

EVALUATION OF TECHNOLOGY ACCEPTANCE OF AUGMENTED REALITY APPLICATIONS IN SMART NATURE TOURISM

AVALIAÇÃO DA ACEITAÇÃO TECNOLÓGICA DE APLICAÇÕES DE REALIDADE AUMENTADA NO TURISMO ECOLÓGICO INTELIGENTE

Article received on: 8/29/2025

Article accepted on: 11/28/2025

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The authors declare that there is no conflict of interest

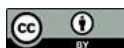
Abstract

Augmented reality technology includes digital components in real life instantly, giving innovative ways to complement experiences in different areas. Although there is an extended investigation in the educative context, the use in nature tourism has not been yet researched enough. This investigation evaluates the acceptance of RA applications in protected natural areas using the Technological Acceptance Model. The methodology combines a quantitative survey (n=120) and a focus group (n=8) in the Recreational National Area “El Boliche” in Ecuador. The findings reveal that Perceived Unity and the Attitude are the principal predictors of usage intention explaining the 58% of the variance. Also, the findings indicate that educative value, the contextual usage worries and the ludic factor are the main elements that affect the acceptance. It is confirmed that augmented reality improves considerably the experience of the relationship interpretation with traditional methods, supporting the capacity of development of touristic, intelligent and sustainable destinies. This study offers a proven methodological structure to evaluate the acceptance of augmented reality in nature tourism and highlights design considerations for educational, useful and attractive applications in nature contexts.

Resumo

A tecnologia de realidade aumentada inclui componentes digitais na vida real instantaneamente, oferecendo maneiras inovadoras de complementar experiências em diferentes áreas. Embora haja uma ampla investigação no contexto educacional, o uso no turismo de natureza ainda não foi suficientemente pesquisado. Esta investigação avalia a aceitação de aplicações de RA em áreas naturais protegidas usando o Modelo de Aceitação Tecnológica.

A metodologia combina uma pesquisa quantitativa (n=120) e um grupo focal (n=8) na Área Nacional Recreativa “El Boliche”, no Equador. Os resultados revelam que a Unidade Percebida e a Atitude são os principais preditores da intenção de uso, explicando 58% da variação. Além disso, os resultados indicam que o valor educacional, as preocupações com o uso contextual e o fator lúdico são os principais elementos que afetam a aceitação. Confirma-se que a realidade aumentada melhora consideravelmente a experiência da interpretação da relação com os métodos tradicionais, apoiando a capacidade de desenvolvimento de destinos turísticos, inteligentes e sustentáveis. Este estudo oferece uma estrutura metodológica comprovada para avaliar a aceitação da realidade aumentada no turismo de natureza e destaca considerações de



Keywords: Augmented Reality. Smart Tourism. Technological Acceptance Model. Quantitative. Acceptance.

design para aplicações educacionais, úteis e atraentes em contextos naturais.

Palavras-chave: Realidade Aumentada. Turismo Inteligente. Modelo de Aceitação Tecnológica. Quantitativo. Aceitação.

1 INTRODUCTION

The tourism is defined as a phenomenon that is produced when one person or more travel to different places from the habitual residence place for a period longer than 24 hours and less than 180 days, which makes people looking for unique experiences adjusted to their preferences just to interact around and participate in recreative activities that new experiences provide (Huertas, Pilco, Suárez, Salgado, & Jiménez, 2020).

Developed countries are societies that receive visitors and also have a diversity of natural resources on their coasts, mountains, woods and forest, ergo, in the landscape of each region. Developed countries are industrialized societies and have a big financial resource, tourists' sources and potentially interested travelers (touristic demand) (Aguilar, Muñoz, & Ortiz, 2015) .

It can be seen that thinking of colonialism is still maintained in many aspects today, due to the concept, from which it originates; therefore, world organizations highlight tourism as an essential source of income.

The United Nations Tourism highlights the changes produced in the management, the consumption and the diffusion of information as a result of the advances and combination of various technologies such as the informatic and communication systems, digital platforms, social media, global positioning thinking, mobile and wireless technologies, etc (UNWTO, 2018).

It is important to evidence that informatic systems have represented a deep change and in some areas are the reason for multiple transformations that are beneficial to the economy.

