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Research on Digital Technology, Brain-Computer Interface Technology, and Willingness to Purchase Travel Experience Quality Insurance

Cheng Zhang [1,2], Ting Zhang [3*], Weiwei Guan[4], Jiale Guan he [5], Jie Zhang[3]

[1]*Econ & Management Sch, Wuhan Univ, Wuhan, Hubei, Peoples R China*
[2]*Wuhan Univ, Ningbo Natl Inst Insurance Dev NIID, Ningbo, Peoples R China*
[3]*Econ & Management Sch, Wuhan Railway Vocational College of Technology, Wuhan, Hubei, Peoples R China*
[4]*China Yangtze Power Co., Ltd, Hubei, Peoples R China*
[5]*Sports Medicine Sch, Wuhan Sport Univ, Wuhan, Hubei, Peoples R China*
[*]*Corresponding Author's Email: zhangting0742@126.com*

Abstract: Based on tourists' concerns regarding the quality and trustworthiness of technology-related effects on travel experience insurance, this study employs experimental methods and Logit regression analysis. The research is conducted in two stages: pre- and post-application of digital technology. Tourists visiting Ningbo Tianyi Pavilion are selected as the research sample. Brain-computer interface technology is utilized to quantitatively measure real-time attention levels and travel experience quality among tourists. By visualizing travel experience quality based on attention levels, this study examines the relationship between digital technology, brain-computer interface technology, and willingness to purchase travel experience insurance from a technological application risk perspective. The findings demonstrate that: (1) Digital technology enhances tourists' attention, thereby improving the quality of their travel experience and positively influencing their inclination to purchase insurance for travel experience quality. Moreover, digital technology can serve as a means of ensuring the quality of purchased travel experience insurance. (2) The utilization of brain-computer interface technology can significantly enhance the inclination to procure insurance for travel experience quality. Brain-computer interface technology offers a reliable guarantee for the acquisition of travel experience quality insurance. This study provides a crucial foundation and practical conditions for investigating the implementation of travel experience quality insurance, offering valuable insights into how technology-enabled insurance can effectively incorporate third-party oversight within the tourism industry.

Keywords: Digital technology; Brain-computer interface technology; Quality of tourist experience; Willingness to purchase insurance; Logit regression analysis method

1. INTRODUCTION

Despite the extensive implementation of digital technologies in the tourism industry, such as virtual reality (VR), augmented reality (AR), holographic projection, digital cultural creativity, and 3D artifacts, which significantly enhance the quality of tourists' travel experiences [1]. However, due to the intangible and non-physical nature of travel experiences' quality, which falls under the category of "soft services," it becomes challenging to quantify them in real-time [2]. Consequently, tourists face widespread difficulties in ensuring the quality of their travel experiences. A review of existing travel insurance policies reveals that their coverage primarily focuses on physical risks, such as property loss and accidents during the travel process [3]. However, there is a lack of coverage for non-physical risks associated with the quality of travel experiences. Assuming the existence of an insurance policy that leverages cutting-edge technologies to offer third-party supervision and real-time quantification of the quality of travel experiences, it can ensure the quality of a tourist's travel experience and provide risk coverage for the quality of travel experiences under the application of digital technologies. The question at hand is whether this would enhance tourists' inclination to purchase insurance for their travel experience quality.

Based on the aforementioned concerns, the empirical investigation conducted in this study reveals that, with the implementation of digital technologies, 59.2% of tourists perceive purchasing insurance as imperative for ensuring the quality of their travel experiences. Nevertheless, there exist two primary reservations regarding the technological efficacy of insurance companies in quantifying and guaranteeing such quality. Firstly, how can insurance companies ensure the improvement of tourists' travel experience quality through digital technologies? Secondly, how can insurance companies utilize technological means to present digital visualization when quantifying the quality of travel experiences, thereby increasing trust in the insurance coverage? The application of digital technology has been proven to significantly enhance tourists' attention, thereby improving the quality of their travel experiences [4]. Furthermore, with the continuous advancement and widespread adoption of brain-computer interface (BCI) technology, particularly through portable EEG devices, there is ample research evidence suggesting the potential of BCI technology in detecting and enhancing individual attention [5]. As a result, this offers technological possibilities for real-time

quantification of tourists' attention and visualization of their travel experience quality.

The focus of this study is on the technological risks associated with purchasing travel experience quality insurance under the application of digital technology, considering two major concerns of tourists: the purchase process and the development of digital technology and brain-computer interface technology. Specifically, it aims to enhance technological risk assurance and examine its impact on willingness to purchase travel experience quality insurance. Therefore, this paper employs experimental methodologies and Logit regression analysis to categorize the study into two phases: pre and post implementation of digital technology. It utilizes brain-computer interface technology to quantitatively assess tourists' attention and real-time travel experience quality. By visualizing tourists' attention, the research aims to investigate the correlation between digital technology, brain-computer interface technology, and the inclination towards purchasing travel experience quality insurance. This investigation offers a reference point and establishes feasibility for further exploration and advancement of travel experience quality insurance. Additionally, it strives to enhance the attractiveness of insurance products and services in the tourism industry while promoting its integration within the industry.

