse-based virtual social platform launched by the Korean company Naver Z. Users can create highly personalized virtual avatars through this platform and engage in various activities in the virtual world, such as socializing, gaming, and creative design. As the leading metaverse platform in Asia, ZEPETO's market value has surpassed $1 billion, with a global user base exceeding 340 million and approximately 20 million monthly active users (Momo, 2024). The platform's core competitive advantage lies in the interactive

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experience it offers by merging the virtual and real worlds, as well as the diverse creative possibilities enabled by user-generated content (UGC).

With the widespread adoption of metaverse platform, the importance of user interface design (UID) in enhancing user experience and increasing user loyalty is gradually becoming more evident. High-quality UID in unique metaverse environments profoundly influences users' visual and interactive experiences and significantly impacts their emotional experiences and continued use of the platform (Gao, Xie, Wang, & Xie, 2023). The core elements of UID significantly affect user experience, which has been widely validated in traditional applications. These elements directly impact users' emotions, usability, and information comprehension through visual communication, thereby significantly improving users' technological acceptance. In metaverse environments like ZEPETO, these elements have unique characteristics and significantly influence users' immersive experiences, further stimulating their exploration intentions and enhancing their acceptance of the technology. Therefore, it is of great theoretical and practical significance to study the specific role mechanisms of UID elements in metaverse technology.

Based on existing research, relevant studies on UID are primarily concentrated in traditional application fields. In contrast, research in the metaverse remains less comprehensive, especially regarding the lack of in-depth discussion and a standardized evaluation framework for the impact of UID on user behavior in immersive virtual environments (Lee & Gu, 2022). This paper uses the Technology Acceptance Model (TAM) as the theoretical framework to address this research gap. It links the core elements of UID with users' perceived ease of use (PEU), perceived usefulness (PU), and behavioral intention (BI), with particular emphasis on the role of responsiveness among UID elements in specific virtual environments. Through empirical analysis using a questionnaire survey, this study aims to provide theoretical support and optimization directions for designers and metaverse platforms to enhance user experience and technology acceptance.

Literature Review

User Interface Design and Perceived Usability and Usefulness

User interface design (UID) is a critical factor in optimizing the interaction experience between users and technological systems. By visually designing interactive elements such as color, typography, layout, aesthetics, and responsiveness, user operational fluidity and satisfaction can be enhanced (Perrig, Ueffing, Opwis, & Brühlmann, 2023; Tymchenko et al., 2021). As the bridge for communication between users and technological systems, prior research indicates that UID directly influences users' understanding of functions and significantly affects their acceptance of technology. In the exceptional technological environment of the metaverse, UID continues to influence users' interaction efficiency, immersion experience, and usage intention (Baptista Oliveira Souza, Cunha, Lima, & Ricca, 2023).

As the most intuitive and influential element in UID, color can directly affect users' emotions and attention through visual communication, further influencing their understanding of platform functions (Venni & Bétrancourt, 2020). Research shows that vibrant and consistent color schemes in user interface design can reduce users' cognitive load and improve perceived ease of use (PEOU) (Pei, Huang, & Li, 2020). Additionally, UID color designs that align with users' aesthetic preferences can enhance their trust in and recognition of the platform interface, thereby significantly improving perceived usefulness (PU) (Oyibo & Vassileva, 2020). In summary, to further explore the specific role of color in the metaverse technology environment, the following hypotheses are proposed:

H1a: Color has a positive effect on perceived ease of use (PEOU).

H2a: Color has a positive effect on perceived usefulness (PU).

Typography is a key element in UID, playing a crucial role in improving overall readability and information transfer efficiency. Previous studies have shown that font selection, element spacing, and the reasonable arrangement of text levels can significantly reduce users' cognitive burden, thereby improving their perceived ease of use (PEOU) (Zhou, Miao, He, & Miao, 2022). Additionally, clear and well-structured typography design can enhance users' professional recognition of the interface, thereby increasing their trust in the interface's functionality and content, and effectively improving perceived usefulness (PU) (Dick & Woloszyn, 2023). Based on these previous studies on typography, this study proposes the following hypotheses:

H1b: Typography positively impacts perceived ease of use (PEOU).