Tourism has the potential to create employment opportunities and to act as the key source of financial incomes in a territory or country. Till now, has played an important role in the socioeconomic advance of Ecuador, promoting the economic progress and being a national source of development, in accordance with the objectives established in the "Plan Nacional de Desarrollo para el Buen Vivir" (Cobeña, 2018). Tourism can boost

the economy in Ecuador and in any other country seeking to promote biodiversity, for it to develop effectively as a source of income, it is imperative to respect nature and keep the balance with tourists.

Sustainability has emerged as an essential strategy to boost tourism around the world, talking about the necessity of reducing the adverse effects in the environment, protecting natural resources and improving the economic and social wellness of nearby communities (Glionna, 2019). As it is mentioned, it is important to maintain a clear focus on the relevance of tourism, but especially in creating techniques that don't affect the environment.

Provide a technological application that allows promotion of tourism is not a guarantee of its adoption, the lack of knowledge of the technological advances, for example, in Riobamba, city of Ecuador, (Morales, 2015) created a technological application with augmented reality that shows technological advances are not used for tourism in the locality because there aren't applications with that objective.

That's why the integration of new technologies such as augmented reality (AR) in smart nature tourism has changed the way travelers interact with the environment, offering innovative and personalized experiences. AR is everyday more popular in the educational field and the results of investigations suggest a better effectiveness in visualization capabilities, which explains its common use as an educational resource (Dayana Farzeeha Ali, 2021).

This advance, proven in education and commerce, is changing into an important tool to improve sustainable and attractive tourism. Nevertheless, the way in which recipients accept and use AR applications play a crucial role in the effective implementation within the tourism sector. Therefore, is essential to assess technology acceptance. The Technology Acceptance Model (TAM) has been proposed as a robust and widely recognized framework for understanding and predicting user responses to technological advances. TAM revolves around two fundamental beliefs that influence a person's decision to interact with a system. Basically, TAM is based on the notion of two essential beliefs that determine an individual's decision regarding the use system (Abdallahman Elshafey, 2020).

To analyze this situation properly, in this investigation TAM is implemented (Davis, 1989) to develop this model based on the theory of the action of reason (TRA) (Ajzen & Fishbein, 1980) , it is important to consider that TAM was created especially to

know how users accept information systems. Also, it should be noted that this methodology evaluates some important points about facilities of use, usefulness, attitude and intention of use to verify what the user wants in relation to the use of the system.

This study recommends using TAM to evaluate how users adopt AR applications in the field of smart ecotourism, providing a new and complete perspective about the factors that influence travelers' willingness to integrate these innovative technological proposals.

By involving specific contextual variables of the smart touristic field, the aim is also to contribute value knowledge for development of more effective applications adapted to user's necessity, aligned with recent empirical approaches presented in academic literature (Dayana Farzeeha Ali, 2021).

2 METHODOLOGY

This study involves a practical research with a mixed methodology, following the categorization of (Roberto Hernández Sampieri, 2014), who point out the explanatory research aims to discover the reasons for events by identifying cause-and-effect. Similarly, the authors say this study can start as explanatory, go through descriptive and finally be explanatory or can fusion the descriptive and explanatory phases (Roberto Hernández Sampieri, 2014).

In this case, the research conducted is both descriptive and explanatory. It is descriptive because it measures and describes user feedback on augmented reality (AR) applications within the context of smart nature tourism, evaluating different perspectives such as perceived usefulness, ease of use, attitude toward use, and behavioral use intention. Similarly, it is explanatory because it seeks to test the theoretical model of technology acceptance in order to establish the causal relationship between these factors and the final use intention. This study revolves around the Technology Acceptance Model (TAM), which has been widely applied to assess how users adopt various technologies..

2.1 Population and sample

The population consists of tourists visiting the “El Boliche” National Recreation Area in the Cotopaxi province of Ecuador. The number of visitors for 2025 could not be

determined; however, it is known that 2,116 tourists visited this natural area during the Christmas holiday period in 2017 (Cotopaxi Noticias, 2018). Furthermore, it is known that more than 300,000 people visited protected areas in Ecuador that same year (El Comercio, 2017).

The lack of annual statistics on the number of visitors to El Boliche hinders a complete assessment of its importance in the tourism sector. Given the difficulty of creating a probabilistic sampling framework, a convenience sampling approach was suggested. This approach involves selecting individuals whom the researcher can easily access for inclusion in the sample. Convenience stems from the fact that these subjects are easier for researchers to study, whether due to their location, familiarity, or other factors (Stewart, 2025). The sample inclusion criteria are presented in Table 1.

Table 1

Sample Inclusion Criteria by Convenience.