2. VARIABLES INVOLVED IN THE STUDY

2.1 Travel experience quality

Due to the absence of a standardized concept of travel experience quality [6], this study adopts the prevailing perspective advocated by scholar Ma Tian, which recognizes travel experience quality as an assessment of the level of excellence or inferiority in one's travel experiences. The measurement of travel experience quality involves evaluating the accumulated emotions experienced by tourists.

Currently, there is a wealth of research focused on the directness, immediacy, and accuracy of measuring participants' emotions from a psychological perspective. From the perspective of psychological physiological reactions, the method of measuring physiological arousal, exemplified by electroencephalography (EEG), is deemed more reliable and capable of yielding accurate results [7]. Meanwhile, with the advent of portable electroencephalogram (EEG) signal acquisition equipment and the rapid advancement of related signal processing methods, both domestic and foreign companies have made significant strides in the development and application of portable EEG devices. The portable EEG instruments produced by leading companies such as Neurosky have effectively addressed the issues associated with expensive traditional EEG equipment, complex operation, and limited suitability for professional laboratories[7]. These advancements provide crucial technical support for acquiring and processing brainwave signals to enhance tourism experience quality. The utilization of portable brainwave instruments is appropriate for assessing tourists' emotional experience based on their psychological reactions, taking into account the actual circumstances encountered by tourists during the process.

In terms of psychological responses, non-verbal self-reporting applications such as the PAD emotion model offer a wider range of application scenarios and broader scopes [8].

Although the advantages of the aforementioned two methods are evident, it does not imply an absence of limitations. Each method possesses its own inherent shortcomings. Therefore, when selecting emotional measurement methods, it is recommended to comprehensively consider both approaches in order to effectively compensate for the deficiencies of physiological reaction-based emotional measurement in psychology and psychological reaction-based emotional measurement in psychology, thereby achieving immediate and optimal emotional assessment.

The present study thus employs a comprehensive assessment of the quality of tourist experiences through two methodologies: the utilization of an electroencephalogram (EEG) and the application of the PAD emotion model.

2.2 Digital technology

The primary objective of incorporating digital technology in the tourism industry is to enhance tourists' attention and emotional experience by leveraging new technologies, thereby augmenting the capacity to deliver tourism, sightseeing, and cultural services [9]. Within the realm of tourism industry, predominant modes of expression encompass images, texts, sounds, graphics, videos, among others. Domestic scholars have discovered that video formats are more effective in capturing the attention of tourists, particularly videos with complete subtitles and keywords which have a greater impact on attention compared to videos without subtitles [5]. In consideration of practical circumstances and tourism characteristics, this study tends to select videos with full subtitles and keywords in the experimental design.

2.3 Brain-computer interface (BCI)

A brain-computer interface (BCI) refers to a direct connection established between the human or animal brain and an external device, facilitating the bidirectional exchange of information [10]. The signals for BCI are derived from the central nervous system and do not rely on the peripheral nervous and muscular systems for transmission. BCI interfaces can be classified as either invasive or non-invasive, depending on the employed methodology. The non-invasive brain-computer interface (BCI) technology, facilitated by portable EEG devices, is widely embraced and acknowledged for its excellent temporal resolution, user-friendly nature, portability, and relatively affordable cost. It finds particular application in the measurement of attention and emotion [7].

According to existing research, it can be inferred that beta waves, theta waves, and delta waves are the brainwave signals most directly associated with attention. When attention is focused, there is an increase in the power of beta waves while a decrease in the power of theta waves and delta waves occurs. Conversely, when attention is not focused, there is a reduction in the power of beta waves and an elevation in theta waves and delta waves. The following brainwave features have been extensively validated by existing research: the delta (δ) to beta (β) energy ratio, beta energy, the alpha (α) plus beta (β) to beta energy ratio, and relative delta (δ) energy. These features are closely associated with attention levels. The delta (δ) wave is the brainwave signal that exhibits the strongest correlation with emotions, showing a positive relationship. The utilization of brainwave signals for emotion measurement has gained recognition from numerous scholars due to its relatively higher reliability [11]. It has found wide applications in diverse fields such as clinical treatment, transportation, elderly care, entertainment, education, and smart wearable devices.

The key to measuring emotions using electroencephalogram (EEG) signals lies in the comprehensive organization of research findings on emotion measurement through brainwave signals, as well as the extraction of features and recognition of emotions from EEG signals [12]. Among them, signal spectral energy, power spectral density, and sample entropy are commonly utilized as EEG features for the extraction of brainwave signals in the context of EEG emotion recognition[13]. Signal spectral energy is frequently employed as one of the physiological signal features to quantify emotional fluctuations [14]. The empirical evidence derived from existing studies demonstrates that energy values can effectively differentiate between negative and positive emotions, making them suitable as brainwave features for research on emotion recognition [15]. Machine learning algorithms are predominantly employed in EEG-based emotion recognition research [15].