H2b: Typography positively impacts perceived usefulness (PU).

As one of the crucial elements of UID, the logic and clarity of the layout directly affect the user's navigation experience and the speed at which information is obtained. Existing research shows that when function partitions are arranged rationally, and functions are intuitively organized within the interface, the user's confusion is significantly reduced, improving their perceived ease of use (PEOU) (Dekate, 2023). A clear and reasonable layout can also enhance the user's trust in the interface design and their perception of its efficiency. Furthermore, it improves users' perceived usefulness (PU) (Zhang, Hou, & Chen, 2023). Based on these existing research findings, this paper proposes the following hypotheses:

H1c: Layout positively impacts perceived ease of use (PEOU).

H2c: Layout positively impacts perceived usefulness (PU).

Aesthetics are also an essential part of the UID elements and significantly impact the user appeal and satisfaction with the interface. Interface designs with visually strong aesthetic appeal are more likely to resonate with users, enhancing their pleasure in using the interface and significantly improving perceived ease of use (PEOU) (Perrig et al., 2023). In addition, high-quality aesthetic design can demonstrate the interface's professionalism and enhance users' overall recognition of the interface's functionality and value, thereby improving perceived usefulness (PU) (Zen, Burny, & Vanderdonckt, 2023). Based on the above analysis of the impact of aesthetic design, this study proposes the following hypotheses:

H1d: Aesthetics have a positive influence on perceived ease of use (PEOU).

H2d: Aesthetics have a positive influence on perceived usefulness (PU).

Responsiveness is an indispensable element in user interface design (UID), primarily reflected in the interface's rapid response to user actions and its smooth responsiveness. Studies have shown that high response speed can significantly improve the user's operational fluency, enhancing their perceived ease of use (PEOU) of the interface (Tan, Zhu, Chen, & Li, 2019). Additionally, fast feedback and efficient responses can increase user trust in the effectiveness of the interface and its functions, thereby improving perceived usefulness (PU) (Ferreira et al., 2020). Based on the above research findings, this paper proposes the following hypotheses:

H1e: Responsiveness has a positive effect on perceived ease of use (PEOU).

H2e: Responsiveness has a positive effect on perceived usefulness (PU).

Technology Acceptance Model (TAM) and User Behavior on Metaverse Platforms

The Technology Acceptance Model (TAM) is a widely used theoretical framework in information systems that predicts user acceptance of new technologies (Davis, 1989). The core variables of TAM include perceived

ease of use (PEOU), perceived usefulness (PU), and behavioral intention (BI). Among these, perceived ease of use (PEOU) refers to the user's evaluation of the operational difficulty of a technical system, while perceived usefulness (PU) refers to the user's perception of the technology's efficiency. TAM theory suggests that PEOU and PU directly affect the user's behavioral intention (BI), that is, the user's intention to use the technology.

In the specific technical context of the metaverse platform, the impact of PEOU and PU on BI remains a key focus of research. Previous studies have shown that users are significantly more sensitive to PEOU and PU due to the complex interaction technologies inherent in the metaverse platform (Aburbeian, A. Y. Owda, & M. Owda, 2022). Based on the comprehensive findings from the above research and theories, this paper proposes the following hypotheses:

H3: Perceived ease of use (PEOU) positively affects behavioral intention (BI).

H4: Perceived usefulness (PU) positively affects behavioral intention (BI).

Based on the aforementioned hypotheses, the proposed research model is shown in Figure 1.

