

Exploring User Intentions towards Sustainable Tourism in the Era of Metaverse

Abhishek

*University School of Management
Studies*

*Guru Gobind Singh Indraprastha
University*

New Delhi, India

abhigupta03071998@gmail.com

Prof. Sanjay Dhingra

*University School of Management
Studies*

*Guru Gobind Singh Indraprastha
University*

New Delhi, India

sdhingra342003@yahoo.com

Bhawika Batra

*University School of Management
Studies*

*Guru Gobind Singh Indraprastha
University*

New Delhi, India

bhawika1189@gmail.com

Dr. Amit Sharma

*University School of Management
Studies*

*Guru Gobind Singh Indraprastha
University*

New Delhi, India

amitsharma.ipu@gmail.com

Ridhima Chadha

*University School of Management
Studies*

*Guru Gobind Singh Indraprastha
University*

New Delhi, India

ridhimachadha7@gmail.com

Abstract - The term “Metaverse” refers to a network of interconnected virtual worlds that, when combined with the Internet, “Augmented Reality (AR)”, and “Virtual Reality (VR)”, provide users with entirely immersive, three-dimensional (3D) experiences. The research highlights the dynamic nature of the metaverse and its expanding range of applications, thus understanding user intentions in this dynamic environment becomes imperative. The study investigates users’ intentions towards sustainable tourism using “Metaverse based Tourism Platforms (MBTPs)” by employing the “Technology Acceptance Model (TAM)” and “Hedonic Consumption Behaviour Theory (HCBT)”. The collected data was analysed using “Partial Least Squares Structural Equation Modeling (PLS-SEM)” technique with a sample of 322 responses obtained through snowball sampling. Our results supported hypotheses H1, H2, and H3, indicating that attitude and intentions are substantially influenced by antecedents of TAM model and flow experience. However, hypothesis H4, which pertains to emotional involvement, was not substantiated. Moreover, the study affirms the moderating impact of “personal innovativeness on the relationship between attitude and intention”, indicating that individuals with greater levels of innovativeness are more open towards MBTPs. The findings shed light on how consumers interact with sustainable tourism in the metaverse and have important implications for marketers looking to boost engagement on these platforms. Future research should consider a broader geographic area, a longitudinal design, and alternative theories or models to further validate and expand upon these findings.

Keywords - *Metaverse, Tourism, Intention, Sustainable, PLS-SEM*

INTRODUCTION

The concept of the metaverse has emerged as a revolutionary digital environment, transforming various sectors, including tourism. The metaverse integrates AR and VR with the internet, providing users with immersive and interactive experiences (Ren et al., 2022). According to experts, the metaverse is the next phase of the internet's development and might fundamentally transform how we communicate, collaborate, and live (Almarzouqi et al., 2022). This research aims to investigate the factors influencing user intentions towards sustainable tourism in the metaverse. The study also explored the moderating impact of “personal innovativeness between attitude and intention” towards sustainable tourism using MBTPs. The study employs “PLS-SEM” to analyze data collected from consumers having previous interactive experiences with metaverse based platforms.

The present investigation makes numerous substantial contributions to the existing literature. Firstly, it addresses the gap in understanding how TAM and HCBT influence user intentions towards sustainable tourism in the metaverse. Secondly, the metaverse is a new era that needs to be researched (Dhingra and Abhishek, 2024) and studied to improve its research implications in tourism (Calderón-Fajardo et al., 2024). Lastly, the research expands on theoretical frameworks by adapting them to the unique context of the metaverse, offering a comprehensive understanding of user behavior in this emerging digital environment.

The manuscript is structured into five main sections. The first part introduces the study, while the second part outlines the literature review and the formulation of the hypothesis. The methodology employed is explained in the third segment, while the results, discussion, and conclusion are the primary focus of the fourth section. Limitations and potential directions for further research are covered in the final section.

REVIEW OF LITERATURE

2.1 “Review of Literature”

The purpose of this literature review is to identify factors affecting the adoption of metaverse technology and offer a more comprehensive picture of its current and future circumstances. There is minimal research in this area, so studying the users’ intentions towards sustainable tourism using MBTPs is imperative. It is depicted from the review that the majority of the study employed a single theory with literature-based factors, which is coped by this study by using the combination of TAM and HCBT. The following research objective is to study the penetration of metaverse technology in tourism.