Criteria	Justification	Theoretical Basis
Focus Group: University Students.		
Related fields of study (Tourism, etc.)	It confirms that participants possess background knowledge that enriches the discussion, offering technical, ecological, and tourism management perspectives on the use of Augmented Reality	Focus Group Technique Theoretical-Practical Elements [15].
Sample by Convenience: Tourists		
Over 18 years old	It ensures that proper informed consent is obtained and reduces bias due to variations in cognitive abilities when using technology, as children	Ethics in research (Organic Law on the Protection of Personal Data, Ecuador).

	may need help.	
Previous use of mobile applications	Ensure that participants possess basic skills to avoid biases due to a lack of technological knowledge.	UX studies in AR [16]
Willingness to try the app during the visit	It ensures that the information reflects real use and makes it possible to assess the incorporation of AR into a genuine tourist experience.	In situ assessment methodologies [17]

The non-probability sampling method used consisted of 200 visitors surveyed on weekends, when tourist traffic is highest. This sample size is considered appropriate for conducting inferential statistical analyses (Joseph F. Hair Jr., 2018).

Similarly, in the qualitative phase, a focus group was conducted with eight people (students enrolled in the Tourism program at the Technical University of Cotopaxi) selected through purposive sampling. The objective of purposive sampling is to focus on a specific group of people to gain a deeper understanding of the distinctive or varied aspects within a culture or situation (Stewart, 2025). This type of sampling ensures informed and relevant discussions for the study's objectives.

2.2 Research question

The current research focuses primarily on evaluating the level of technological acceptance of augmented reality applications by tourists in protected natural areas. To achieve this objective, the essential elements of the Technology Acceptance Model (TAM) are examined: perceived utility (PU), perceived ease of use (PEU), attitude toward use (A), and intention to use (BI). Consequently, the following research question is proposed:

How do the constructs of Perceived Utility (PU), Perceived Ease of Use (PEU), and Attitude toward Use (AT) from the TAM model predict the Behavioral Intention to Use (BI) of an Augmented Reality application among tourists in the "El Boliche" National Recreation Area?

2.3 Operationalization of Variables

The process of operationalizing variables involves categorizing or recognizing data based on their characteristics of the study, which can be organized in an orderly fashion in rows and columns (Arias, 2021).

Table 2 presents the elements that make up the TAM, showing the variables considered, the components of the evaluation instrument, and the statistical analysis methods that were applied.

Table 2

Operationalization of the TAM Model Variables.

Construct	Type of Variable	Indicator Variable / Measurement Item	Measurement Scale	Analysis Method
Perceived Ease of Use (PEOU)	Independent Variable	PEOU 1: I think learning to use the AR app would be easy for me. PEOU 2: My interaction with the AR app would be clear and understandable. PEOU 3: I would find the AR app flexible to interact with.	Likert Scale	Descriptive Analysis: Means (M) and Standard Deviations (SD) for each item and construct. Inferential Analysis: Confirmatory Factor Analysis (CFA) for validity, Cronbach's alpha for reliability, and Structural Equation Modeling (SEM) to test

			hypotheses
Perceived Utility (PU)	Independent Variable	<p>PU1: Using the AR app would allow me to learn more about the natural heritage of "El Boliche" more quickly.</p> <p>PU2: The AR app would improve my tourist experience in the natural area.</p> <p>PU3: I would find the AR app useful during my visit.</p>	Likert Scale
Attitude Towards Use (AT)	Intermediary /Dependent Variable	<p>AT1: Using an AR app for nature tourism seems like a good idea to me.</p> <p>AT2: The idea of using an AR app in "El Boliche" seems appealing to me.</p> <p>AT3: I have a favorable attitude toward the use of AR in this context.</p>	Likert Scale
Behavioral Use	Principal/Dependent Variable	<p>BI1: If I had access to the app,</p>	Likert Scale

Intention (BI)		I would intend to use it during my visit to "El Boliche". BI2: I plan to use the AR app on future visits to similar natural areas. BI3: I will likely recommend this app to others.		
Qualitative Data (Focus Group)	In-depth Data	Emerging themes: Perceptions of barriers, facilitating factors, suggestions for improvement, and a deeper understanding of the reasons behind quantitative scores.	Semi-structured focus group script	Thematic Content Analysis: Transcription, coding, identification of categories and recurring themes to triangulate and enrich the quantitative findings.