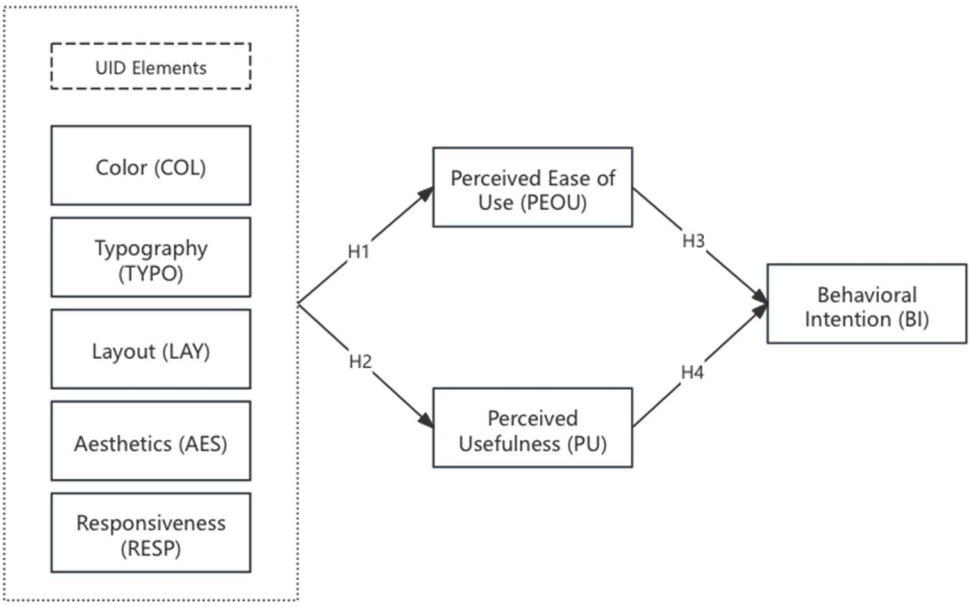


Figure 1. Research model.

Methodology

Research Design

This study aims to explore the effects of UID elements on users' perceived ease of use, perceived usefulness, and behavioral intention regarding the ZEPETO World interface. The subjects were active users of the ZEPETO World, who are direct users of the platform's interface design and can provide firsthand feedback. Active users are typically more sensitive to the platform's interface design, making them ideal participants for exploring the relationship between UID and users' perceived ease of use, usefulness, and behavioral intention. Additionally, selecting active users enhances the quality of questionnaire feedback and the credibility of the data, as these users have substantial experience and understanding of the ZEPETO World interface design. This study adopts a quantitative research method, utilizing a questionnaire survey to collect user feedback, and employs descriptive statistics and correlation analysis for data processing.

Questionnaire Design

The questionnaire used in this study consists of two parts. The first part aims to collect demographic information (such as gender, age, and education level) from the respondents to provide a comprehensive sample overview. Descriptive statistical analysis was conducted to validate the collected data, including percentages and frequencies. The second part consists of five subscales with a total of eight items. UID elements were extracted from the ZEPETO virtual world and integrated into the questionnaire design (Table 1) to assess the impact of color, typography, layout, aesthetics, and responsiveness variables systematically. The subscales use Likert scales to collect data on individuals using the ZEPETO World. The questionnaire is tailored to the scale established in the literature (Table 2) to suit the specific context of users in the ZEPETO World of the metaverse platform.

Table 1

ZEPETO UID Element

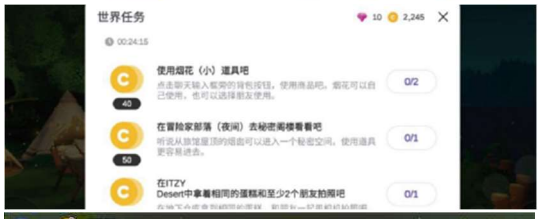
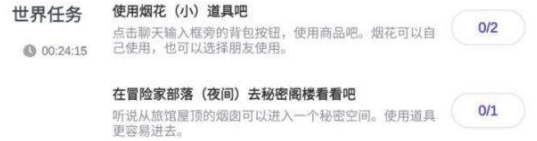
Constructs	UID elements	Extract elements
Color (COL)		
Typography (TYPO)		
Layout (LAY)		
Aesthetics (AES)		
Responsiveness (RESP)		

