



**JOURNAL OF TOURISM,  
HOSPITALITY AND  
ENVIRONMENT MANAGEMENT  
(JTHER)**

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## THE EFFECT OF AR/VR APPLICATIONS ON INTENTION TO VISIT MUKAH, SARAWAK: AN EMPIRICAL STUDY AMONG HIGHER INSTITUTIONS STUDENTS

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### Article Info:

#### Article history:

Received date: 28.01.2026

Revised date: 15.02.2026

Accepted date: 03.03.2026

Published date: 18.03.2026

#### To cite this document:

Sabli, H. M., Chen, W. K., Reduan, I., & Ramli, M. (2026). The Effect of AR/VR Applications on Intention to Visit Mukah, Sarawak: An Empirical Study Among Higher Institutions Students. *Journal of Tourism Hospitality and Environment Management*, 11 (43), 402-412.

### Abstract:

This study examines how Augmented Reality (AR) and Virtual Reality (VR) influence tourism intention towards Mukah, Sarawak among Malaysian university students. Data were collected through an online survey involving 422 respondents from public and private higher education institutions. The analysis combined descriptive statistics, thematic analysis, Pearson correlation, and exploratory factor analysis using SPSS version 27. The findings show consistently positive evaluations of the AR/VR experience, particularly in relation to content informativeness, visual clarity, ease of use, and overall satisfaction. A significant positive relationship was found between user satisfaction and intention to visit Mukah ( $r = .68$ ,  $p < .01$ ), indicating that immersive applications can strengthen destination interest even before physical travel takes place. The qualitative responses further suggest that respondents valued the experience for its immersive, informative, and engaging qualities. Nevertheless, the results should be interpreted with caution because the sample comprised students rather than actual visitors. Overall, the study suggests that AR/VR can serve as an effective promotional and educational tool for rural tourism destinations.

DOI:10.35631/JTHER.1143025 **Keyword:**

AR/VR Tourism, Immersive Technologies, Tourism Intention,  
Rural Tourism, Mukah, Sarawak, Malaysia



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## Introduction

Tourism plays a pivotal role in Malaysia's socio-economic development by generating income, creating employment, and strengthening cultural exchange. In Sarawak, tourism development is no longer confined to major urban centres; it increasingly includes secondary and rural destinations such as Mukah. Mukah is distinctive because it combines cultural heritage assets, community-based traditions, and an educational environment shaped by both public and private higher education institutions. The destination is known for the Melanau community, the Kaul Festival, the Jerunei heritage site, and the Sapan Puloh Museum, all of which provide substantial potential for heritage-based tourism. Despite these assets, Mukah remains comparatively underrepresented in mainstream tourism promotion. This underexposure makes it an appropriate setting for examining digital approaches that can expand destination visibility and enrich visitor engagement.

A clear research gap remains in the literature. While immersive tourism technologies have been widely studied in urban, museum, and heritage settings, limited empirical work has examined how AR/VR applications shape tourism intention in rural or peripheral destinations in East Malaysia, particularly among young and digitally literate users. This gap is important because destinations such as Mukah require promotional strategies that can communicate place identity, cultural meaning, and experiential value without relying solely on conventional brochures or websites. Accordingly, this study investigates whether AR/VR experiences are associated with satisfaction and tourism intention among Malaysian university students. By focusing on Mukah as an emerging digital tourism site, the study offers evidence relevant to rural destination marketing, youth-oriented tourism promotion, and the broader smart tourism agenda (Guttentag, 2010; Huang et al., 2013; Hassan et al., 2020).

## Literature Review

Recent scholarship shows that immersive technologies such as Augmented Reality (AR) and Virtual Reality (VR) are increasingly used to enhance tourism experiences before, during, and after travel. These technologies can simulate destination environments, support storytelling, and enrich interpretation, thereby influencing destination image, engagement, and behavioural intention (Guttentag, 2010; Tussyadiah et al., 2018). Systematic reviews also indicate that AR/VR research in tourism has become more methodologically rigorous, although important contextual gaps remain, especially in non-metropolitan destinations and in developing tourism contexts (Pratisto et al., 2022; Yung & Khoo-Lattimore, 2019). Within Malaysia, related studies suggest that interactivity, visual vividness, and information quality shape users' perceptions of

usefulness and enjoyment, which in turn support destination evaluation and satisfaction (Hassan et al., 2020; Song et al., 2024). Taken together, the literature suggests that immersive technologies matter not only as technical tools but also as experience-shaping media. However, fewer studies have examined their role in promoting culturally specific destinations such as Mukah, Sarawak, or in assessing how digitally literate student users translate immersive experience quality into travel intention.