According to the TAM model (Silva, 2015), this study posits that Perceived Ease of Use (PEOU) and Perceived Utility (PU) are the independent variables. Attitude Toward Use (AT) acts as a bridge, as it is affected by the other two.

Ultimately, the main variable is behavioral intention (BI), given that the objective is to clarify and predict this variable through the direct effects of perceived utility and attitude, as well as through the indirect effect of perceived ease of use.

3 RESULTS

The results of this study are presented in two main sections, which reflect the comprehensive strategy adopted for the chosen methodological design. The first part examines the quantitative analysis of the survey, aimed at answering how the elements of the Technology Acceptance Model impact the desire to use the application. The second section presents the qualitative analysis of the focus group, with the objective of comparing the statistical results obtained and analyzing in greater detail the opinions, obstacles, and environmental elements that influence technology acceptance (Fabián Darío Rodas Pacheco, 2020).

3.1 Quantitative data analysis

3.1.1. Descriptive statistics and reliability

A descriptive study of the elements and concepts of the TAM model was conducted to analyze general trends in participants' responses. To understand the internal reliability of each question, it was evaluated using Cronbach's alpha. This index determines whether the questions within the same group are addressing the same issue. If they all focus on the same area, this means they are evaluating the same concept. An appropriate range is often considered to be between 0.7 and 0.9. However, some sources suggest that a minimum value of 0.6 can also be considered "acceptable" (Roco-Videla, 2024).

Table 3 presents the four elements of the TAM model, demonstrating excellent internal consistency. The Cronbach's alpha values range from 0.88 to 0.91, which means they are significantly above all acceptable minimum levels. Specifically:

Perceived usefulness (PU) and behavioral use intention (BI) show "excellent" reliability ($\alpha > 0.90$), while Perceived ease of use (PEOU) and attitude toward use (AT) show "good" reliability ($\alpha > 0.80$), very close to excellent.

This strongly demonstrates that the questions formulated to measure each factor of the TAM methodology are highly consistent with each other and accurately and consistently assess the theoretical concept they are intended to evaluate, validating the robustness of the measurement instrument used.

Table 3*Descriptive Statistics and Reliability of the TAM Constructs (N=200).*

Construct	N ^o of Items	Average	Standard Deviation	Cronbach's Alpha
Perceived Ease of Use (PEOU)	3	4.25	0.61	0.89
Perceived Utility (PU)	3	4.40	0.55	0.91
Attitude Towards Use (AT)	3	4.32	0.59	0.88
Behavioral Use Intention (BI)	3	4.15	0.72	0.90

To interpret these results, it is necessary to remember that the responses were obtained using the 5-point Likert scale (where 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly agree). The choice of this response format is supported because it helps to reliably measure attitudes and perceptions; (Ankur Joshi, 2015) states that Likert scales are widely used in survey research and are reliable measurement tools.

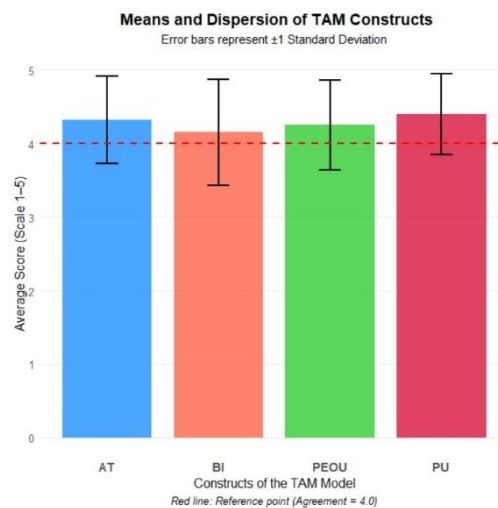
Figure 1*Means and Dispersion of the TAM Constructs.*

Figure 1 shows the mean scores for the four constructs of the TAM model. The error bars (black vertical lines) indicate ± 1 standard deviation, demonstrating the small

variation in responses and supporting the consensus among participants. All means are above the acceptance level of 4.0 (identified by the dotted red line), with Perceived Utility (PU) being the highest-rated construct.

