Journal of Competitiveness

Virtual tourism: A new way of travelling and a new traveller profile

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Abstract

The evolution of technology makes it possible to discover destinations in an immersive way without the need to travel. Through fieldwork based on 415 surveys, this study determines the relationships between the socio-demographic profile, the respondent's self-assessment of the use of technology, video games, virtual reality and the metaverse, with the willingness to carry out different immersive virtual tourism experiences. Using an artificial neural network of the multilayer perceptron type, it was found that youth and prior knowledge of online video games and virtual reality have a decisive influence on the willingness to engage in immersive virtual tourism activities.

Keywords: *virtual tourism, artificial neural network, tourists' profiles*

JEL Classification: Q55, L83

Article history: Received: June 2023; Accepted: December 2023; Published: December 2023

1. INTRODUCTION

Technology has made it possible to get to know a remote tourist destination without using a means of transport. Pictorial or photographic representations have traditionally been available resources to get to know a distant place, at least visually. However, virtual reality (VR) has made it possible, not so long ago, to live a much richer and more intense immersive experience. As a result, virtual tourism has revolutionised the industry and the experience linked to certain products (Pedrana, 2014). This type of tourism is based on constructing a visual environment recreated from real landscapes that allow tourists to experience an immersive experience (Bogicevic et al., 2019). In addition, new mixed reality or virtual reality techniques have opened up new possibilities for destination exploration. These techniques make it possible to get to know existing or lost places through digital composition work based on photographs, videos, archival documents, photogrammetry, computer modelling, etc. (Vincent, 2017; Bec et al., 2021). From this material, it is possible to generate VR experiences that include images, movement and sound, but also other mixed experiences that combine real and imagined environments and environments in which the real environment is overlayed in a digital context (Bec et al., 2021). There are, therefore, various levels of immersion in the virtual tourism experience (Beck et al., 2019).

There is a marked and evident difference between face-to-face and virtual tourism. Their comparison must consider how consumption decisions are made, how the experience is evaluated, tourists' behaviour, and their profiles (Zhang et al., 2022). Zhang et al. (2022) have pointed out the need to increase the practical evidence and theoretical framework on virtual tourism to improve knowledge about public sentiment towards this activity. Few studies have studied public sentiment towards virtual tourism (Kim et al., 2020; Lin et al., 2020; Wei et al.,

2019). Beck et al. (2019) have indicated that additional information is needed on ex-situ tourism and the explanations that would increase its growth. Such reasons could include the effect of personal characteristics on the decision to purchase virtual products or previous experience in digital environments, as this study proposes. Virtual tourism research has mainly focused on the usefulness of VR as a tourism marketing tool (Gaudiosi, 2016; Yung & Khoo-Lattimore, 2019; Yung, Khoo-Lattimore, & Potter, 2021; Yung et al., 2021). Therefore, there is a clear research gap in the academic literature regarding the factors that condition the adoption of this new form of tourism. The recent development of this form of tourism explains the limited number of studies, so exploratory analyses are needed first to provide an empirical basis for developing theories. This study seeks to contribute to this research gap by providing evidence on which tourist profiles are more likely to engage in virtual tourism. This contribution is useful, as it will help focus marketing actions on potential consumers, who are considered early adapters of this type of technology.

Connecting with the research gap detected, the contribution of this work focuses on providing evidence to help determine predictors of the acceptance of this type of tourism among potential users. Specifically, this study determines the relationships between the socio-demographic profile (gender, age, the population size of the place of residence and tourist activities carried out per year), the respondent's self-assessment of the use of technology, video games, VR and the metaverse, with the willingness to carry out different immersive virtual tourism experiences. Once a significant sample of surveys has been collected, an artificial neural network (ANN) is used. This methodology allows us to estimate as output values the different willingnesses to carry out this type of experience, taking as a reference the answers incorporated into the ANN as input values (socio-demographic profile and self-assessment) and easily customisable by the researcher, this being especially useful in the development of products and services adapted to immersive virtual tourism. Specifically, the following research questions (RQ) are sought to be answered. RQ1: Which tourist profile is most receptive to virtual tourism activities? RQ2: What role does previous experience in technology, video games, VR and programming play in the predisposition to engage in virtual tourism activities? The study is based on fieldwork carried out between May and October 2022 on a sample of 415 individuals living in Spain. The survey was distributed through various social networks based on a distribution plan that guaranteed simple random sampling in a population segmented only by age. The results of this study will be of interest to both academia and the tourism industry.