“RO1: To identify the factors affecting the users’ intentions towards sustainable tourism using MBTPs”.

“RO2: To analyse the factors affecting the users’ intentions towards sustainable tourism using MBTPs”.

“RO3: To analyse the moderating role of Personal Innovativeness on the relationship between Attitude and Intention”.

The study completed the first research objective by reviewing several papers on the domain, and some significant studies have been shown in Table 1 as a part of literature review taken form Dhingra and Abhishek (2024).To complete the other 2 objectives detailed analyses has been performed using PLS-SEM approach.

Table 1: Review of Literature (AN – Antecedents; MeV – Mediators; MoV – Moderators; DV – Outcome)

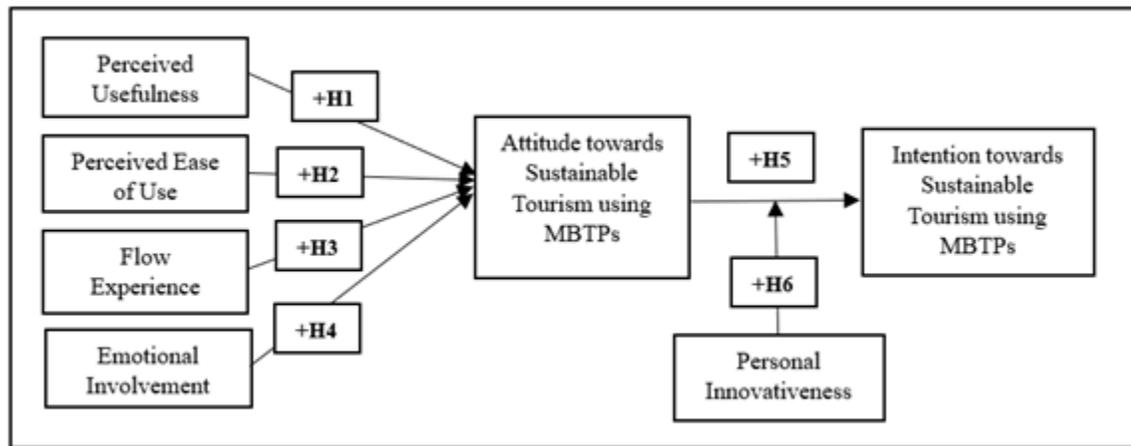
Authors	Theory/Model	Analysis Technique	Sampling	Variables
Zhang et al. (2024)	“Theory of planned behaviour and Self-determination theory”	“PLS-SEM”	“Survey from 248 respondents (Judgemental sampling)”	<p>“AN – Perceived relatedness, Perceived competence & Perceived autonomy MeV - Intrinsic motivation, Subjective norms, Attitude & Perceived behavioural control DV – Intention to participate in metaverse tourism”</p>
Moriuchi <i>et al.</i> (2023)	“TAM with other constructs”	“PLS-SEM & Monte carlo simulation (MCS) technique”	“Online survey from 207 patients in study1 & 10 patients in study2 (Purposive sampling)”	<p>“AN - Perceived usefulness, Anthromorphism & Perceived ease of use MeV - Attitude & Trust DV - Intention to use”</p>
Alawadhi <i>et al.</i> (2022)	“TAM with other constructs”	“PLS-SEM”	“Online questionnaire survey from 435 medical students (Purposive sampling)”	<p>“AN - Perceived enjoyment & Personal innovativeness MeV - Perceived ease of use & Usefulness DV - User intension to use the metaverse system”</p>
Ren <i>et al.</i> (2022)	“TAM & Flow theory”	“Factor analysis”	“Online questionnaire survey from 849 students (Convenience sampling)”	<p>“AN - Flow experience, Perceived usefulness, Ease of use MeV - Attitude & Behavioral intention MoV – Gender DV - Usage behaviour”</p>
Hammady et al. (2020)	“TAM”	“Regression analysis & Factor analysis”	“Questionnaire survey from 47 museum visitors (Purposive sampling)”	<p>“AN – Personal innovativeness MeV - Enjoyment, Perceived ease of use & Perceived usefulness DV - Willingness of future use”</p>

Source: Self development

2.2 “Hypothesis Development”

The study used the identified factors from the literature from two fundamental theories, i.e., TAM (Davis, 1989) and HCBT (Hirschman & Holbrook, 1982), to study users' intentions regarding sustainable tourism using MBTPs. All the six hypotheses were formed based on existing relationships in the literature, as shown through a research model in Figure 1.