### ***Theoretical Framework***

This study is anchored in the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB). TAM explains technology adoption through perceived usefulness and perceived ease of use, both of which are relevant to AR/VR applications that rely on visual clarity, interactivity, navigation quality, and informative content (Venkatesh et al., 2003). In this study, these dimensions are reflected in respondents' evaluations of the AR/VR experience and in their overall satisfaction. TPB complements this perspective by linking attitudes to behavioural intention, thereby providing a basis for interpreting intention to visit Mukah after exposure to immersive content (Ajzen, 1991). Used together, TAM and TPB provide a coherent explanation for why a positive AR/VR experience may translate into stronger tourism intention: users who perceive the application as useful, engaging, and easy to use are more likely to form favourable attitudes toward the destination and report higher intention to visit. This theoretical positioning strengthens the study by moving it beyond a purely descriptive account of user reactions.

### **Methodology**

This study employed a cross-sectional survey design targeting university students enrolled in public (IPTA) and private (IPTS) higher education institutions in Malaysia. A non-probability sampling approach, combining convenience and purposive elements, was used because university students represent a digitally literate group with relatively high familiarity with mobile and immersive technologies. Although this sample does not represent all tourist segments, it is appropriate for examining early responses to AR/VR-based destination promotion among potential young users. A structured online questionnaire was distributed through Google Forms over a three-month period from July 2025 to September 2025, and 422 valid responses were obtained. The instrument included Likert-scale items measuring interactivity, visual quality, informativeness, usability, emotional engagement, satisfaction, and behavioural intention, together with open-ended questions for additional feedback and suggestions (Hassan et al., 2020; Radianti et al., 2020).

Data were analysed using SPSS version 27, including descriptive statistics, Pearson correlation analysis, and exploratory factor analysis (EFA). Descriptive statistics were used to summarise respondent characteristics and overall item responses. Pearson correlation examined the relationship between satisfaction and tourism intention, while EFA was used to assess the dimensionality of the AR/VR experience measures. Open-ended responses were reviewed thematically to identify recurring perceptions and suggestions. The study adhered to basic research ethics procedures: participation was voluntary, informed consent was obtained at the beginning of the questionnaire, and responses were treated confidentially and used only for research purposes.

## **Data Analysis**

Descriptive analysis was used to summarise respondent characteristics and central tendencies across the AR/VR measures, with attention to gender and age-group patterns. Open-ended responses were analysed thematically to identify recurring descriptions of the experience and suggestions for improvement. Pearson correlation was then used to examine the strength and significance of the relationship between overall satisfaction and intention to visit. Exploratory factor analysis (EFA), conducted in SPSS version 27, assessed the dimensionality of the survey items. The Kaiser-Meyer-Olkin (KMO) statistic and Bartlett's Test of Sphericity confirmed that the dataset was suitable for factor analysis, and the extracted component explained more than 60% of the total variance (Guttentag, 2010; Jung et al., 2016).

## **Demographic Profile of Respondents**

**Table 1: Demographic Profile**

<b>Gender</b>	<b>Frequency</b>	<b>Percentage (%)</b>
<b>Female</b>	285	67.54
<b>Male</b>	137	32.46
<b>Age Group</b>		
<b>&lt;18</b>	163	38.63
<b>19-25</b>	250	59.24
<b>26-35</b>	0	0.00
<b>36-50</b>	9	2.13
<b>51+</b>	0	0.00

Overall, the descriptive results indicate consistently positive evaluations of the AR/VR experience. Content informativeness ( $M = 4.55$ ,  $SD = 0.75$ ) and overall satisfaction ( $M = 4.48$ ,  $SD = 0.71$ ) recorded the highest mean scores, suggesting favourable responses to the application as an informational and promotional tool. Higher engagement was observed among female respondents and among participants aged 19–25 and 36–50. These patterns should be interpreted cautiously because the sample was student-based and uneven across age groups; however, they provide a useful indication of the respondent profile most receptive to the immersive content.

## **Section B: AR/VR Technical and Visual Experience**

This section evaluates visual clarity, interactivity, multimedia richness, and ease of navigation within the AR/VR tourism experience. All items recorded high mean values, with content informativeness producing the highest score ( $M = 4.55$ ). These findings indicate that respondents generally regarded the AR/VR application as clear, useful, and capable of conveying information about Mukah's attractions in an accessible way.

