



How to Make Metaverse Popular in Higher Education - A Survey in Henan's University

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Abstract. The educational-use Metaverse products have been deployed in many campuses in Henan Province of China, including software or hardware like VR equipment. However, after the first wave of spreading, the continuous use of Metaverse after class or out from school are very rare. This study tries to find, what factors can impact the continuous use intention of using Metaverse in educational field, with the theory of SOR model and TAM, and find out some suggestions for Metaverse provider companies how to allocate their resources while developing Metaverse products.

Keywords: Metaverse, Higher Education, Continuous Use Intention

1 Introduction

The integration of the Metaverse in higher education presents numerous opportunities. The Metaverse can offer a more immersive and interactive learning experience, allowing students to participate in virtual simulations, collaborate in real-time, and explore digital representations of complex concepts.

However, it is now still in the early stages of development and adoption, and there are challenges that need to be addressed. An evidence is that although there are many universities and colleges deployed Metaverse application and equipment in some classrooms, but it is now still using the elementary version, after the first wave of purchase. It is about time to discuss, why the Metaverse has not become a mainstream phenomenon in higher education, and what are the necessary steps to make the Metaverse more popular. And how to encourage both the students and educators to continuous use it after the specific classes.

2 Research Problems

The final purpose of this research is to make users' continuous use intention to be more strong. To engage this purpose, let's consider educational Metaverse product as its duplication, the video game. Thus, the problems to be researched is, what kind of Metaverse product feature can make users to have more mental immersion and sense of belonging, resulting in helping Metaverse to become more popular in higher education? And what kind of mental satisfaction can be obtained from using Metaverse, so that it can successfully persuade users to use it in the long term, instead of using it just for single classes.

3 Underlying Theories

This study draws insights from three theories or models, the first one is the Stimulus-Organism-Response model[1], which suggests that environmental stimuli (such as Metaverse features) can influence an individual's internal states (such as mental immersion and sense of belonging), which in turn shape their behavioral responses . For instance, Kim et al. (2018) applied the theory while doing VR tourism research (Figure 1), while Tian et al.(2021) also apply this into a customer visit intention research(Figure 2)[2][3].

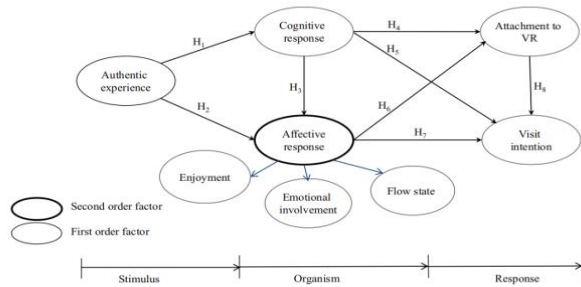


Fig. 1. SOR model in VR research

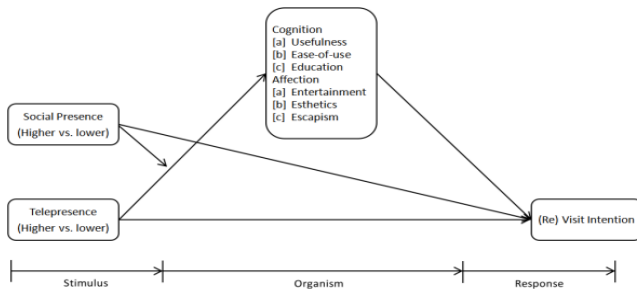


Fig. 2. SOR model in Virtual tourism research

The second one is to consider Metaverse as a new technology so the Technology Acceptance Model is also applied, to see what kind of perceived usefulness and perceived ease of use can help to increase the usage intention. For the use of TAM theory in doing Metaverse related research, Al-Adwan et al.(2023) have done a typical framework [4](Figure 3):

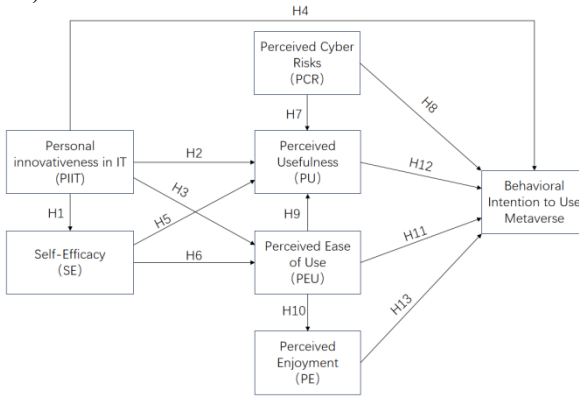


Fig. 3. TAM model application in Metaverse based education platform

4 Hypothesis Development

The degree of pleasure and satisfaction users derive from interacting with a novel technology has been found to positively influence their inclination to continue utilizing that technology in the future. Childers and colleagues highlighted that "enjoyment is a key antecedent variable of user attitudes in online shopping scenarios". And the continuous use intention, is influenced by peoples perceived sense of presence and belonging, which related to the game world design and digital asset.

