

The impact of the implementation of virtual reality (VR) technology on the number of planned tourist visits in Taman Apung Mas Kemambang

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Abstract

Indonesia's tourism industry plays an important role in the economy, supported by natural and cultural beauty. VR technology transforms interaction by offering an immersive experience for potential tourists, becoming an effective promotional tool to attract visitors. Taman Apung Mas Kemambang Tourism in Purwokerto has adopted VR as a marketing strategy to introduce the beauty of the tourist attraction. This study aims to evaluate the impact of the use of VR technology on tourist visit plans to Taman Apung Mas Kemambang, using logistic regression to analyse the relationship between VR user experience and other factors that influence visit decisions. The results of this study show that descriptive analysis and logistic regression provide significant insights into the factors that affect the interest of visitors to visit Taman Apung Mas Kemambang Tourism. The logistic regression model used has a very high degree of fit, with a Pseudo R-squared value of 1,000 and a low log-likelihood value, despite the risk of overfitting. Variables such as gender, age, frequency of use, probability of visiting, and friend recommendations proved to have a significant effect, where friend recommendations had the highest coefficient. The model also showed 100 % accuracy in classifying visitor interest after a VR experience, confirming the potential of VR technology as an effective tool in improving tourist interest and visit decisions.

Keywords

virtual reality, logistic regression, Taman Apung Mas Kemambang, tourism promotion

1. Introduction

The tourism industry in the archipelago plays a vital role as a driver of the economy, especially in countries that are climbing the ladder of progress such as Indonesia [Aliansyah and Hermawan, 2021]. With its stunning natural panorama and unparalleled cultural mosaics, the country's tourism sector has an extraordinary allure, both for domestic and international tourists [Rahma, 2020]. However, the rapid flow of digital innovation has revolutionized the landscape of this industry, changing the paradigm of interaction between travel service providers and their connoisseurs. In the midst of this wave of change, one of the technological innovations that is currently widely adopted is Virtual Reality (VR) technology [Djamil and Sulisty, 2023].

VR innovations open the gates of a new dimension in the world of exploration, allowing virtual explorers to immerse themselves in simulations of environments that are virtually indistinguishable from reality, through hypnotic auditory and visual experiences. In the context of tourism, VR is not just a promotional tool, but also a catalyst for transformation that offers immersive 'snippets' of destinations to potential tourists, long before they set foot in the actual location [Djamil and Sulisty, 2023]. Through this digital portal, tourist destinations can showcase their charm in a more dynamic and interactive way, inviting potential visitors to 'explore' the beauty of the place virtually, which in turn can be a decisive factor in the decision-making process to visit the destination physically.

Taman Apung Mas Kemambang Tourism, a tourist attraction in Purwokerto, Central Java [Rika Widianita, 2023] has stepped into the digital era by adopting VR technology as the spearhead of its marketing strategy. The implementation of VR in this destination is not just a trend, but a visionary breakthrough that aims to amaze potential visitors with a virtual panorama that brings the magic of Taman Apung Mas Kemambang to life. While these innovations promise a revolution in the way travelers plan their trips, the effectiveness of VR in catalysing visiting decisions is still a challenging puzzle to solve. Therefore, this study aims to evaluate the impact of the implementation of VR technology on the number of planned tourist visits in Taman Apung Mas Kemambang Tourism.

This study adopts the logistic regression method as an analytical instrument to evaluate the impact of virtual reality (VR) technology on tourists' decisions in planning visits to Taman Apung Mas Kemambang destinations. The selection of this method is based on his ability to analyse complex relationships between dependent variables and a number of independent variables [Jurafsky and Martin, 2012]. These independent variables include the experience of tourists in using VR technology, as well as various other factors that can affect the tourist decision-making process [Oncioiu and Priescu, 2022].

Through this analytical approach, it is hoped that a deeper and more comprehensive understanding of the effectiveness of VR technology in promoting tourist destinations can be obtained. In addition, the results of this research are expected to provide valuable insights that can be used to develop tourism marketing strategies in general, so that they can attract more tourists and improve their experience in exploring the tourist locations offered.

2. Literature review

Previous research has shown that VR technology has significant potential in attracting attention and increasing visitor interest in various fields, including tourism. The use of VR in tourism has been widely adopted to provide an immersive visual experience to potential travellers, allowing them to ‘visit’ the destination before a physical visit is made. Based on existing studies, several aspects of VR content are known to affect the interests and preferences of potential visitors.