**Table 2: Mean for AR/VR Technical and Visual Experience**

Item	Mean	Standard Deviation
B1. The AR/VR visuals were clear and immersive.	4.45	0.80
B2. I could interact effectively with the AR/VR content.	4.35	0.78
B3. The content was informative about Mukah's attractions.	4.55	0.75
B4. The experience included rich multimedia (audio, video, 3D elements).	4.49	0.75
B5. Navigation within the experience was intuitive and easy.	4.46	0.71
C1. I felt as if I was physically present in Mukah while using AR/VR.	4.22	0.88
C2. The AR/VR experience made me feel emotionally connected to the culture.	4.29	0.83
C3. I enjoyed the overall AR/VR experience.	4.34	0.77
C4. I found the AR/VR experience to be useful in learning about Mukah.	4.41	0.78
C5. I would prefer using AR/VR over brochures or websites for tourism info.	4.33	0.79
D1. I am more interested in visiting Mukah after this AR/VR experience.	4.24	0.82
D2. I would recommend this experience to other travelers.	4.37	0.78
D3. I would like to explore more destinations using similar technology.	4.43	0.75
D4. I am satisfied with the AR/VR application as a promotional tool.	4.48	0.71

### ***Section C: Emotional & Cultural Engagement***

This section examines emotional response, enjoyment, and perceived cultural learning generated by the AR/VR experience. All items exceeded a mean score of 4.20, indicating that respondents generally experienced the application positively. The results suggest that the immersive content was able to foster both enjoyment and a sense of cultural connection,

although these interpretations should be read as perceived responses within a mediated experience rather than evidence of actual on-site engagement.

**Table 3: Emotional & Cultural Engagement**

Item	Mean	Standard Deviation
C1. I felt as if I was physically present in Mukah while using AR/VR.	4.22	0.88
C2. The AR/VR experience made me feel emotionally connected to the culture.	4.29	0.83
C3. I enjoyed the overall AR/VR experience.	4.34	0.77
C4. I found the AR/VR experience to be useful in learning about Mukah.	4.41	0.78
C5. I would prefer using AR/VR over brochures or websites for tourism info.	4.33	0.79

**Section D: Behavioral Intentions & Satisfaction**

This section assesses respondents' intention to visit Mukah, willingness to recommend the AR/VR experience, and satisfaction with the application as a tourism promotion tool. The mean values were consistently high, although the mean for intention to visit Mukah (M = 4.24) was slightly lower than the other items. This pattern suggests that respondents evaluated the application very positively, while the translation from favourable evaluation to concrete travel intention may be somewhat more cautious.

**Table 4: Behavioral Intentions & Satisfaction**

Item	Mean	Standard Deviation
D1. I am more interested in visiting Mukah after this AR/VR experience.	4.24	0.82
D2. I would recommend this experience to other travelers.	4.37	0.78
D3. I would like to explore more destinations using similar technology.	4.43	0.75
D4. I am satisfied with the AR/VR application as a promotional tool.	4.48	0.71

### ***Thematic Analysis***

The thematic analysis supports the quantitative findings. Respondents frequently described the AR/VR experience as immersive, easy to use, and informative, while suggested improvements focused on better interaction, stronger visuals, and more varied content. These themes indicate that participants valued both functional usability and the experiential qualities of the application.

**Table 5: Summary of Thematic Analysis**

<b>Theme</b>	<b>Frequency of Mentions</b>	<b>Example Keywords</b>
Immersive Ness	126	"Engaging," "realistic," "felt present"
Ease of Use	97	"user-friendly," "simple," "smooth"
Informative	88	"Educational," "insightful," "learned a lot"
Suggested Improvements	104	"Better interaction," "improve visuals," "more content"

Taken together, the qualitative responses reinforce the statistical results by showing that respondents did not evaluate the application solely in technical terms. Rather, they associated immersive quality with usability, information value, and enjoyment, which helps explain why satisfaction was positively related to travel intention.

### ***Correlation Analysis***

The correlation analysis showed a statistically significant positive relationship between overall satisfaction and travel intention ( $r = .68, p < .01$ ). This indicates that respondents who evaluated the AR/VR experience more favourably were also more likely to report stronger intention to visit Mukah. The result does not establish causality, but it does suggest that satisfaction is an important attitudinal predictor within the context of immersive destination promotion

**Table 6: Correlation Between Satisfaction and Travel Intention**

<b>Variable 1</b>	<b>Variable 2</b>	<b>Pearson r</b>	<b>Significance (p-value)</b>
<b>Overall Satisfaction</b>	Travel Intention	0.68	< .01

This finding highlights the strategic importance of user satisfaction in AR/VR-based tourism marketing. Applications that are informative, usable, and emotionally engaging are more likely to support favourable destination responses and stronger intention to visit among similar digitally literate users.

### ***Exploratory Factor Analysis***

Exploratory Factor Analysis (EFA) was performed to assess the dimensionality of the survey constructs. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.846, indicating good suitability, and Bartlett's Test of Sphericity was statistically significant ( $\chi^2 = 2156.34, p < .001$ ). A single factor with an eigenvalue greater than 1 was extracted and explained 64.7% of the total variance. All items loaded above 0.70, indicating strong convergence among the measured attributes.