Also, when engaging with virtual world, the feeling of engagement is another critical factor that can lead to long-term use. Researchers have found that the level of personal involvement and engagement strongly predicts an individual's intention to continue using a particular system or technology [5].

And to online products or virtual products such as Metaverse related application, the continued use intention is the key to product success and also affects company revenue. Since the enjoyment and engagement is the layout by stimuli, they are treated as the "O" part in SOR model. Similarly, The CUI is the "R" part. Therefore, the key point is to reveal the factors impact on enjoyment, engagement and continuous use intention of Metaverse.

Interactivity and telepresence are the factors proved by many literature that have significant relationship with virtual world, they can trigger users' positive feelings and response, which refers to "S" part in SOR model[6]. Therefore, the hypothesis are proposed as below:

Hypothesis 1a(H1a): There is a positive relationship between interactivity(INT) towards continuous use intention (CUI) in using Metaverse application.

H2a: There is a positive relationship between INT towards enjoyment(ENJ) in using Metaverse application.

H3a: There is a positive relationship between INT towards engagement(ENG) in using Metaverse application.

H1b: There is a positive relationship between telepresence(TP) towards CUI in using Metaverse application.

H2b: There is a positive relationship between TP towards ENJ in using Metaverse application.

H3b: There is a positive relationship between TP towards ENG in using Metaverse application.

H4: There is a positive relationship between ENJ towards CUI in using Metaverse application.

H5: There is a positive relationship between ENG towards CUI in using Metaverse application.

H6a: Enjoyment mediates significantly between INT and CUI.

H6b: Enjoyment mediates significantly between TP and CUI.

H7a: Engagement mediates significantly between INT and CUI.

H7b: Engagement mediates significantly between TP and CUI.

With the hypothesis developed, the theoretical framework is designed as below(Figure 4):

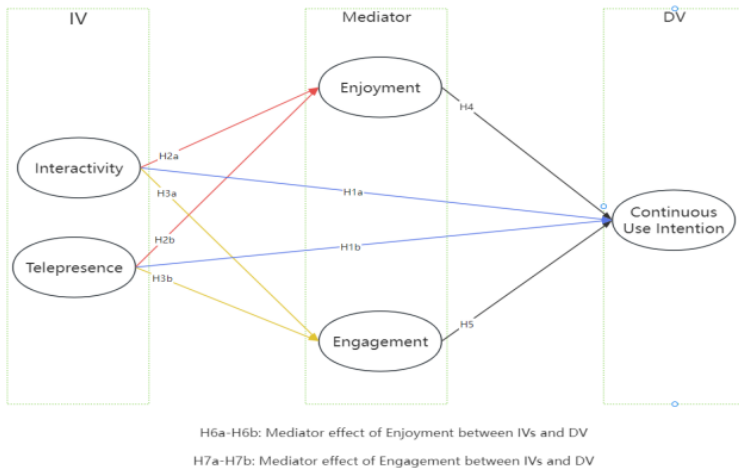


Fig. 4. Research Framework

5 Research Methodology

To investigate the factors impacting the continuous use intention of Metaverse in higher education, this study will adopt a quantitative research. The data will be collected from a sample of university students who have experience using the Metaverse for educational purposes, they are also the representative of each area in Henan Province. Namely, six specific universities or colleges, as listed below (Table 1):

Table 1. The investigated institute

University	Abbr.	City	Amounts of investigated students
Zhengzhou University	ZZU	ZhengZhou	100
Henan University of Economics and Law	HUEL	ZhengZhou	100
Henan Normal University	HNU	XinXiang	100
Henan University	HENU	Kai Feng	100
Henan Polytechnic University	HPU	JiaoZuo	100
Henan Polytechnic	--	Zhengzhou	100

From the six campus, the survey is conduct with the online survey platform named “Wen Juan Xing” (WJX), it is a famous tool doing online survey with some advantages, for example the automation data cleaning and analyzing function. The sampling method within a single school is simple random sampling, 100 questionnaire links are sent to students’ mailbox after random selection by the administrator.

6 Data Analysis

6.1 Reliability

With the data cleaning, 408 valid answers are taking into account. In this study, Cronbach's alpha coefficient was employed to assess the reliability of thirteen variables, thereby confirming the consistency of scales. The reliability test of this survey appears to be good, as the Table 2 below:

Table 2. Reliability Coefficients for Variables

Variables	N of Items	Cronbach Alpha	Strength
Interactivity	3	.809	Very Good
Telepresence	5	.871	Very Good
Enjoyment	5	.878	Very Good
Engagement	5	.864	Very Good
Continuous Use Intention	4	.855	Very Good

6.2 Hypothesis Testing – SEM

With tools in Amos, the model is built base on the framework. And each endogenous variable is draw with error term, all exogenous variables have drawn double arrow for correlation(Figure 5).