The application of brain-machine interface technology in this study primarily relies on portable EEG devices, which are utilized for real-time quantification and visualization of tourists' attention levels, as well as the instantaneous assessment of the quality of their travel experiences.

2.4 Desire to procure insurance for enhancing the quality of travel experiences.

The willingness to purchase refers to the consumer's inclination towards acquiring a specific product or service. It represents a psychological evaluation of whether or not to proceed with a purchase after consumers have gathered and processed information, and can be utilized for predicting consumer buying behavior. In this study, the willingness to purchase travel experience quality insurance is defined as the inclination towards obtaining assurance for the quality of travel experiences

3 THE ANALYSIS OF HYPOTHESIS MODELS

3.1 The impact of digital technology on the inclination to acquire insurance for travel experience quality

The primary purpose of utilizing digital technology in the purchase of travel experience quality insurance is to ensure quality, as illustrated in Figure 1. Previous research has demonstrated that the utilization of digital technology can enhance the quality of travel experiences by augmenting tourists' attention. Specifically, digital technology optimizes the presentation formats of travel products, stimulating tourists' senses and capturing their attention effectively [16]. Furthermore, digital technology reinforces both virtual and real experiences as well as immersive encounters, thereby prolonging tourists' attention span [17].

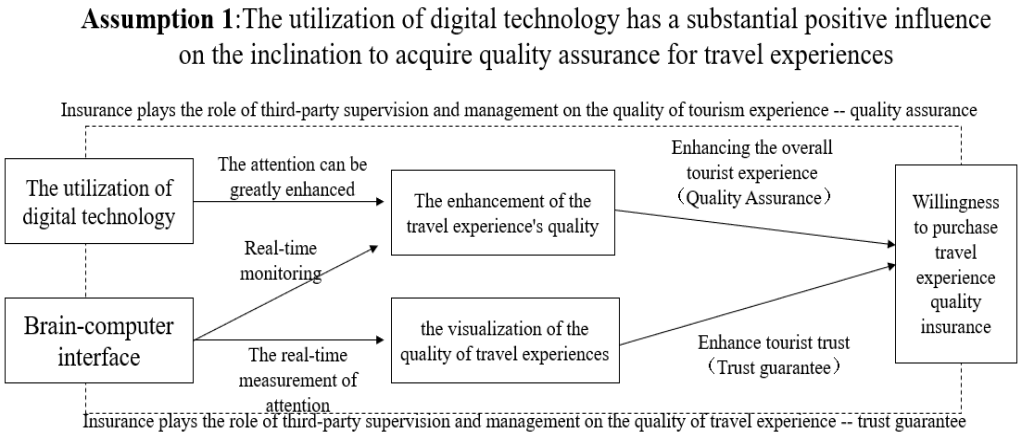

Figure 1 Model assumption

Meanwhile, numerous scholars have empirically demonstrated that the enhancement of tourists' attention exerts a significant positive impact on the quality of travel experiences from the perspectives of environmental development in tourist attractions, individual behavioral characteristics of tourists, and the interaction between tourists and tourist attractions [18]. The exhibits that are renowned, of substantial size, and visually captivating have a greater propensity to captivate the attention of tourists, thereby enhancing the overall quality of their travel experiences [19]. The implementation of digital technology in museums has a significant impact on audience attention and sensory stimulation, leading to increased concentration and improved quality of travel experiences for tourists. As such, the technological assurance provided by digital technology may increase tourists' willingness to purchase travel experience quality insurance [20]. In line with the research findings of scholars like Wang Yuanyuan (2016), the inadequate integration of digital technology and insurance products emerges as a significant factor impeding enterprises' inclination to procure insurance coverage [21].

Therefore, we propose hypothesis 1: Digital technology, by enhancing attention and thereby improving the quality of travel experiences, exerts a significant positive impact on individuals' willingness to purchase insurance for travel experience quality.

3.2 The impact of brain-computer interface on the inclination to acquire insurance for travel experience quality

The brain-computer interface serves two primary functions in influencing the willingness to purchase travel experience quality insurance. Firstly, it enables the quantitative real-time measurement of tourists' attention, visually and accurately presenting it to them. This enhances their trust in travel experience quality insurance by providing a sense of trust guarantee [20]. The findings of other scholars' studies have also indicated that the utilization of technology to enhance the transparency of insurance transaction information and services can significantly augment individuals' inclination to purchase insurance [22]. The utilization of blockchain technology can significantly enhance consumers' willingness to purchase insurance by mitigating the issue of information asymmetry and establishing an efficient trust mechanism [23]. Secondly, the brain-computer interface allows for instant assessment of tourists' travel experience quality, offering empirical evidence for ensuring digital technology's quality assurance in travel experiences [24]. By instilling trust regarding tourists' travel experience quality, the brain-computer interface has the potential to increase their inclination towards purchasing travel experience quality insurance.