This study is based on the noted research gap. Fieldwork was designed to determine which user profiles would be most receptive to the adoption of this new form of travel. It is based on two different applications of virtual tourism: one that takes place in the destination itself and one that takes place outside of it. The application of a neural network system will be used to analyse which tourist profile is most likely to adopt this form of tourism. This will complement previous studies that have highlighted certain aspects of the profile of virtual tourism users and have even indicated predictors associated with similar technologies. This study focuses specifically on defining a typical user profile and highlighting the role of previous experience with technology as a predictor of the acceptance of this form of travel. This paper presents a review of the literature focused on virtual tourism. The types of services that are included within the concept of virtual tourism are presented and the characteristics indicated in the academic literature on the user profile of this type of experiences are analyzed. The research questions are justified in the context of previous research. The methodology used is then presented, which is based on neural networks. This section details the way in which the data used was obtained,

as well as the profile of the individuals surveyed. The following section presents the results obtained, focused on answering the research questions. In the last section, the main conclusions are presented and contextualized in the previous literature.

2. THEORETICAL BACKGROUND

Virtual tourism is already an alternative form of travel, affecting policy formulation by government tourism departments and tourism companies' marketing strategies (Tavakoli & Mura, 2015; Lin et al., 2020). Virtual tourism takes centre stage in a world conditioned by a still active pandemic and the need to reduce the environmental impact of all human activities (Zhang et al., 2022). Tourism is not the only force that deteriorates a destination but is a significant contributor (Frey & Steiner, 2011; González-Pérez et al., 2023; González-Pérez et al., 2020), so specific demand reduction techniques can help recovery (Bec et al., 2021; Martín et al., 2022). However, making future predictions about such a novel activity is complex. At present, virtual tourism does not seem to threaten traditional formulas but rather serves as a complement to the tourism experience and a promotional tool. Digital transformation processes are136ynaptit to a series of factors (Wang et al., 2023), and it is necessary to identify them in each sector.

The first step in introducing virtual tourism experiences has been their use as a marketing tool to support the sale of traditional experiences (Lee, 2018; Spielmann & Orth, 2020). However, the implementation of virtual tourism experiences linked to destinations of great fragility, to visits to lost places or as a complement to traditional holidays is growing (Beck et al., 2019; Guttentag, 2010; Wei, 2019). Obviously, the development of new forms of tourism must take into account potential problems, as well as the benefits expected by different groups (Michálková et al., 2023). Examples would be the recreations of temples or ancient cities offered in interpretation centres, the virtual reality experiences offered by some theme parks, the remote visit Ies provided by some museums or the interaction experiences offered in some tourist spots focused on difficult access points. This has undoubtedly been helped by the development of technology, which makes more immersive and intense experiences possible (De Gauquier et al., 2019; Leung et al., 2020; Spielmann & Orth, 2020). These techniques have significantly impacted educational and communicative resources, given their potential to create immersive and interactive dynamics (Nayyar et al., 2018; Kang & Yang, 2020). Taking the classification proposed by Bec et al. (2021) as a reference, virtual tourism experiences would be ex-situ, as they take place away from the destination. In this case, the dissemination vectors would be those related to education, marketing/promotion, and preservation of sensitive destinations, among others. A second type of virtual tourist attraction (in-situ) would combine face-to-face access to destinations with the virtual experience, which would diversify the experience and make it possible to interact with static interests to generate new tourist products or ways of discovering existing ones. It is understood that this second modality would have a faster penetration than the first. In short, virtual tourism experiences can be seen as a form of destination selection, as a form of pre-travel visit, as a substitute for a face-to-face visit or as a complement to it (Beck et al., 2019; Skard et al., 2021). This separation between types of experiences should not be understood strictly, as a positive experience in a virtual environment has increased the desire to visit the destination in person (Tussyadiah et al., 2018). VR technology has evolved from a mere marketing tool to an instrument to organise a tourism experience, given its ability to generate immersive experiences (Skard et al., 2021).

In terms of profiles, several studies have pointed out some characteristics of the potential virtual tourist. Tavakoli and Mura (2015) state that, compared to face-to-face tourism, virtual tourism may be attractive to young tourists, as it is more affordable. Guttentag (2010) suggests that the lower costs associated with virtual tourism will lead tourists to accept virtual experiences as a replacement for face-to-face travel experiences. However, as Skard et al. (2021) point out, there is a possibility that virtual tourism experiences may only work equally well for some consumer profiles, so it is essential to understand the acceptance factors. As studies applied to the tourism sector are scarce, findings from studies on technology adoption, in general, are used. Information and communications technology research has confirmed that users tend to adopt and use technology differently according to their socio-demographic characteristics, including gender and age (Devolder et al., 2012; Gefen & Straub, 1997; Ata et al., 2022). The virtual experience depends on technological factors (the medium), the user's characteristics and previous experience (Baños et al., 2004; Gutiérrez et al., 2008). These findings are incomplete, which justifies the need to define a complete user profile with the greatest predisposition to use this form of tourism. This is reflected in RQ1: Which tourist profile is the most receptive to virtual tourism activities? Given that there are several technological tools that can be applied to the set of activities included in virtual tourism, the results section specifies which type of activity is being analysed in each case. The respondents' willingness to engage in various types of activities was analysed.