Figure 1: Research Model



Source: Self development

METHODOLOGY

This section delineates the methodology employed to investigate the factors influencing user intentions toward sustainable tourism using the MBTPs. The study takes a quantitative approach, collecting respondents' data through a standardized questionnaire. There are 28 items in the questionnaire, each of which is evaluated on a 5-point Likert scale. Expert examination confirms the questionnaire's face validity. The minimum required sample size is derived by multiplying the total number of items by a factor of 10 (Chuah & Cham, 2020), which is 280 for the study. This investigation implemented a snowball sampling methodology to ensure that a diverse array of potential respondents was accessed throughout India. A survey was conducted with a sample size of 500 participants, which yielded 322 valid responses. In order to participate, participants were required to have previous experience working with metaverse platforms. The demographic breakdown of the respondents is depicted in Table 2. The data acquired was analyzed using “PLS-SEM” a statistical methodology employed to investigate complex relationships among variables (Hair Jr et al., 2022).

Table 1: Respondent’s Profile (n = 322)

“Characteristics”	“Categories”	“No. of Respondents”	“Percentage (%)”
“Gender”	“Male”	178	55.28
	“Female”	144	44.72
“Age”	“15 – 20”	46	14.28
	“21 – 26”	143	44.42
	“27 – 32”	103	31.98
	“33 and above”	30	9.32
“Employment Status”	“Employed”	213	66.14
	“Unemployed”	109	22.86

“Education”	“Diploma”	37	11.50
	“Bachelor's degree”	124	38.50
	“Master's degree”	96	29.82
	“Doctoral degree”	48	14.90
	“Other”	17	5.28

Source: Self development

RESULTS & ANALYSIS

4.1.1 “Measurement Model Assessment”

The measurement model's “Discriminant Validity, Composite Reliability (rho_c), Average Variance Extracted (AVE), and Factor Loading” are evaluated during the initial analysis (Hair Jr et al., 2022), displayed in Tables 3 and 4. The “Factor Loadings” of all the items exhibit internal consistency estimates ranging from (.751 to .907). Similarly, “Cronbach's alpha and rho-c” values for all the constructs lie within the range of (.841 to .918), both of which surpass the established threshold of 0.70 (Hair et al., 2019). Convergent validity is evaluated by examining the “Average Variance Extracted (AVE)” values of all constructs, which vary from (.675 to .736), surpassing the predetermined threshold of 0.50 (Hair et al., 2019). In order to evaluate the “Discriminant Validity” of each construct, the "Heterotrait-Monotrait ratio (HTMT)" criteria is applied. The establishment of “Discriminant Validity” is achieved by the fact that the value of each construct is less than the threshold value of 0.85 (Hair et al., 2017). The “Inner Value Inflation factor (VIF)” was used to ascertain the “Common Method Bias (CMB)”. The study is free from CMB, as all VIF values are within the range of (1.426 to 1.908), which is less than the 3.33 threshold value (Kock, 2015), shown in Table 5.

Table 2: Measurement Model Assessment

“Constructs and Items”	“Factor Loadings”	“Cronbach’s alpha”	“CR rho_c”	“AVE”
“Perceived Usefulness (PU)”		.874	.913	.726
“PU1”	.868			
“PU2”	.871			
“PU3”	.888			
“PU4”	.775			
“Perceived Ease of Use (PEOU)”		.878	.916	.732
“PEOU1”	.842			
“PEOU2”	.879			
“PEOU3”	.848			
“PEOU4”	.855			
“Flow Experience (FE)”		.881	.918	.736
“FE1”	.871			
“FE2”	.864			
“FE3”	.837			
“FE4”	.876			

“Emotional Involvement (EI)” “EI1” “EI2” “EI3” “EI4”	.813 .784 .838 .857	.845	.894	.678
“Attitude (AT)” “AT1” “AT2” “AT3” “AT4”	.907 .853 .875 .794	.864	.907	.710
“Intention (IN)” “IN1” “IN2” “IN3” “IN4”	.751 .880 .839 .837	.846	.897	.686
“Personal Innovativeness (PI)” “PI1” “PI2” “PI3” “PI4”	.835 .814 .847 .790	.841	.893	.675