A number of studies have identified elements in VR that can affect the emotions and interests of potential tourists. Realistic visualization of the natural environment, for example, has proven to be effective in attracting tourists by presenting a beautiful and detailed panorama of a destination [Martínez-Navarro *et al.*, 2019]. In addition, the element of interactivity in VR that allows users to explore or interact directly with virtual objects creates a stronger appeal than a passive visual experience [Guttentag, 2010]. The addition of narrative elements, such as destination-related stories or histories, also provides an immersive experience for users, increasing emotional engagement and interest in visiting.

Other research reveals that types of VR content that have educational or informative value can be more effective in arousing user interest. For example, studies on virtual tours that include information regarding local cultural or historical uniqueness have been shown to increase tourists’ interest in visiting the destination in person [Oncioiu and Priescu, 2022]. In the context of cultural or historical tourism, visitors are generally more interested in content that provides in-depth insights related to the site being displayed, so user preference for informative VR is one of the important considerations.

The acceptance of VR technology in the context of tourism has been explored with the Technology Acceptance Model (TAM) approach. This model assesses the perceived aspects of usability, ease of use, and entertainment value of VR as the main factors that influence the visitor’s intention to try or visit a destination after seeing a VR tour. Based on research by [Khaqiqi and Alfansi, 2022], the perception that VR can provide educational value and a unique experience increases the likelihood that users will be more interested in visiting the actual location. Therefore, VR content providers are advised to optimize these factors, as they are proven to support higher acceptance of VR technology.

Studies in the field of tourism show that the pre-visit experience through VR has a strong correlation with the intention of visitors to make a physical visit. Realistic visualization of the scenery and atmosphere of the destination, balanced with a personal touch such as an interactive guide or stories about the local people, has been shown to be able to change the perception of users and increase their desire to explore the destination further [Djamil and Sulisty, 2023]. In the context of Taman Apung Mas Kemambang Tourism, this can be applied by providing VR tours that focus on the natural beauty and uniqueness of local culture that can only be found in the location.

Based on the findings above, the use of VR content for tourism marketing has proven to be effective in attracting interest and expanding the reach of potential visitors. VR-based promotional programs that prioritize realistic and educational content, combined with word-of-mouth marketing strategies or friend referrals, have proven to play a big role in attracting potential new tourists [Nihayah *et al.*, 2023]. Studies show that as users share their VR experiences, the impact on friends or family’s interest in visiting increases, creating a beneficial chain effect for tourist destinations.

In the context of tourism education and accessibility, VR is also a tool that can overcome the physical limitations of visitors. With this technology, users who may have physical limitations or geographical constraints can enjoy the beauty and attraction of a place virtually, without having to be present at the location [Silva *et al.*, 2018]. This innovation not only increases the number of potential visitors, but also provides a more inclusive opportunity for the entire community to experience tourism.

Overall, this literature review shows that the effectiveness of VR technology in tourism depends not only on the adoption of the technology itself, but also on the design of engaging, informative, and interactive VR content. By combining realistic visual elements, in-depth education, and interactive experiences, VR content can enhance tourist appeal and drive potential visitors’ interest. This supports an experience-based marketing strategy that can optimize the use of VR in the tourism industry.

3. Methods

3.1 Research design

This study uses a quantitative design with a cross-sectional survey approach. “Cross-sectional” is a type of research design in which data is collected at a single point in time from a desired population or sample [Levin, 2006]. In this approach, data was collected at a specific time from respondents regarding their perception of VR technology and its influence on tourism interest in Taman Apung Mas Kemambang. Primary data was collected through a structured questionnaire distributed to respondents who had experienced VR demonstrations from Taman Apung Mas Kemambang Tourism.

To analyse the data, this study uses logistic regression analysis. This method was chosen because the dependent variable (Interested in Visiting) is dichotomous, namely interested or not interested in visiting Taman Apung Mas Kemambang Tourism after the VR experience.

3.2 Sample and population

This study determined a target population that includes individuals with or without experience in the use of VR technology, and have an interest in visiting Taman Apung Mas Kemambang tourism after watching Taman Apung Mas Kemambang tourism videos through VR media. Considering the limitations of resources and time, this study uses a convenience sampling method with a limited sample size. The research sample con-

sisted of 32 respondents who were selected based on their willingness to participate in the online survey. Inclusion criteria for respondents include: Individuals who have watched Taman Apung Mas Kemambang virtual tour videos on YouTube, be at least 18 years old, have internet access to fill out online surveys.

Although the sample size is relatively small, it can still provide valuable early insight into the impact of VR technology on interest in visiting Taman Apung Mas Kemambang Tourism. Data collection was carried out through an online survey platform, where respondents were asked to watch a VR video of the Mas Kemambang Floating Park in Purwokerto before filling out a questionnaire.