Table 2

Questionnaire Design

Constructs	Items	Reference
Color (COL)	1. The color composition in ZEPETO's virtual environment is highly attractive. 2. The color scheme used in ZEPETO's design is very harmonious. 3. The choice of colors in ZEPETO is well-coordinated and pleasing. 4. The colors in ZEPETO are visually appealing and enhance the user experience.	Aris et al., 2023
Typography (TYPO)	1. The font size and style on the interface are easy to read. 2. The typography is consistent with the overall interface design style. 3. The text hierarchy is clear, making important content easy to identify.	Rajaobelina et al., 2021
Layout (LAY)	1. The layout of ZEPETO's metaverse appears professional and well-organized. 2. The layout design of ZEPETO's interface is modern and stylish. 3. The design of ZEPETO's metaverse space and interface is detail-oriented and carefully crafted. 4. The layout design of ZEPETO is clear and conceptually consistent.	Aris et al., 2023
Aesthetics (AES)	1. ZEPETO's interface looks attractive and visually satisfying. 2. The overall aesthetics of ZEPETO's interface match the immersive feel of its virtual world. 3. The aesthetic design of ZEPETO's interface is unique and enhances brand recognition.	Magableh & Tahat, 2024
Responsiveness (RESP)	1. ZEPETO's interface is easy to navigate, allowing users to quickly find the desired features. 2. ZEPETO's interface provides interactive features that enhance the user experience, such as drag-and-drop customization and responsive buttons. 3. The interactive elements of ZEPETO's interface (such as buttons and menus) are highly responsive and easy to use.	Aladwani & Palvia, 2002
Perceived ease of use (PEOU)	1. I find navigating and exploring the ZEPETO World simple and intuitive. 2. Learning to use ZEPETO's features, such as creating avatars or interacting with others, is effortless. 3. I can effectively use ZEPETO's tools and features without needing assistance. 4. Interacting with ZEPETO, including navigating its virtual spaces and customizing content, does not require much mental effort.	Lun et al., 2024
Perceived usefulness (PU)	1. Using ZEPETO enhances my ability to express creativity and socialize in virtual environments. 2. Using ZEPETO helps me connect with others and engage in interactive experiences. 3. Using ZEPETO improves the effectiveness of my virtual interactions and personal expression.	Sohn & Kwon, 2020
Behavioral intention (BI)	1. I intend to frequently explore and use ZEPETO in the future. 2. I intend to actively participate in ZEPETO's virtual experiences and activities. 3. I intend to recommend ZEPETO to others to experience its creative and social features. 4. I intend to purchase ZEPETO-related products or services in the future.	Rahman et al., 2017

Data Analysis and Results

SPSS 29.0 was used to analyze the data. First, the scale was tested for reliability and validity. Reliability analysis included calculating Cronbach's α coefficient to assess the internal consistency of each subscale. Validity analysis involved the KMO and Bartlett's test of sphericity and principal component analysis to verify the structural validity of the scale. These steps were used to assess the reliability and validity of the measurement model. Subsequently, correlation and multiple regression analyses were performed to explore the relationships between the study variables and test the research hypotheses.

Descriptive Statistics

Descriptive statistical analysis was used to validate the collected data, including percentages and frequencies. The research subjects in this study are users of ZEPETO World, our metaverse platform. The overall characteristics of the sample were described and analyzed based on the gender, age, and educational background of the respondents. A total of 204 questionnaires were collected for this study. Table 3 provides a comprehensive demographic analysis. The sample consisted of 49.51% male and 50.49% female respondents, indicating a relatively balanced gender distribution, with a slightly higher proportion of females. Most respondents were

between 26 and 30 years old, accounting for 39.71% of the total sample, reflecting the younger generation's higher acceptance and more frequent use of ZEPETO World. Additionally, 86.27% of the respondents held a college junior college or bachelor's degree, indicating that college students are more likely to embrace the metaverse and engage with ZEPETO World.

Table 3

Statistical Information on the Demographic Sample of Participants, n = 204

	Option	Count	Percentage (%)
Gender	Male	101	49.51
	Female	103	50.49
Age	Under 18 years	10	4.9
	18-25	40	19.61
	26-30	81	39.71
	31-40	47	23.04
	Above 41 years	26	12.75
Education	High school	20	9.8
	Associate degree	74	36.27
	Bachelor	102	50
	Master and higher	8	3.92
Total		204	100

Reliability Analysis

Reliability analysis was performed on eight variables of the questionnaire: color, typography, layout, aesthetics, responsiveness, perceived ease of use, perceived usefulness, and behavioral intention. Table 4 below shows that the Cronbach's alpha coefficient for each variable is greater than 0.6, indicating that the scale reliability of this study is good, and the data are accurate and reliable.