Source: Self development

Table 3: HTMT

	PEOU	EI	PU	IN	PI	AT	FE
PEOU							
EI	0.452						
PU	0.612	0.383					
IN	0.722	0.460	0.732				
PI	0.548	0.451	0.728	0.727			
AT	0.613	0.411	0.735	0.744	0.770		
FE	0.340	0.729	0.394	0.478	0.433	0.447	

Source: Self development

4.1.2 “Structural Model Assessment”

The findings of the “structural model analysis”, which used “beta value, t statistics, and path coefficients” to test the hypothesis, are displayed in Table 5. The data was examined using bootstrapping approach involving 10,000 samples at a significance level of 0.05 in SmartPLS 4 (Hair Jr et al., 2022). The findings indicate that the “perceived usefulness ($\beta=0.453$, $p<0.000$)”, “perceived ease of use ($\beta=0.237$, $p<0.000$)”, and “flow experience ($\beta=0.161$, $p<0.004$)” positively impacts attitude towards sustainable tourism using MBTPs, hence H1, H2, and H3 are supported. However, “emotional involvement ($\beta=0.024$, $p<0.737$)” is shown to be insignificant, so hypothesis H4 is not supported. The study found that “attitude ($\beta=0.374$,

p<0.000)”, have a positive impact on intention towards sustainable tourism using MBTPs, hence H5 is supported. The results also supported that “personal innovativeness ($\beta=0.328$, $p<0.000$)” moderates the relationship between AT and IN towards sustainable tourism using MBTPs (H6 supported).

The value of the “Coefficient Of Determination (R²)” between the antecedents and outcome variables is displayed in the results. The model accounts for 48.7% of the variability in attitude and 49.1% in intention towards sustainable tourism using MBTPs. The “effect size (f²)” value is determined to assess the role of antecedents in explaining the variations in outcome variables. The table displays values categorized as “low (ranging from 0.02 to 0.15), medium (ranging from 0.15 to 0.35), and large (0.35 and beyond)” (Hair et al., 2019). Given that the threshold value of “Q² must be larger than 0”, the model's predictive relevance is evaluated, which is 0.473 for attitude and 0.513 for intention. This implies that the proposed model has a high degree of predictive relevance. Moreover, a measure of the overall model fit is provided by the “standardized root-mean-square residual (SRMR)” of 0.066, which is less than the threshold at 0.80 (Hair et al., 2017).

Table 4: Structural Model Assessment

Hypothesis	H1: PU -> AT	H2: PEOU-> AT	H3: FE -> AT	H4: EI -> AT	H5: AT -> IN	H6: PI -> IN
RESULTS WITHOUT MODERATION						
VIFs	1.481	1.528	1.686	1.772	1.000	
Beta (β)	0.453	0.237	0.161	0.024	0.643	
T statistics	8.396	4.248	2.907	0.338	14.618	
P Values	0.000	0.000	0.004	0.736	0.000	
f ²	0.277	0.072	0.029	0.000	0.697	
Q ²	0.473				0.441	
R ²	0.487				0.409	
Supported	Yes	Yes	Yes	No	Yes	
RESULTS WITH MODERATION						
VIFs	1.481	1.528	1.686	1.772	1.887	1.908
Beta (β)	0.453	0.237	0.161	0.024	0.374	0.328
T statistics	8.396	4.248	2.908	0.336	6.710	6.231
P Values	0.000	0.000	0.004	0.737	0.000	0.000
f ²	0.277	0.072	0.030	0.000	0.145	0.109
Q ²	0.473				0.513	
R ²	0.487				0.491	
Supported	Yes	Yes	Yes	No	Yes	Yes
SRMR					0.066	

Source: Self development

FUTURE SCOPE OF THE STUDY

The study has several limitations. First and foremost, the research was only based on Indian respondents, which makes generalizing its findings difficult. Future studies should include other cultural as well as geographical contexts to increase the results generalizability. Secondly, data is only collected at a particular point due to the study's cross-sectional design, which is a constraint. Longitudinal studies could offer more significant insights into how MBTPs may evolve in terms of attitudes towards sustainable tourism and thus

give a more dynamic understanding of user’s intentions. Moreover, this study employed TAM and HCBT, which are analyzed using PLS-SEM. Future studies can employ a combination of other models and theories that can be analyzed using different analysis techniques to study the adoption of sustainable tourism using MBTPs.

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