3.3 Research variables

This study identified two main types of variables: dependent variables and independent variables. Dependent variables are variables that are influenced or result from the existence of independent variables [Alwiyah et al., 2018]. The dependent variable in this study is Interest in Visiting Taman Apung Mas Kemambang. This variable was measured based on respondents' answers to the question of whether watching VR videos made them more interested in visiting Taman Apung Mas Kemambang. This variable is categorical with two answer choices: Interested and Disinterested.

Independent variables are variables that affect or cause changes in dependent (bound) variables [Kusurkar et al., 2011]. These variables were selected to analyze various factors that might affect the respondents' interest in visiting Taman Apung Mas Kemambang after watching VR videos. An analysis of the relationship between these independent variables and dependent variables will help understand the impact of VR technology on tourist interest in visiting.

3.4 Mitigation of data imbalance

In this study, the dependent variable "Interested to Visit" showed a significant imbalance in the data distribution. Of the 31 observations, there were 30 respondents who expressed interest (the "interested" class) and only 1 respondent who stated that they were not interested (the "not interested" class). This ratio, which indicates the dominance of "interested" classes, can cause the model to tend to bias towards the majority class and result in inaccurate prediction performance, especially in recognizing minority classes.

To solve this imbalance problem, the RandomOverSampler technique from the imbalanced-learn Used. This technique serves to oversample the minority class, that is, the "disinterested" class, by doubling the existing sample so that the number is equal to the majority class. This process not only increases the proportion of data for minority classes but also allows the model to learn from more diverse patterns [Benítez-andrades et al., 2024].

3.5 Logistic regression analysis

Logistic regression analysis is a statistical method imple-

mented to examine the relationship between independent variables (both categorical and continuous) and a dichotomous dependent variable. In the context of this study, the approach applied is binary logistic regression, a variant of the non-linear regression model that has special characteristics in the form of binary-bound variables that are manifested in two values: zero (0) and one (1).

The uniqueness of logistic regression lies in the use of logit functions as a mathematical bridge that connects binary-bound variables with independent variables. Logit functions, which essentially represent the natural logarithms of dependent variables, produce transformations that convert data into dichotomous forms with only two possible values: zero or one. The mathematical formulation of the logit function can be expressed as follows:

$$P(Y | x_{ki}) = \frac{e(\beta_0 + \beta_1 \beta_{1i} + \beta_2 \beta_{2i} + \dots + \beta_k^x \beta_{ki})}{1 + e(\beta_0 + \beta_1 \beta_{1i} + \beta_2 \beta_{2i} + \dots + \beta_k^x \beta_{ki})} + \dots$$

Information:

- P : Probability of y (dependent variable)
- x_{ki} : Value of observation i at change k
- β_k : Value of coefficient of predictor variable k
- K : Index of change of predictor
- I : Index for observation
- E : Constant 2.71828

By applying logistic regression, the study can predict the probability of whether a person will be interested in visiting Taman Apung Mas Kemambang after watching a VR video, based on a combination of the above factors. Each independent variable was analysed to see its significant effect on the dependent variable, both positively and negatively.

3.6 Model evaluation

The evaluation of the Logistic Regression model was carried out to assess the classification performance in predicting the results of the given dataset. One of the main metrics used is accuracy, which measures how many predictions are correct out of the total predictions generated by the model [Dinga et al., 2019]. However, accuracy alone is not enough to provide a complete picture, especially in the case of unbalanced data. Therefore, the confusion matrix is used to break down the prediction results into True Positives, True Negatives, False Positives, and False Negatives, so that we can understand where model errors occur most often and how it affects the quality of the classification (Varoquaux and Colliot, n.d.).

To understand the model's performance as the training data grows, a learning curve is also used, which helps in identifying whether the model is overfitting or underfitting [Viering and Loog, 2023]. Logistic regression, as a relatively simple model, is usually easier to interpret and is less prone to overfitting than more complex models. Accuracy formula:

$$\text{Accuracy} = \frac{(TP + TN)}{(TP + TN + FP + FN)}$$

Where:

- *TP* (True Positive): The number of correct positive predictions.
- *TN* (True Negative): The number of correct negative predictions.
- *FP* (False Positive): The number of false positive predictions (type I error).
- *FN* (False Negative): The number of incorrect negative predictions (type II errors).

4. Result and discussion

4.1 Descriptive analysis

This descriptive analysis presents the results of in-depth research on the factors that affect the interest in visiting. The study, based on a model that used 31 observations, yielded significant findings and potentially provided valuable insights for the development of marketing strategies and visitor experiences.