Table 4

Reliability Analysis

Variable	Number of items	Cronbach α
COL	4	0.867
TYPQ	3	0.823
LAY	4	0.866
AES	4	0.854
RESP	3	0.836
PEOU	4	0.895
PU	3	0.852
BI	4	0.869

Validity Analysis

The validity analysis of the questionnaire results was conducted to assess the correctness and validity of the measurement outcomes. This analysis evaluates whether the item design is reasonable and accurately reflects the purpose and requirements of the study. Factor analysis (exploratory factor analysis, EFA) was used for detection. KMO values and Bartlett's test of sphericity were performed to assess whether the selected indices are suitable for factor analysis (Shrestha, 2021).

Table 5

The KMO and Bartlett's Test of Sphericity for the Scale

KMO	0.906
Bartlett's test of sphericity	3,357.086
	378
	0.000

As shown in Table 5, the scale's KMO value is 0.906, and the result of Bartlett's test of sphericity is less than 0.01, indicating that the scale is suitable for factor analysis (Shrestha, 2021).

Table 6

Total Variance Explained by the Scale

Component	Initial eigenvalues			Rotation sums of squared loadings		
	Total	Variance %	Cumulative %	Total	Variance %	Cumulative %
1	10.510	37.535	37.535	3.085	11.017	11.017
2	1.885	6.732	44.267	2.986	10.665	21.682
3	1.780	6.358	50.624	2.979	10.639	32.321
4	1.601	5.718	56.342	2.962	10.580	42.902
5	1.529	5.460	61.802	2.368	8.456	51.358
6	1.405	5.018	66.820	2.283	8.154	59.512
7	1.336	4.771	71.591	2.233	7.976	67.488
8	1.065	3.804	75.395	2.214	7.907	75.395
9	0.578	2.064	77.458			
10	0.538	1.922	79.381			
11	0.501	1.788	81.168			
12	0.462	1.650	82.819			
13	0.440	1.570	84.389			
14	0.432	1.541	85.930			
15	0.410	1.463	87.393			
16	0.396	1.413	88.806			
17	0.370	1.322	90.128			
18	0.344	1.230	91.358			
19	0.325	1.160	92.518			
20	0.314	1.122	93.640			
21	0.267	0.953	94.593			
22	0.261	0.932	95.525			
23	0.239	0.854	96.379			
24	0.231	0.824	97.203			
25	0.213	0.762	97.965			
26	0.207	0.740	98.705			
27	0.197	0.705	99.410			
28	0.165	0.590	100.000			

As shown in Table 6, the factor analysis results indicate that eight factors were extracted, and the cumulative explained variance of the factors is 75.395%, which exceeds the recommended cumulative variance threshold. In social sciences, a value greater than 60% is considered ideal, indicating a good level of explanation (Goretzko, Siemund, & Sterner, 2024).

Table 7
Rotated Component Matrix

Item	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Component 7	Component 8
COL1		0.782						
COL2		0.773						
COL3		0.760						
COL4		0.790						
TYPQ1							0.735	
TYPQ2							0.803	
TYPQ3							0.764	
LAY1			0.724					
LAY2			0.796					
LAY3			0.799					
LAY4			0.790					
AES1					0.838			
AES2					0.797			
AES3					0.806			
RESP1								0.704
RESP2								0.839
RESP3								0.751
PEOU1	0.757							
PEOU2	0.748							
PEOU3	0.798							
PEOU4	0.793							
PU1						0.802		
PU2						0.762		
PU3						0.774		
BI1				0.814				
BI2				0.736				
BI3				0.751				
BI4				0.809				

According to the rotated component matrix results in Table 7, the factor loading of each item exceeds the threshold value of 0.5, indicating a strong correlation between each item and its respective dimension. The items of each scale align with their theoretical dimension construction, demonstrating that the scale has good structural validity and that the items accurately reflect their intended dimensions. The cumulative variance explanation ratio of all dimensions exceeds 60%, indicating that the factor structure of the scale explains most of the variable variance, thus demonstrating good explanatory power (Dragan & Topolšek, 2014).