Therefore, hypothesis 2 is proposed: The implementation of a Brain-Computer Interface (BCI) has the potential to significantly enhance tourists' trust and increase their willingness to purchase travel experience quality insurance through real-time visualization of their attention.

The research focuses on digital technology, brain-computer interface technology, and the willingness to purchase insurance for tourism experience quality. It aims to internalize insurance in the tourism industry by shifting its role from post-event compensation to pre-event risk prevention, in-event control, and post-event management. By combining "technology + third-party professional services + insurance," this approach enhances the supervisory and trust roles of tourism experience quality,

thereby improving transaction credibility and transparency of tourism experience quality insurance and strengthening the willingness to purchase it. The specific manifestations are as follows: On one hand, insurance companies leverage digital technology to enhance tourists' attention and provide quality guarantees for purchasing tourism experience insurance. On the other hand, they utilize brain-computer interface technology to visualize tourists' attention, thereby increasing transparency in insurance transaction information and product services, which ensures trust when purchasing tourism experience insurance.

4 EXPERIMENTAL DESIGN

4.1 Experiment time

The experiment is scheduled for the period of July to August 2022, which coincides with the peak of summer when scorching weather prevails, potentially causing irritability and difficulties in concentration among individuals. If the experiment yields valid results amidst these relatively unfavorable conditions during this time frame, it is highly likely to exhibit even greater effectiveness in other months.

4.2 Experimental Location

The Tianyi Ge Museum in Ningbo City (5A) is a specialized museum dedicated to book culture. It falls under the category of cultural themed tourist attractions and carries a significant risk of impacting the overall quality of the tourist experience. Therefore, it serves as an exemplary case for studying the relationship between digital technology, brain-computer interfaces, and the willingness to purchase travel experience quality insurance. Within the entire Tianyi Ge Museum, there is only one designated area for digital technology applications - the "Tianyi Ge Documentary" screening room located near the exit. The rest of the museum primarily focuses on sightseeing tours. The screening room accommodates a total of 9 seats but lacks air conditioning. Hence, this study selects the "Tianyi Ge Documentary" screening room as its experimental location. The experimental material used is a video titled "Tianyi Ge Documentary," with an approximate duration of 15 minutes. The video predominantly portrays a somber tone and delves into depicting comprehensively Tianyi Ge's establishment, prosperity, and decline - all closely intertwined with modern Chinese history.

4.3 Experimental Subjects

Translation: According to the requirements of psychological experiments, a sample size of more than 30 subjects is considered a large sample. In this experiment, a convenience sampling method was used, and a total of 42 tourists were recruited. The experimental subjects were primarily female, accounting for 73.8%, while males accounted for 26.2%. The age range was between 15 and 50 years old, with the main concentration in the age groups of 15-18, 26-35, and 36-45, accounting for 28.6%, 23.8%, and 23.8% respectively. In terms of education, the majority had a master's degree or above, followed by junior high school or below, and then a bachelor's degree, accounting for 31%, 19%, and 19% respectively. Associate degrees accounted for 16.7%, and high school accounted for 14.3%. In terms of occupation, students accounted for the majority, reaching 40.5%, followed by personnel engaged in public institutions, accounting for 21.4%, with company employees and freelancers both accounting for 11.9%, and others were negligible. In terms of income distribution, the majority had an income below 1,000 yuan, accounting for 38.1%, followed by an income above 10,000 yuan, accounting for 35.7%, with 5,000 to 10,000 yuan coming next, accounting for 14.3%, and finally, 1,000 to 5,000 yuan, accounting for 11.9%.

4.4 Experimental Equipment

The tools utilized in this experiment to capture tourists' attention and assess the quality of their tourism experience include the BrainLink EEG device (Professional Research Version) manufactured by Neurosky, a laptop, a mobile phone, and a compatible EEG biofeedback system. The BrainLink EEG device (Professional Research Version) enables direct and real-time measurement of brainwaves and attention levels, as depicted in Figure 2. The BrainLink (Professional Research Edition) brainwave instrument primarily eliminates artifacts through a series of operations, including data importation, filtering, electrode positioning, segmentation, and Independent Component Analysis (ICA) applied to the brainwave signals. Subsequently, the preprocessed data undergoes short-time Fourier transform to extract the energy of the brainwave signals. The BrainLink instrument has been extensively utilized in the domains of healthcare, education, and medical research for attention studies, and has received validation from prominent scientific research teams both domestically and internationally including USC, Yale, Stanford, UCLA, MIT, and the University of Wollongong.