Figure 1 shows the Model used in this analysis showing a very high level of match, indicated by a Pseudo *R*-squared value of 1,000. While this value indicates a perfect fit, it should be noted that it can also indicate the risk of overfitting. On the other hand, a very low log-likelihood value (-1.1423e-07) indicates that the model has achieved good convergence, which is a positive indicator of the model’s quality.

Several variables have been proven to have a significant influence on interest in visiting. These variables include gender, age, frequency of use, probability of visiting, and friend recommendations. Each of these variables has a coefficient

that indicates the direction and magnitude of influence on the dependent variable. Sex, with a coefficient of -20.0217, showed a significant negative influence, indicating a substantial difference in visiting preferences between different gender groups.

The frequency of use appears to be a highly influential factor, with a coefficient of 21.9455. This indicates that the more often a person interacts with a related service or product, the more likely they are to be interested in visiting. The probability of visiting, interestingly, has a negative coefficient (-13.8713), which may indicate the presence of other factors that influence the actual decision to visit. Friend recommendations emerged as the most influential factor, with the highest coefficient of 37.5907. These findings emphasize the importance of word-of-mouth marketing and the effectiveness of referral programs in increasing interest in visiting.

4.2 Regression logistic findings

The findings from the logistics regression model provide in-depth insight into the potential of VR technology in attracting visitors to Taman Apung Mas Kemambang Tourism. The results of the analysis revealed the superiority of the model in predicting the interest of potential tourists, which was shown with a perfect level of accuracy after balancing the data. The model’s outstanding performance is reflected in its ability to classify each sample precisely, without any prediction errors. This shows that the factors analysed in the model have a very strong correlation with the individual’s decision to visit such tourist destinations after interacting with VR technology.

The results of the confusion matrix in Table 1 provide a clear picture of the effectiveness of the model. By successfully iden-

Dep. Variable:		Tertarik_berkunjung	No. Observations: 31			
Model:		Logit	Df Residuals:	20		
Method:		MLE	Df Model:	10		
Date:		Fri, 04 Oct 2024	Pseudo R-squ.:	1.000		
Time:		05:02:09	Log-Likelihood:	-1.1432e-07		
Converged:		False	LL-Null:	-4.4177		
Covariance Type:		Nonrobust	LLR <i>p</i> -value:	0.5478		
	coef	Std err	<i>z</i>	<i>P</i> > <i>Z</i>	[0.025	0.975]
const	37.7772	1.71e+05	0.000	1.000	-3.35e+05	3.35e+05
Jenis_kelamin	-20.0217	1.04e+07	-1.93e-06	1.000	-2.04e+07	2.04e+07
Usia	4.3277	1.11e+07	3.89e-07	1.000	-2.18e+07	2.18e+07
Pengalaman_pengguna	-23.7331	nan	nan	nan	nan	nan
Frekuensi_pengguna	21.9455	1.02e+05	0.000	1.000	-2e+05	2e+05
dampak_wisatavirtual	10.5702	nan	nan	nan	nan	nan
Dayatarik_Balekambang	-19.7345	1.71e+05	-0.000	1.000	-3.34e+05	3.34e+05
Probabilitas_kunjung	-13.8713	1.49e+05	-9.29e-05	1.000	-2.93e+05	2.93e+05
Minat_promosiwisata	0.5734	nan	nan	nan	nan	nan
Rekomendasi_teman	37.5907	1.89e+05	0.000	1.000	-3.71e+05	3.71e+05
Keberlanjutan_lingkungan	3.9290	nan	nan	nan	nan	nan

Figure 1: Logit regression result

Table 1: Confusion matrix

Matric	Value	
Accuracy	1.0 (100 %)	
Confusion Matrix		
Actual	Positive Predicted	Negative Predicted
Actual Positive	3 (True Positive)	0 (False Negative)
Actual Negative	0 (False Positive)	9 (True Negative)

tifying 3 cases in which respondents showed interest in visiting after the VR experience, the model was also accurate in predicting 9 cases in which respondents were not interested in visiting. These findings confirm that the use of VR technology can be a powerful tool in increasing visitor interest, making a significant contribution to the marketing strategy of tourist destinations.

Furthermore, the learning curve presented in Figure 2 provides additional insights into the model's performance. The training score curve showed a steady improvement as the training set size increased, eventually achieving an accuracy close to 1.0 on larger training set sizes. Meanwhile, the cross-validation score curve showed a significant improvement, ranging from an accuracy of about 0.5 to equivalent to a training score when the training set size reached around 35-40. These two curves converge and stabilize at a very high level of accuracy for training set sizes above 40, with slight fluctuations indicated by the shadow area around the main line.