Correlation Analysis

Correlation analysis is a statistical method used to examine the relationship between two or more variables. It helps to understand the associated properties of variables, verify the strength and direction of their correlation, and assess the level of closeness between them. If the absolute value of the correlation coefficient between two variables is closer to one, the correlation is stronger. In this study, if the correlation coefficient is below 0.3, there is a weak or no correlation between the variables; if the coefficient is between 0.3 and 0.6, the correlation is moderate; and if the coefficient is above 0.6, the correlation is considered strong. A positive correlation

coefficient indicates a positive relationship between the variables, while a negative correlation coefficient suggests a negative relationship (Gogtay & Thatte, 2017). The results of the relevant tests are shown in Table 8.

Table 8

Correlations Between Study Variables (p < 0.05, ** p < 0.01, *** p < 0.001)*

	COL	TYPQ	LAY	AES	RESP	PEOU	PU	BI
COL	1							
TYPQ	0.452**	1						
LAY	0.382**	0.410**	1					
AES	0.355**	0.385**	0.414**	1				
RESP	0.469**	0.405**	0.405**	0.434**	1			
PEOU	0.453**	0.483**	0.465**	0.445**	0.473**	1		
PU	0.458**	0.466**	0.426**	0.355**	0.497**	0.510**	1	
BI	0.418**	0.445**	0.438**	0.326**	0.439**	0.473**	0.404**	1

As shown in Table 8, all variables are positively correlated at the 0.01 significance level. TYPQ has the highest correlation with PEOU (0.483), indicating that typography design may significantly affect users' perceived ease of use. The high correlation between LAY and PEOU (0.465) suggests that layout also influences perceived ease of use. The correlation between PEOU and PU is the highest (0.510), indicating that perceived ease of use significantly affects perceived usefulness. The correlation with BI is also high (0.473), suggesting that users' perceived ease of use may directly impact behavioral intention.

Multiple Regression Analysis

This study examines the effects of user interface design elements on perceived usefulness (PU), perceived ease of use (PEOU), and behavioral intention (BI) using multiple regression analysis. The path analysis results are presented in Tables 9 and Table 10.

Table 9

Coefficients (p < 0.05, ** p < 0.01, *** p < 0.001)*

PU		PEOU		BI	
Variable	β	Variable	β	Variable	β
R^2 = 0.381***		R^2 = 0.408***		R^2 (PU) = 0.163***	R^2 (PEOU) = 0.223***
COL	0.191	COL	0.149	PU	0.404
TYPQ	0.231	TYPQ	0.207	PEOU	0.473
LAY	0.178	LAY	0.187		
AES	0.043	AES	0.159		
RESP	0.264	RESP	0.175		

Table 10

Direct Effect (p < 0.05, ** p < 0.01, *** p < 0.001)*

Direct or indirect effect of pathway	Standardized path coefficient	S.E	P
COL→PU	0.191	0.075	0.012
TYPQ→PU	0.231	0.076	0.002
LAY→PU	0.178	0.075	0.019
AES→PU	0.043	0.071	0.547
RESP→PU	0.264	0.072	<0.001

Table 10 to be continued

COL→PEOU	0.165	0.073	0.026
TYPQ→PEOU	0.232	0.074	0.002
LAY→PEOU	0.212	0.074	0.004
AES→PEOU	0.170	0.069	0.015
RESP→PEOU	0.183	0.070	0.010
PU→BI	0.363	0.058	<0.001
PEOU→BI	0.425	0.056	<0.001

For perceived usefulness (PU), responsiveness (RESP, $\beta = 0.264$, $p < 0.001$) was the most significant predictor across hypotheses H1a to H1e, supporting the H1e hypothesis. Typography (TYPQ, $\beta = 0.231$, $p = 0.002$) also positively affected PU, supporting the H1b hypothesis. Color (COL, $\beta = 0.191$, $p = 0.012$) and layout (LAY, $\beta = 0.178$, $p = 0.019$) had significant effects on PU, supporting the H1a and H1c hypotheses. In contrast, aesthetics (AES, $\beta = 0.043$, $p = 0.547$) had no substantial direct effect on PU, meaning the H1d hypothesis was not supported.