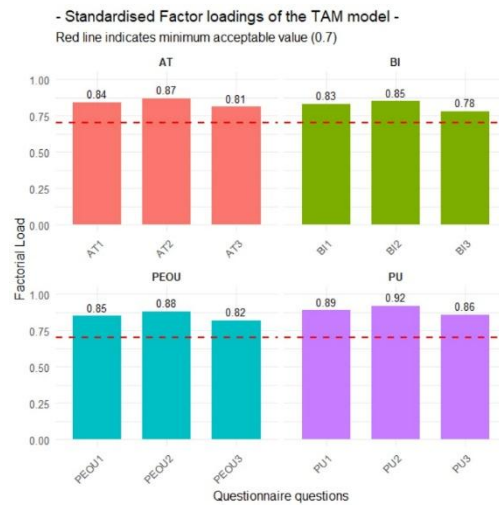
3.1.2 Confirmation factor analysis

A confirmatory factor analysis (CFA) was performed using RStudio and the lavaan package to verify the framework of the measurement tool. (Martínez Ávila, 2022) indicates that confirmatory factor analysis evaluates the measurement model to ensure its reliability and validity, and then estimates the structural model, aligning it with the research model.

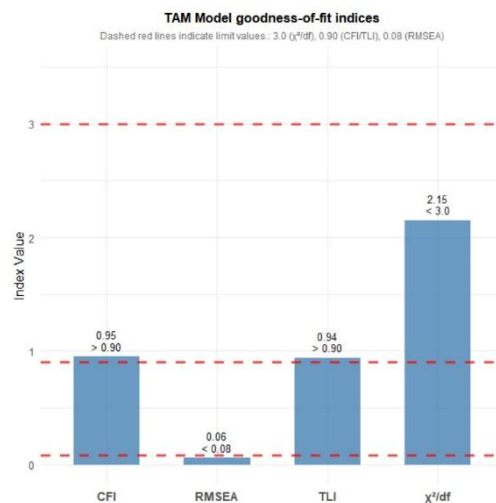
In this study, the CFA confirms that the questionnaire items effectively group into the four constructs of the TAM model (PEOU, PU, AT, BI) and that each item specifically and reliably measures its corresponding construct, thus ensuring the psychometric soundness necessary for the subsequent structural analysis.

The standardized factor loadings for each item exceeded the critical threshold of 0.7 suggested by (Joseph F. Hair Jr., 2018), ranging from 0.78 to 0.92. Most importantly, all these loadings were statistically significant ($\rho < 0.001$). When the p-value falls below the predetermined significance level (*e. g.*, 0.05 or 0.01), the null hypothesis is rejected, leading to the conclusion that the observed relationship is genuine and not merely random. In this context, applying such rigorous standards strengthens the credibility of the connections observed between the items and the theoretical concepts to which they are linked.

This demonstrates the effectiveness of the questions in measuring what is required. For example, a loading of 0.85 means that approximately 72% of the item's variability (0.85^2) is attributed to the construct, while the remainder is related to errors or factors not considered. (Tavakol, 2020) indicates that squaring yields factor loadings, which represent the proportion of variance explained by the factor. Overall, Figure 2 shows strong and consistent loadings in the indicators corresponding to each construct.

Figure 2*Factor loading chart.*

On the other hand, to understand the AFC, the goodness of fit index was calculated and it was determined that these really meet the acceptability criteria established in the literature (Grubert et al., 2022), which validates that the four-factor model fits the data well.

Figure 3*Goodness of Fit Chart.*

Note:

χ^2/df = Chi-square/degrees of freedom (acceptable if < 3.0);

CFI = Comparative Fit Index (acceptable if > 0.90);

TLI = Tucker-Lewis Index (acceptable if > 0.90);

RMSEA = Root Mean Square Error of Approximation (acceptable if < 0.08).

Figure 3 shows the four main indices used to analyze the adequacy of the TAM measurement model. All values fall within the suggested ranges: the $\chi^2/df(2.15)$ is below 3.0, the CFI (0.95) and TLI (0.94) exceed 0.90, and the RMSEA (0.06) is less than 0.08. Taken together, these findings suggest that the proposed four-factor structure fits the data well.

3.1.3. Hypothesis testing using structural equation modelling (SEM).

To test the causal relationships proposed by the TAM model, the structural model was analyzed using structural equation modeling.

Structural equation of the TAM Model:

- $PU = \beta_1PEOU + \zeta_1$
- $AT = \beta_2PEOU + \beta_3PU + \zeta_2$
- $BI = \beta_4PU + \beta_5AT + \zeta_3$

Where β represents the standardized path coefficients and ζ error terms.