Within the tourism sector, Shin and Jeong (2021) have analysed the factors that motivate the use of augmented reality (AR) applications and demonstrated how aspects related to play, and enjoyment are relevant. This relates to one of the contributions of this paper, which is to determine the effect of previous experience with video games developed in virtual environments. However, the research published on virtual tourism has yet to form a solid theoretical framework regarding people's attitudes towards this form of tourism and the factors that explain them (Zhang et al., 2022). This relates to RQ2: What role does previous experience with technology, video games, VR, and programming play in willingness to participate in virtual tourism activities? The academic literature has described only a few factors that influence the choice of virtual tourism, such as the motivation behind the trip, social factors (Han et al., 2014), technical ease of use (Han et al., 2014) and tourism psychology among others (Sundar et al., 2015). Part of the acceptance and, thus, the spread of this form of tourism will be conditioned by the perceived benefits. Given the incipient level of development of this type of tourism, its benefits still need to be well communicated. Among these benefits are those related to its usefulness as a marketing and promotional tool and to boost the desire to visit (Huang et al., 2016); those related to sustainability (Bec et al., 2021) or the psychological benefits for certain people (Higuera-Trujillo et al., 2020; Tussyadiah et al., 2018). For further information on tourism in virtual environments, it is recommended to analyse the literature review proposed by Buhalis et al. (2023).

3. RESEARCH OBJECTIVE, METHODOLOGY AND DATA

3.1. Methodology and objectives

The survey consisted of three blocks. The first block focused on collecting socio-demographic information from respondents. The second block focused on previous experience with technology, differentiating between different user levels. The third block considered the predisposition to carry out virtual tourism activities in their other modalities. A seven-point

Likert scale was used to complete the information for blocks two and three. Thus, in block two, the respondents, using this scale, defined their degree of experience with different technologies. And in block three, also using this scale, respondents indicated their willingness to carry out virtual tourism activities. 415 valid surveys were collected through Google Forms between March and October 2022. Assuming an infinite population and a random sampling, the sample offers a sampling error of ±5% and a confidence level of 95%. The questionnaire was distributed on social networks through dissemination mechanisms offered by these networks.

Using SPSS Statistics software v.23 and taking this dataset as the basis, an ANN is developed, in which the input values correspond to the profile and self-assessment in technology, video games and VR, and the output values correspond to the estimates that the network makes on the different willingness to practice immersive virtual tourism activities. Then, various networks are tested, considering Multilayer Perceptron (MLP) and Radial Basis Function, finally preserving the one that presents higher goodness of fit (an MLP type, in this case).

Rumelhart and McClelland (1986) define an artificial neural network as a system composed of several process elements (PE) or nodes with a small amount of storage capacity. The nodes are grouped into several layers: input and intermediate or hidden layers (that can be one or more) and output (Figure 1). First, the input layer is composed of a vector of values (I_1, I_2, …, I_n), with synaptic weights ($w_{11}I_{12}$, I.., w_{1k}, ..., w_{nk}) that are applied to these input vectors using a propagation rule (based on the corresponding linear combination, generally the product of both) to attain the hidden layer values (H_1, H_2, …, H_k). Next, these values are transfo138ynapthrough an activation function and later multiplied by their respective synaptic weightIw_{11},I_2, w_1..., w_{1m}, ..., w_{km}) to obtain the output values (O_1, O_2, …, O_m).