Overall, the findings from this logistic regression analysis provide valuable insights into how VR technology can affect visitor interest in coming to Taman Apung Mas Kemambang Tourism. The high accuracy of this model shows great potential in understanding the impact of VR technology on tourist visit behaviour, which could ultimately be the basis for more effective tourism marketing and development strategies. This is in line with the research objectives that explore the impact of VR technology implementation on the number of planned tourist visits to Taman Apung Mas Kemambang, emphasizing the importance of utilizing innovative technology in enhancing the tourism experience.

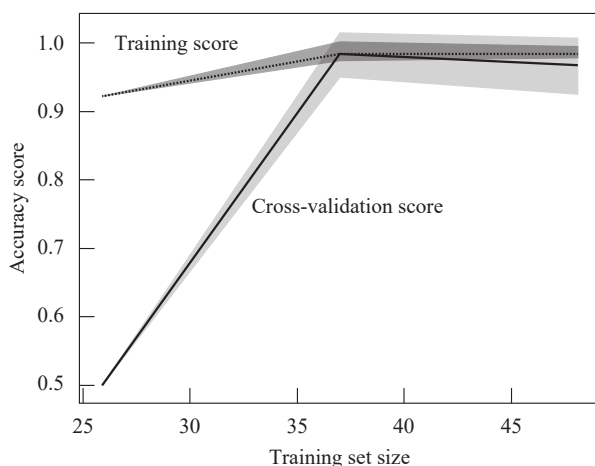


Figure 2: Learning curve

4.3 In-depth discussion and implications

Virtual Reality (VR) technology is increasingly being applied in the tourism industry to increase the attractiveness of destinations. The application of VR offers an immersive experience that can attract potential tourists, especially in tourist attractions that want to increase the number of visitors. This study shows that the application of VR technology has a significant impact on the interest in visiting Taman Apung Mas Kemambang Tourism. With logistic regression analysis reaching a Pseudo R-squared value of 1,000, it was seen that there was a strong correlation between the analysed factors and the visiting decision after the VR experience.

However, it is important to consider the risk of overfitting and the potential influence of external variables that may not be identified. These findings provide an opportunity for tourist destinations such as Taman Apung Mas Kemambang to leverage VR technology as an effective marketing tool, offer an immersive experience before a visit, and support visitors in decision-making. Further research is also suggested to explore the specific applications of VR as well as its long-term impact on tourist behaviour.

The analysis further revealed several key factors influencing interest in visiting, including gender, age, frequency of VR use, probability of visiting, and friend recommendations. The finding that friend recommendations have the greatest influence (coefficient 37.5907) emphasizes the importance of word-of-mouth marketing and referral programs in the tourism industry. This implies that marketing strategies that leverage social networks and encourage visitors to share their VR experiences can be very effective in increasing the number of visits. In addition, the frequency of VR uses positively correlated with interest in visiting suggests that increasing accessibility and opportunities to interact with VR content can be an effective strategy to increase tourist interest.

The research also revealed some interesting findings related to the influence of demographic characteristics and visitor expectations. The variation of influence based on gender and probability of visit shows the complexity in the tourist decision-making process. This suggests the need for a more differentiated approach in implementing VR technology as a marketing tool, taking into account the diversity of visitor characteristics and preferences.

Based on the overall findings, it can be concluded that VR technology has great potential as a strategic tool in increasing interest in visiting Taman Apung Mas Kemambang Tourism. The high accuracy of the model in predicting interest in visiting emphasizes the effectiveness of VR as a marketing instrument for tourist destinations. To maximize this potential, a comprehensive implementation strategy is needed that takes into account the role of word-of-mouth marketing, user experience, and the characteristics of diverse target visitors. This integrated approach is expected to optimize the impact of VR technology in increasing the number of tourist visits.

5. Conclusion

From the results of the research, it can be concluded that the implementation of Virtual Reality (VR) technology has a significant impact on the increase in tourist visit plans at Taman Apung Mas Kemambang Tourism. The immersive experience offered by VR not only introduces the beauty of the destination visually but also arouses the interest of visitors to explore further. In addition, the use of this technology can be an effective marketing strategy to attract tourists, especially in the ever-evolving digital era.

Although the study has limitations in sample size, these findings show the great potential of VR technology in promoting tourism. Therefore, it is recommended that tourist attraction managers continue to develop and implement innovative technologies such as VR to enhance the tourist experience and strengthen the attractiveness of the destination. Further research with a larger and more diverse sample is expected to provide a more comprehensive picture of the long-term effects of the use of VR in the tourism industry.

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