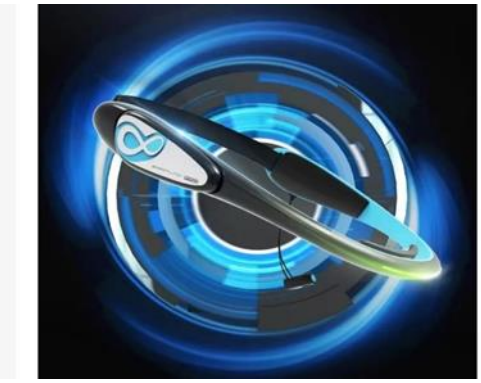

Figure 2 BrainLink (Professional Research Edition)

4.5 Experimental Steps

Specific Experimental Steps: (1) Prior to the experiment, provide a concise introduction of the procedure and precautions to the participants, ensuring that the experiment can be smoothly conducted without any disruptions such as phone calls or leaving midway. Additionally, confirm that they have not undergone attention training and obtain their explicit consent. (2) After obtaining consent, the tourist's brain wave changes and attention changes should be monitored for a duration of 2 minutes. Subsequently, they should be requested to complete the "Tourist PAD Tourism Experience Quality Form" and the "Purchase Tourism Experience Quality Insurance Form" prior to watching the documentary. (3) During the documentary, continuously monitor the tourists' brainwave patterns and fluctuations in attention until its conclusion, and subsequently administer the "Museum Tourism PAD Tourism Experience Quality Form" as well as the "Purchase Tourism Experience Quality Insurance Form" for completion. (4) The data indicators to be collected encompass the tourist's brain waves, attention level, body temperature, ambient temperature, and time throughout the entire process. (5) After completing the questionnaire, conduct in-depth interviews with tourists to gather qualitative data, aiming to gain a deeper understanding of tourists' willingness to purchase quality insurance for tourism experiences before and after the experiment. This will provide more detailed information and supplementary explanations for the results obtained from quantitative testing.

4.6 The Calculation of Experimental Data

4.6.1 The computed outcomes of tourism experiential quality

Calculate the quality of tourist experiences pre and post implementation of digital technology, focusing on psychological reactions. Specifically, refer to Li Ji's (2019) [25] approach which utilizes the PAD emotional model for assessing museum tourism experiences. The resulting calculations are presented in Table 1, where positive emotions are denoted as 1 and negative emotions as 0. It is noteworthy that in-depth interviews revealed a tendency among tourists with moderate museum tourism experience quality to lean towards negative emotions.

Table 1 Before and after the application of digital technology, the quality of museum tourism experience

Sample	Before the application of digital technology		After the application of digital technology	
	emotional tendency	Travel experience quality	emotional tendency	Travel experience quality
1	Hostility	0	Gentleness	0
2	Hostility	0	Gentleness	0
3	Relaxation	1	Boredom	0
4	Anxiety	0	Gentleness	0
5	Boredom	0	Boredom	0
6	Optimistic	1	Surprise	1
7	Surprise	1	Boredom	0
8	Gentleness	0	Surprise	1
9	Fear	0	Gentleness	0
10	Gentleness	0	Gentleness	0
11	Contempt	0	Anxiety	0
12	Boredom	0	Gentleness	0
13	Fear	0	Resentment	0
14	Anxiety	0	Surprise	1

15	Boredom	0	Boredom	0
16	Anxiety	0	Resentment	0
17	Anxiety	0	Sadness	0
18	Sadness	0	Dependence	1
19	Surprise	1	Boredom	0
20	Dependence	1	Anxiety	0
21	Anxiety	0	Sadness	0
22	Contempt	0	Anxiety	0
23	Contempt	0	Fear	0
24	Sadness	0	Boredom	0
25	Dependence	1	Dependence	1
26	Gentleness	0	Anxiety	0
27	Anxiety	0	Boredom	0
28	Boredom	0	Boredom	0
29	Anxiety	0	Surprise	1
30	Surprise	1	Gentleness	0
31	Gentleness	0	Relaxation	1
32	Anxiety	0	Anxiety	0
33	Boredom	0	Dependence	1
34	Dependence	1	Dependence	1
35	Dependence	1	Contempt	0
36	Contempt	0	Joy	1
37	Dependence	1	Boredom	0
38	Boredom	0	Surprise	1
39	Anxiety	0	Fear	0
40	Boredom	0	Surprise	1
41	Boredom	0	Surprise	1
42	Contempt	0	Joy	1

The quality of tourist experiences, both before and after the implementation of digital technology, can be assessed by considering psychological and physiological reactions. This study draws inspiration from Teng Kaidi et al.'s (2022) [15] methodology, which utilizes support vector machines to identify and classify the quality of museum visitors' tourism experiences. However, it is important to acknowledge that there might be discrepancies between tourists' actual emotions and their perceived quality of museum visits when they are in a moderate state. Therefore, when measuring the physiological reactions associated with the quality of museum visitors' tourism experiences, separate calculations were made for predicting whether these experiences would be classified as positive or negative during moderate states. As presented in Table 2, results obtained through support vector machine algorithms demonstrate that linear SVM, polynomial kernel SVM, and Gaussian kernel SVM can effectively identify and categorize emotional tendencies among museum visitors both before and after the application of digital technology. These models achieved success rates exceeding 72% to 77%. These findings align with interview data collected from museum visitors indicating that individuals with moderate tourism experiences tend to exhibit negative emotional tendencies.