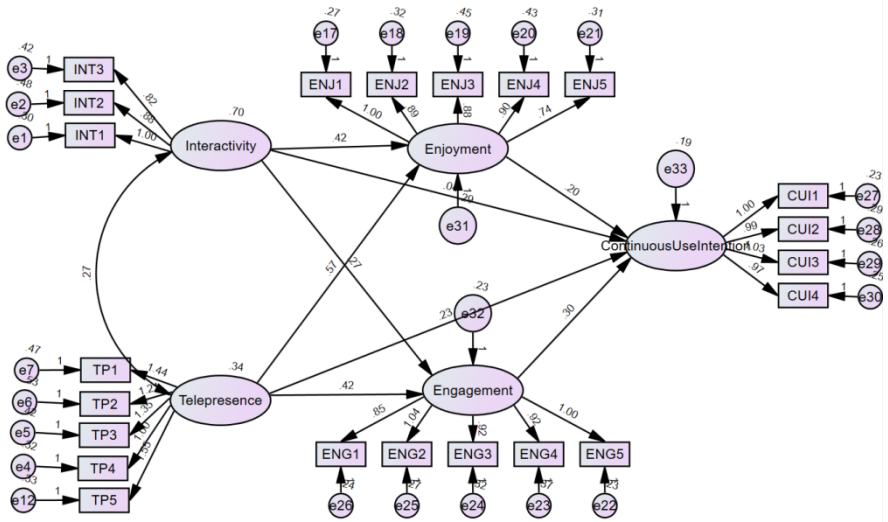


Fig. 5. SEM Model

To clarify the model fit level, as Table 3 shows, some important indexes are listed:

Table 3. Model Fit

Index	Testing output	Standard	Evaluating
CMIN/DF	1.515	<3	Fit
GFI	0.915	>0.9	Fit
AGFI	0.897	>0.8	Fit
RMR	0.031	<0.05	Fit
RMSEA	0.036	<0.05	Fit
CFI	0.970	>0.9	Fit
NFI	0.916	>0.9	Fit

From SEM we can conduct path analysis, path analysis allows us to decompose the effects between variables into direct, indirect and total effects, and this information can be used to further understand the underlying mechanism between the constructs. As listed below (Table 4):

Table 4. Path Analysis

Path	SE	Estimate	S.E.	C.R.	P	Label
Interactivity→Enjoyment	0.294	0.279	0.058	4.829	***	H2a
Telepresence→Enjoyment	0.258	0.352	0.083	4.266	***	H2b
Interactivity→Engagement	0.234	0.178	0.05	3.519	***	H3a
Telepresence→Engagement	0.248	0.271	0.073	3.723	***	H3b
Telepresence→CUI	0.175	0.186	0.075	2.491	0.013	H1c
Interactivity→CUI	0.024	0.018	0.053	0.334	0.738	H1d
Enjoyment→CUI	0.215	0.167	0.061	2.738	0.006	H4
Engagement→CUI	0.256	0.249	0.066	3.779	***	H5

After all the coding, standardized mediating Bootstrap analysis can be done with following outcome (Table 5):

Table 5. Standardized Mediating Effect Bootstrap Analysis

Standardized Mediating Effect Bootstrap Analysis								
Path	estimate	SE	Bias-corrected 95%CI			Percentile 95%CI		
			Lower	Upper	P	Lower	Upper	P
int→enj→CUI	0.063	0.027	0.021	0.129	0.003	0.016	0.120	0.007
int→eng→CUI	0.060	0.025	0.020	0.125	0.001	0.017	0.116	0.002
tel→enj→CUI	0.055	0.024	0.019	0.121	0.003	0.014	0.107	0.007
tel→eng→CUI	0.064	0.025	0.023	0.127	0.001	0.020	0.120	0.002

With Table 4 and 5, the result of hypothesis are as follows (Table 6):

Table 6. Hypothesis Testing Results

Path	Hypothesis	Evaluation
int→CUI	H1a	Rejected
tel→CUI	H1b	Accept
int→enj	H2a	Accept
tel→enj	H2b	Accept
int→eng	H3a	Accept
tel→enj	H3b	Accept
enj→CUI	H4	Accept
eng→CUI	H5	Accept
int→enj→CUI	H6a	Accept
tel→enj→CUI	H6b	Accept
int→eng→CUI	H7a	Accept
tel→eng→CUI	H7b	Accept

From above analysis, the conclusion is that, both interactivity and telepresence have significant impact on enjoyment and engagement while people using Metaverse in educational scenario, and enjoyment and engagement totally mediates the interactivity and CUI, while partially mediates the telepresence and CUI.

7 Conclusion

The Metaverse does not come from void. Despite there are some kinds of AI tools that can generate code or multimedia, the Metaverse platform or applications are created by a team of engineers or hundreds or thousands of engineers, this will bring about the problem of how to allocate human resources in develop stage, and also update stage. In addition, Internet products are highly time sensitive.

From the discussion, Metaverse producers should focus their resources to the area which can increase users’ interactivity and telepresence, to enlarge their market share.

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