For perceived ease of use (PEOU), typography (TYPQ, $\beta = 0.207$, $p = 0.002$) and layout (LAY, $\beta = 0.187$, $p = 0.004$) were the most significant predictors across hypotheses H2a to H2e, supporting the H2b and H2c hypotheses. Responsiveness (RESP, $\beta = 0.175$, $p = 0.015$) significantly affected PEOU, supporting the H2e hypothesis. Aesthetics (AES, $\beta = 0.159$, $p = 0.052$) approached statistical significance, partially supporting the H2d hypothesis.

For behavioral intention (BI), the influence of perceived ease of use (PEOU, $\beta = 0.473$, $p < 0.001$) on BI was stronger than that of perceived usefulness (PU, $\beta = 0.404$, $p < 0.001$), which supports the H3 and H4 hypotheses. This suggests that in a metaverse application, users are more likely to evaluate their behavioral intention based on ease of use.

Discussion

Using the Technology Acceptance Model (TAM) as the theoretical framework, this paper examines the effects of UID elements on perceived ease of use (PEOU), perceived usefulness (PU), and behavioral intention (BI) of ZEPETO World users and tests the validity of the theoretical model's hypotheses through empirical analysis.

Influence of UID Element

The results show that color (COL), typography (TYPQ), layout (LAY), and responsiveness (RESP) in UID elements significantly enhance perceived usefulness (PU) and perceived ease of use (PEOU) for users in the metaverse technology environment. In particular, logical and straightforward typography improves users' information processing efficiency while enhancing their trust in the system's functionality. Additionally, reasonable color schemes and functional layout partitions positively affect users' visual comfort and overall experience, thus influencing their perception of the system. Responsive interaction design significantly enhances users' fluency in using the system. These results further suggest that functional design elements (such as typography, layout, and responsiveness) and sensory design elements (such as color) impact users' acceptance of technology in a metaverse virtual immersive environment.

However, the direct effect of aesthetics (AES) on the perceived variables was not significant. This suggests that the role of visual appeal may be limited in a metaverse environment, with users placing greater emphasis on interactive performance and ease of interface operation rather than on simple visual design effects.

The Mediating Role of Perceptual Variables

Perceived ease of use (PEOU) and perceived usefulness (PU) play key mediating roles in the relationship between UID elements and user behavioral intention (BI). In the unique technical environment of a metaverse platform, the direct impact of PEOU on BI is significantly greater than that of PU. This suggests that user convenience is more influential than perceived effectiveness when deciding whether to use a metaverse platform. This finding supports the applicability of TAM theory and further highlights the unique influence of the metaverse environment on user decision-making behavior.

Theoretical and Practical Significance

From a theoretical perspective, this study extends the applicability of TAM theory to the metaverse environment. It verifies the impact of UID elements on users' perceived usefulness and behavioral intention, offering a new perspective for studying user behavior in virtual immersive environments. From a practical standpoint, this study provides clear direction for the interface optimization of metaverse platforms. Designers and developers can prioritize typography and responsiveness to increase user acceptance of the technology, thereby promoting the platform's sustainable development.

Research Limitations and Future Directions

Although this study has made some valuable discoveries, it still has certain limitations. First, the research focused solely on active users of the ZEPETO World, which may limit the generalizability of the findings. Second, the data were collected from self-reported questionnaires of platform users, which may introduce subjective biases. Future studies could adopt experimental or mixed research methods to further verify the influence of UID elements. Additionally, incorporating data from other metaverse platforms would enhance the breadth and depth of the study.

Conclusion

Using the Technology Acceptance Model (TAM) as the theoretical framework, this study explored the effects of UID elements on perceived ease of use (PEOU), perceived usefulness (PU), and behavioral intention (BI) on the ZEPETO metaverse platform and confirmed the critical role of UID elements in the metaverse technology environment. The results show that typography (TYPQ) and responsiveness (RESP) significantly and positively affect perceptual variables, making them key factors in user interface design within the metaverse. Additionally, color (COL) and layout (LAY) also positively affect user perception variables, though their effects are relatively weaker. The direct impact of aesthetics (AES) is insignificant, indicating that, in this technological environment, users prioritize interface functionality and operational convenience.

This study extends the applicability of TAM theory to the metaverse platform and provides specific directions for optimizing UID elements. Future development of metaverse platforms should prioritize typography logic and interactive responsiveness to enhance user acceptance of technology, improve the user experience, and promote the long-term development potential of the platform.

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