Based on the comprehensive analysis of Table 1 and Table 2, it can be seen that regardless of whether it is before or after the application of digital technology, utilizing a combination of tourists' psychological and physiological reactions, including brainwave signals and the PAD emotional model, for the direct, immediate, and accurate measurement of museum visitors' tourism experience quality is feasible and the results are reliable.

Table 2 The classification results of the SVM algorithm for museum tourism experience quality before and after the implementation of digital technology

Stage	Method	Predictive success rate when classified as positive in a mild manner		Predictive success rate when classified as positive in a mild manner	
		Ataset for training	Evaluation dataset	Ataset for training	Evaluation dataset
Prior to the implementation of digital	Linear SVM	—		0.73	
	Polynomial Kernel SVM	0.917	0.613	0.742	0.747

technology	Gaussian Kernel SVM	0.899	0.562	1	0.727
	Sigmoid SVM	0.539	0.465	—	—
After the implementation of digital technology	Linear SVM	—		0.77	
	Polynomial Kernel SVM	0.935	0.636	0.935	0.636
	Gaussian Kernel SVM	0.903	0.535	0.903	0.535
	Sigmoid SVM	0.516	0.545	0.516	0.545

Note: — represents unstable results and classification failure.

4.6.2 Tourist attention

The results from Table 3 demonstrate a significant linear relationship between the analysis of tourist attention values and the energy levels of ∂, β, γ, δ, and θ at a 5% level of significance. Specifically, attention is significantly correlated with θ and (∂+θ)/β. These findings are robust as attention shows negative correlations with both θ and (∂+θ)/β while positively correlating with β. This aligns with existing research on the linear relationship between brain wave energy levels and attention. Therefore, it can be concluded that the tourist attention data detected using the BrainLink brainwave device is reliable.

Table 3 The regression relationship between tourist attention value and θ, and (∂+θ)/β

	Regression coefficient	Standard error	*t*	*p*
Constant	$4.37e^{-9}$	0.1268	0	1
θ	-.2782	0.1214	-2.12	0.041**
（∂ + θ）/β	-.4722	0.1314	-3.59	0.001***
R^2	0.3572			
A-R^2	0.3242			
F	F(2,39)=10.83,*p*=0.0002			

* *p* < 0.1, ** *p* < 0.05, *** *p* < 0.01

5 RESULTS AND DISCUSSION

5.1 Fundamental research: The integration of digital technology enhances tourist attention, thereby positively impacting the quality of tourism experience

According to Table 4, a paired samples T-test was conducted on the attention of museum visitors before and after the implementation of digital technology. The results revealed that, at a significance level below 0.05, with a correlation coefficient of 0.047, the P-value was found to be less than 0.05. These findings indicate a significant disparity in the attention levels of museum visitors before and after the integration of digital technology, which is positively correlated in a statistically significant manner. Moreover, Cohen's d value of 17.93 suggests an exceptionally large difference exceeding 0.8 standard deviations, thereby implying a substantial impact resulting from the application of digital technology on enhancing visitor attention.

Table 4 The regression relationship between tourist attention value and θ, and (∂+θ)/β

	Correlation analysis of paired samples		The Paired Sample Test						
Paired Variables	Correlation	Significance	Mean	Standard Deviation	The Skewness of the Difference falls within the 95% Confidence Interva		*t*	significance	*Cohen d*
					Lower Limit	Upper Limit			
before and after attention	0.047	0.015	-5.530	-1.7	-6.209	-4.852	-0.42	0.001 ***	17.93

* *p* < 0.1, ** *p* < 0.05, *** *p* < 0.01

According to Table 5, the breakpoint regression analysis revealed that the impact of visitor attention on the quality of museum tourism experience after implementing digital technology was statistically significant at a significance level of 5%. The P-values for the Conventional, Bias-Corrected, and Robust methods were found to be 0.009, 0.007, and 0.034 respectively, all indicating

significance. Furthermore, the coefficients for visitor attention on the quality of museum tourism experience were determined to be 0.789, 0.810, and 0.810 respectively; all values exceeding zero. Henceforth, it can be inferred that following the implementation of digital technology in museums leads to a substantial improvement in visitor attention which significantly enhances their overall tourism experience.

Table 5 The Breakpoint Regression Results Summary

Method	Coef.	Std. Err.	*z*	*p*	95% CI
Conventional	0.789	0.301	2.622	0.009***	0.199 ~ 1.379
Bias-Corrected	0.810	0.301	2.693	0.007***	0.221 ~ 1.400
Robust	0.810	0.383	2.116	0.034**	0.060 ~ 1.561

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The robustness test at different bandwidths, as indicated in Table 6, follows the method of robustness testing in breakpoint regression proposed by Liu Hongyan et al. (2023) [26]. Based on the robustness results obtained using a triangular kernel function with various bandwidth values, the calculated outcomes reveal that for bandwidth values of 6.906, 8.633, 10.360, 12.086, and 13.813, the corresponding P-values are found to be 0.009, 0.005, 0.004, 0.005 and 0.007. The results indicate that, at a significance level of 5%, the effects of different bandwidths are comparable and statistically significant, suggesting robustness.