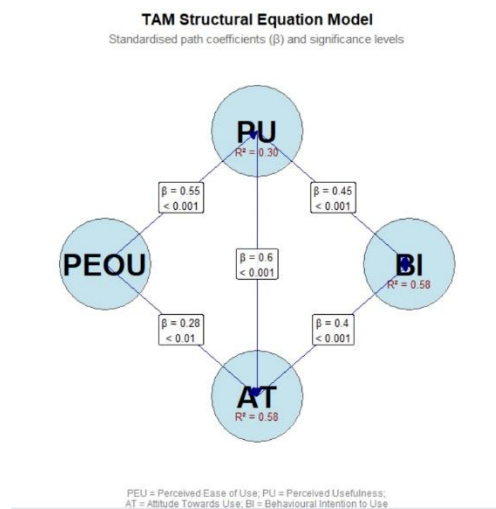
Table 4

Results of the Hypothesis Testing of the TAM Model (N=200).

Hyphotesis	Relation	Coefficie nt Path β	Probability / significanc e level
H1	PEOU \rightarrow PU	0.55	< 0.001
H2	PEOU \rightarrow AT	0.28	< 0.01
H3	PU \rightarrow AT	0.60	< 0.001
H4	PU \rightarrow BI	0.45	< 0.001
H5	AT \rightarrow BI	0.40	< 0.001

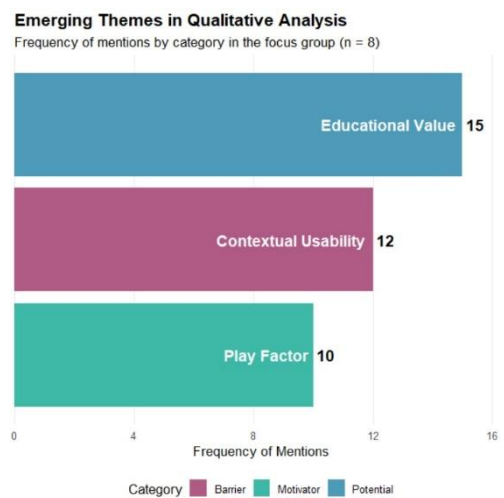
The model explains the following variance proportions:

- $R^2 PU = 0.30$ (30% variance in Perceived Utility)
- $R^2 AT = 0.58$ (58% variance in Attitude)
- $R^2 BI = 0.5$ (58% variance in Intention to Use).

Figure 4*TAM structural equation model.*

According to Table 4 and Figure 4, structural equation modeling (SEM) confirmed that Perceived Ease of Use (PEOU) directly influences Perceived Usefulness (PU) ($\beta = 0.55, p < 0.001$). Furthermore, both PEOU ($\beta = 0.28, p < 0.01$) and PU ($\beta = 0.60, p < 0.001$) have a significant effect on Attitude Toward Use (AT). In turn, PU ($\beta = 0.45, p < 0.001$) and AT ($\beta = 0.40, p < 0.001$) account for 58% of the variation in Intention to Use (BI), demonstrating a high degree of predictive power of the model. Taken together, these findings support the validity of TAM for understanding the acceptance of Augmented Reality applications in nature tourism scenarios, highlighting that Ease of Use impacts Intention mainly through Perceived Utility.

Figure 5 highlights the three main themes that emerged, which structure the participants' perceptions.

Figure 5*Emerging themes of qualitative analysis.*

Representative quotes:

1. It's not just about seeing a tree, it's about understanding its role in the ecosystem.
2. Concerns about screen brightness and battery consumption.
3. I would use it out of curiosity, like a modern treasure hunt.

Educational Value as an Amplifier of Perceived Usefulness (PU): With 15 mentions, this was the most recurring theme. Respondents indicated that AR not only increases effectiveness but also facilitates a better understanding of information, offering more details to comprehend and deepen reasoning. The quote "It's not just seeing a tree, it's understanding its role in the ecosystem" demonstrates that PU goes far beyond simply being useful, providing benefits by offering value in both education and experience.

- Contextual Barriers to Perceived Ease of Use (PEOU): Although research indicated a high PEOU, qualitative analysis of 12 mentions revealed specific limitations, such as low screen brightness and battery consumption, thus affecting the experience in real-world situations. This suggests that evaluating PEOU in general may not accurately reflect the problems that arise in specific situations.
- Playfulness as a Key Motivator: With 10 mentions, this aspect stands out as an independent factor that enhances the intention to use the AR, in addition to its conventional perceived usefulness. Survey participants indicated that presenting something fun and sparking intrigue increases the appeal of AR, suggesting that personal satisfaction is key to its greater impact.