**Table 7: Factor Loadings for Principal Component (Unidimensional Model)**

Item Code	Description	Factor Loading
B1	Visual clarity and immersion	0.78
B2	Interactivity with content	0.74
B3	Informativeness of content	0.82
B4	Rich multimedia elements	0.79
B5	Ease of navigation	0.75
C1	Sense of physical presence	0.73
C2	Emotional connection to culture	0.76
C3	Overall enjoyment	0.80
C4	Learning utility	0.77
C5	Preference over brochures/websites	0.74
D1	Interest in visiting Mukah	0.72
D2	Recommendation to others	0.79
D3	Willingness to explore other destinations via AR/VR	0.81
D4	Overall satisfaction with the application	0.84

The factor structure suggests that respondents conceptualised the AR/VR tourism experience as a coherent experiential construct rather than as a set of isolated technical features. In practical terms, visual quality, interactivity, learning value, enjoyment, satisfaction, and behavioural intention appear to be closely intertwined in how users evaluate the application.

## Discussion

The findings indicate that AR and VR applications were positively received by the student respondents, particularly in relation to clarity, usability, informativeness, and emotional engagement (Jung et al., 2016; tom Dieck & Jung, 2017). The significant association between satisfaction and intention to visit Mukah suggests that favourable evaluations of immersive content are linked to stronger destination interest. From a TAM perspective, this pattern is consistent with the view that perceived usefulness and ease of use support positive attitudes toward technology-mediated experiences. From a TPB perspective, these favourable attitudes may contribute to behavioural intention, even when the destination itself has not yet been physically experienced.

At the same time, the findings should be interpreted within the limits of the sample. Because the respondents were university students rather than actual on-site tourists, the results should not be generalised to all visitor groups. A more cautious interpretation is that immersive technologies may enhance perceived engagement and travel intention among digitally literate users. The EFA results further suggest that respondents experienced AR/VR tourism content holistically, which helps explain why technical and emotional features jointly shaped satisfaction and intention.

This study makes three contributions. First, it contributes theoretically by applying TAM and TPB to explain how immersive destination content relates to satisfaction and tourism intention. Second, it contributes practically by indicating that tourism developers should prioritise informative storytelling, intuitive navigation, stronger interactivity, and culturally meaningful multimedia when designing AR/VR applications for destination marketing. Third, it

contributes contextually by providing empirical evidence from Mukah, Sarawak, a peripheral destination that is rarely examined in immersive tourism research. Future work should test the model with broader tourist segments and compare responses across actual visitors and prospective users. Future development of AR/VR applications should prioritise interactive storytelling and personalised content to strengthen user engagement across different demographic groups.

## Conclusion

In sum, the study shows that AR/VR applications may function as effective promotional tools for introducing Mukah, Sarawak to digitally literate users. The evidence points to strong perceived value in content quality, usability, and experiential engagement, while also indicating the need for more interactive and personalised design. Given the student-based sample, the findings are best understood as an early empirical indication rather than a definitive representation of all tourists.

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**Acknowledgements:** The authors express their sincere appreciation to Politeknik Mukah Sarawak (PMU) for the institutional support and facilities provided throughout this research. The authors also thank Persatuan Melanau Mukah for its cultural insights and cooperation in supporting the contextual development of the AR/VR tourism content related to Mukah, Sarawak. This study was funded through the Technology and Applied Research Grant Scheme (TARGS) under Jabatan Pendidikan Politeknik dan Kolej Komuniti (JPPKK), Ministry of Higher Education Malaysia.

**Funding Statement:** This study was supported by the Technology and Applied Research Grant Scheme (TARGS) under Jabatan Pendidikan Politeknik dan Kolej Komuniti (JPPKK), Ministry of Higher Education Malaysia.

**Conflict of Interest Statement:** The authors declare that there is no conflict of interest regarding the publication of this paper. All authors have contributed to this work and approved the final version of the manuscript for submission to the Journal of Tourism, Hospitality and Environment Management (JTHEM).

**Ethics Statement:** This study was conducted in accordance with ethical research standards. All procedures involving human participants were reviewed and approved by the [Research, Innovation & Commercialization, Unit] Politeknik Mukah Sarawak Board/Ethics Committee], approval number [T-ARGS/2024/BK01/0211] Informed consent was obtained from all participants prior to data collection. Participation was voluntary, and respondents were assured of confidentiality and anonymity. The data collected were used solely for academic purposes.

**Author Contribution Statement:** All authors contributed significantly to the development of this manuscript. Habsah Mohamad Sabli was responsible for the conceptualization, methodology, and overall supervision of the

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study. Chen Wong Keong handled data collection, analysis, and interpretation of results. Iskandar bin Reduan and Mazira binti Ramli contributed to the literature review, drafting, and critical revision of the manuscript. All authors read and approved the final version of the manuscript prior to submission.

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