Table 6 Conducting robustness tests under different bandwidth conditions

Bandwidth value	Coef.	Std. Err.	*z*	*p*	95% CI
6.906(Multiple of 1)	0.789	0.301	2.622	0.009***	0.199 ~ 1.379
8.633(Multiple of 1.25)	0.776	0.278	2.797	0.005***	0.232 ~ 1.320
10.360(Multiple of 1.5)	0.750	0.259	2.894	0.004***	0.242 ~ 1.258
12.086(Multiple of 1.75)	0.687	0.243	2.829	0.005***	0.211 ~ 1.163
13.813(Multiple of 2)	0.618	0.228	2.713	0.007***	0.172 ~ 1.064

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Similarly, when the kernel function is changed to Epanechnikov and Uniform, the corresponding calculation results are presented in Table 7. The regression outcomes consistently demonstrate that the substantial enhancement in visitor attention following the implementation of digital technology significantly contributes to the quality of museum tourism experience. Hence, at a significance level of 5%, the breakpoint regression findings remain significant and pass the robustness test, affirming that leveraging digital technology leads to a noteworthy improvement in visitor attention and enhances overall tourism experience.

Table 7 The regression results for RDD breakpoint analysis with various kernel functions are summarized

The kernel function	Method	Coef.	Std. Err.	*z*	*p*	95% CI	value of bandwidth
epanechnikov	Conventional	0.702	0.334	2.104	0.035**	0.048 ~ 1.356	5.742
	Bias-Corrected	0.697	0.334	2.089	0.037**	0.043 ~ 1.351	
	Robust	0.697	0.417	1.673	0.034**	-0.119 ~ 1.514	
uniform	Conventional	0.834	0.286	2.915	0.004***	0.273 ~ 1.395	6.209
	Bias-Corrected	0.972	0.286	3.396	0.001***	0.411 ~ 1.533	
	Robust	0.972	0.335	2.902	0.004***	0.316 ~ 1.628	

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In conclusion, the application of digital technology has resulted in a significant enhancement in visitor attention, thereby positively impacting the overall quality of the tourism experience. Put simply, digital technology elevates the quality of the tourism experience by improving visitor attention and ensuring a high standard for the overall experience.

5.2 Quality Assurance: Digital Technology and the Willingness to Invest in Travel Experience Insurance

According to Table 8, the Logit regression analysis reveals that digital technology has a significant impact on the willingness to purchase travel experience quality insurance. Specifically, following the implementation of digital technology, there is a statistically significant positive relationship (regression coefficient = 0.088, $p < 0.05$) between visitor attention and the propensity to purchase travel experience quality insurance. This finding suggests that higher levels of visitor attention contribute to a stronger inclination towards purchasing such insurance products after the adoption of digital technology in tourism experiences. In essence, digital technology enhances the quality of tourism experiences by augmenting visitor attention, thereby positively influencing their willingness to invest in travel experience quality insurance. Consequently, Hypothesis 1 is supported. In line with the research findings of scholars Chen Shengwei and Li Jiaxin (2022), this study affirms that the amalgamation of technology and insurance service quality exerts a positive regulatory impact on consumers' inclination to purchase insurance [27].

Table 8 The logit summary of the regression analysis findings

Item	Regression coefficient	Standard error	*z*	Wald χ^2	*p*	OR	95% CI
After-application attention	0.088	0.040	2.192	4.804	0.028	1.092	1.009 ~ 1.181
intercept	-1.046	1.944	-0.538	0.289	0.591	0.351	0.008 ~ 15.875

Note：The dependent variable is the intention to purchase travel experience quality insurance following the implementation of digital technology

5.3 Trust Assurance: Brain-Computer Interface and the Willingness to Acquire Insurance for Ensuring Travel Experience Quality

The results of a paired sample T-test from Table 9 indicate that the application of brain-computer interface leads to a significant increase in tourists' willingness to purchase travel experience quality insurance. Specifically, the mean willingness after the application is found to be 0.48 higher than before, suggesting that visualizing the quality of tourism experiences positively influences their purchasing behavior. Moreover, at a significance level below 0.05, both the P-value and Cohen's d value (0.942) demonstrate strong statistical significance and effect size respectively (>0.8).

Table 9 The paired sample T-test was conducted to examine the intention to purchase travel experience quality insurance before and after the implementation of brain-computer interface technology

Paired Variables	Mean± S D		The Skewness of the Difference falls within the 95% Confidence Interva		t	significance	Cohen d
	After application	Before application	Lower Limit	Upper Limit			
Purchase intention	0.64±0.48	0.17±0.38	0.319	0.634	6.105	0.000 ***	0.942

$^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$

These findings confirm a substantial difference in willingness to purchase travel experience quality insurance before and after implementing brain-computer interface technology, thereby supporting Hypothesis 2. In line with the research findings of Liu Xiaoling (2018) and others, the utilization of blockchain technology in conjunction with insurance service quality contributes to the establishment of an insurance trust mechanism and positively influences consumers' inclination towards purchasing insurance [28].