In summary, qualitative triangulation supports the quantitative results, perceived usefulness increases due to its educational importance, perceived ease of use depends on its environment, and the attitude of use is linked to the recreational element, thus providing clear guidelines for developing and incorporating AR within the nature tourism sector.

4 DISCUSSION

In this research, the Technology Acceptance Model (TAM) was applied to examine travelers' attitudes toward the incorporation of Augmented Reality (AR) applications in the "El Boliche" National Recreation Area. The results obtained indicate that the TAM model has a strong predictive capacity, explaining 58% of the variability in Behavioral Use Intention (BI). This supports its viability for implementation in emerging technologies such as smart tourism. This finding is important considering that several applications currently adopt the augmented reality approach, especially in educational and entertainment fields, but its use in nature tourism is still limited and underexplored, particularly in remote regions of Latin America where both technological and digital infrastructure are still in their initial stages (Dayana Farzeeha Ali, 2021).

The most notable predictor of use intention ($\beta = 0.45$; $p < 0.001$) was the Perceived Utility (PU) construct.

Tourists perceive an improvement in their experience when information is made more accessible and their understanding of the natural heritage is deepened. This finding aligns with previous research that emphasizes the importance of information and the enhanced experience as motivations for adopting AR in heritage sites (N. Chung, 2015). Qualitative data supports this assertion, indicating that AR introduces an educational element that strengthens the connection with the environment.

Perceived Ease of Use (PEOU) proved to be important, although its influence on usage intention was largely indirect, mediated through User Performance (UP) and Attitude (AT) ($\beta = 0.55$; $p < 0.001$). Participants noted contextual obstacles such as screen brightness and battery consumption, suggesting that PEOU in natural environments should consider interaction with the physical environment, beyond just the application interface (T. Jung, 2015).

Attitude Toward Use (AT) emerged as an intermediary between users' thoughts and their intentions to act. Participants highlighted the entertaining and original aspects of AR, demonstrating that the desire for enjoyment acts as an independent driver that adds to the actual benefit. This expands the classic understanding of the Theory of Attitude (TAM) in recreational situations (E. E. Cranmer, 2020). To promote the use of AR in natural settings, it is essential to emphasize its educational and experiential value, ensure that interfaces are user-friendly and function well outdoors, and incorporate gamified elements to increase engagement. Future research could replicate the study in different locations, evaluate moderating variables, and validate the intent to use through functional prototypes, integrating extended TAM models and user-centered design.

5 CONCLUSION

The presented research project evaluated the acceptance of Augmented Reality (AR) applications in the nature tourism sector, implementing the Technology Acceptance Model (TAM), and validated its predictive capacity in this context. The results obtained explain that tourists have a strong intention to use this technology, motivated primarily by its Perceived Usefulness (PU) as an educational resource that enhances the experience, and supported by a favorable Attitude (AT) influenced by its playful and novel aspects.

Therefore, the research indicates that in places like the "El Boliche" National Recreation Area, Augmented Reality is seen as a relevant tool for enriching the visitor experience, rather than simply being a technological add-on. The close relationship between Perceived Ease of Use and Perceived Usefulness highlights the need for accessible design, although the qualitative analysis points to significant contextual obstacles, such as screen brightness and energy consumption, which must be considered to ensure effective usability in outdoor environments. Therefore, this research presents parameters for implementing AR in ecotourism: emphasizing its educational and experiential value, ensuring its usefulness in outdoor spaces, and incorporating playful aspects that generate interest and entertainment.

The mixed-methods approach employed, combining quantitative and qualitative analysis using the TAM methodology, unites a solid statistical foundation with an in-depth interpretation of the focus groups. Furthermore, augmented reality emerges as an effective alternative to overcome infrastructure deficiencies, enrich the tourist experience,

strengthen the connection with natural heritage, and promote little-known smart, educational, and sustainable destinations.

ACKNOWLEDGEMENTS

Optional section, where the author can thank the funding agencies, or other applicable thank you.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Iza, J. P. Q., Moreta, J. E. T., & Collaguazo, L. R. Q. EVALUATION OF TECHNOLOGY ACCEPTANCE OF AUGMENTED REALITY APPLICATIONS IN SMART NATURE TOURISM. *Veredas Do Direito*, e234238. <https://doi.org/10.18623/rvd.v23.n2.4238>