6 CONCLUSIONS

6.1 The research findings

Based on tourists' concerns regarding the quality and reliability of technology in relation to travel experience insurance, this study initially employs brain-computer interface to real-time detect tourists' attention and assess their travel experience quality under the application of digital technology, thereby empirically demonstrating the impact of digital technology on travel experience quality. The empirical findings reveal that digital technology significantly enhances tourists' attention and positively influences their travel experience quality. The aforementioned conclusion is a response to Zhou Jingjing's (2022) research, which suggests that sensory stimulation plays a significant role in the digital transformation of museums by greatly influencing audience attention and subsequently impacting the overall quality of tourists' experiences [29].

Subsequently, building upon the empirical research, this study investigates tourists' willingness to purchase travel experience insurance with respect to digital technology. The results indicate that digital technology has a positive effect on tourists' inclination to acquire travel experience insurance, thus providing assurance for its quality. The findings of scholars such as Jordan (2022) provide empirical support for the notion that the utilization of the Internet significantly enhances farmers' inclination, behavior, and intensity towards procuring policy-based agricultural insurance [30].

Lastly, by visualizing tourists' attention through brain-computer interface technology, this study explores the relationship between brain-computer interface technology and the propensity to purchase travel experience insurance. It reveals that brain-computer interface technology substantially increases individuals' willingness to obtain such insurance coverage, thereby offering a trust guarantee for their purchase. The findings of Zhang Kunyang and Zhang Gaiqing (2020) support the notion that incorporating technology into insurance product services and enhancing trust levels contribute to an increased inclination among farmers to purchase agricultural insurance [31].

6.2 Implications for Recommendations

Through direct empirical research on the effectiveness and risks of technology applications, the research findings of this study provide quality assurance and trust guarantees for enhancing willingness to purchase travel experience quality insurance with digital technology and brain-computer interface technology. This study offers important references and feasibility conditions for further research on travel experience quality insurance, which is significant for internalizing insurance in the tourism industry and strengthening its integration.

Based on the research findings, the following recommendations are proposed: (1) In order to enhance the development of travel experience quality insurance, it is suggested to further harness the potential of digital technology. By exploring various forms and methods of digital technology applications, it can play a crucial role in ensuring stability and quality assurance for insurance services, serving as a third-party quality supervisor. This also offers valuable insights for other "soft service" industries in terms of their insurance offerings. We can initiate the process by focusing on the following aspects:

Firstly, we should explore the establishment of a digital quality supervision system. By leveraging digital technology, we can establish a comprehensive system for monitoring the quality of tourism experiences. This will enable us to monitor the real-time status of tourism services, promptly identify and resolve any issues that arise, and provide accurate and reliable data support for tourism insurance services. In addition, leverage digital technology to drive innovation in the service model of tourism experience quality insurance, thereby enhancing the user experience and fostering greater trust and willingness among users to purchase tourism insurance. Thirdly, actively engage in cross-industry collaboration and data sharing. Enhance partnerships with relevant sectors such as tourism, hospitality, and transportation to facilitate the exchange of data and seamless communication. Together, establish a digital assessment system for evaluating the quality of tourism services and ensure comprehensive quality assurance for tourism insurance services.

(2) Considering that brain-computer interface technology can instill trust in purchasing travel experience quality insurance, it is recommended to promote its multi-faceted application and research outcomes. This will provide diverse marketing strategies and immersive experiences to facilitate the purchase of such insurance policies, fostering the growth of "immersive insurance" [32]. Additionally, this approach will bridge the gap between consumers and their perception of insurance services while enhancing consumer trust.

We can proceed by exploring immersive insurance experiences. By utilizing brain-computer interface technology, we can create scenarios that provide consumers with a firsthand experience of the effect and value of insurance services in a virtual environment. This will enhance trust and willingness to purchase insurance. The second aspect involves leveraging brain-computer interface technology to gain precise insights into consumer needs and enable personalized marketing. This enables the provision of customized insurance products and service plans that cater to diverse consumer requirements. Enhance consumers' sense of participation and interactivity by leveraging brain-computer interface technology to augment the interaction between consumers and tourism insurance services. This will enable consumers to gain a deeper understanding of the unique features and advantages of tourism insurance products during their engagement, thereby bolstering their trust and satisfaction with such offerings.

AVAILABILITY OF DATA AND MATERIAL

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

COMPETING INTERESTS

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AUTHORS' CONTRIBUTIONS

Cheng Zhang: Project administration, Conceptualization, Writing - original draft; Writing - review & editing, Methodology

Ting Zhang: Supervision, Formal analysis, Investigation, Data curation, Writing - original draft

Weiwei Guan: Writing - original draft, Resources, Software, Investigation

Jiale Guan he: Validation, Visualization, Writing - review & editing

Jie Zhang: Data curation, Resources, Writing - review & editing

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