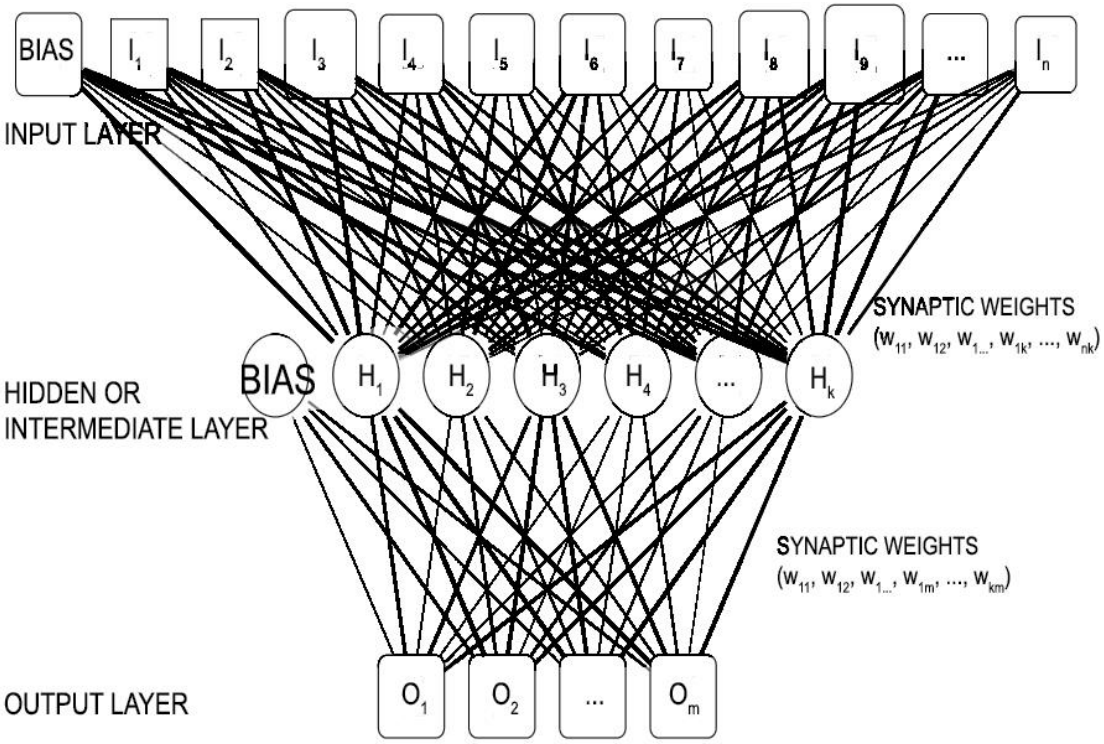

Fig. 1. Artificial neural networks' structure

For the synaptic weights' elaboration, the dataset cases are divided between the training and testing groups, weighted around 70% and 30%, respectively. The training group develops the synaptic weights of the network. In contrast, the testing group calculates the error (the difference between the real and estimated values) that the training group is making. When the testing group detects that the error committed can no longer be reduced, the stopping rule is reached, and the model is finished.

Once the synaptic weights are determined, the output values can be estimated. For this purpose, and with bias taking a value of 1, input values are previously standardised (z) following Equation 1 to incorporate into the model, being μ the mean value and δ the standard deviation of the inputs. Subsequently, they are multiplied by their respective synaptic weights (Equation 2), producing the input values of the PEs of the hidden layer, which is transformed through the hyperbolic tangent type activation function (Equation 3). Then, these values ar139ynapticlied by their synaptic weights (Equation 4), generating the output values of the network. Finally, the standardisation is inverted (Equation 5) through a reverse arithmetic procedure of Equation 1 to obtain estimated values (E_1, E_2, …, E_m) in the same scale as the real ones.

$$z = \frac{I - \mu}{\delta} \quad (1)$$

$$(H_1 = z_1 \cdot w_{11} + z_1 \cdot w_{12} + \cdots + z_1 \cdot w_{1k};\ H_2 = z_2 \cdot w_{21} + z_2 \cdot w_{22} + \cdots + z_2 \cdot w_{2k}; \ldots;\ H_k = z_n \cdot w_{n1} + z_n \cdot w_{n2} + \cdots + z_n \cdot w_{nk}) \quad (2)$$

$$\tanh(H) = \frac{e^{H} - e^{-H}}{e^{-H} + e^{H}} \quad (3)$$

$$(O_1 = \tanh(H_1) \cdot w_{11} + \tanh(H_2) \cdot w_{21} + \cdots + \tanh(H_k) \cdot w_{k1}; O_2 = \tanh(H_1) \cdot w_{12} + \tanh(H_2) \cdot w_{22} + \cdots + \tanh(H_k) \cdot w_{k2}; O_m = \tanh(H_1) \cdot w_{1m} + \tanh(H_2) \cdot w_{2m} + \cdots + \tanh(H_k) \cdot w_{km}) \quad (4)$$

$$(E_1 = O_1 \cdot \delta + \mu; E_2 = O_2 \cdot \delta + \mu; \ldots;\ E_m = O_m \cdot \delta + \mu) \quad (5)$$

Following this arithmetic procedure, it is possible to determine the degree of influence (either positive or negative) that each input value contributes to every output value. To obtain it, firstly, the input values are set to their mean (and majority, in the case of nominal variables) to reach these results. Secondly, the input variable to be analysed takes its minimum and maximum values, while the output values are collected for both situations. Finally, the process is repeated with all input values. Thus, the increments or decrements that each of the input values contributes to the output values are obtained.

3.2. Socio-demographic profile and question collection

The respondents' profile is shown in Table 1. The sample has a slight majority of women. Two out of three live in medium-sized and/or small cities. The profile comprises a young population, with 50% under age 21 and more than three out of four under age 30. Regarding the tourist activities carried out per year, two-thirds of the sample develop between zero and five, and almost nine out of ten do not carry out more than ten activities per year. The average profile corresponds to a woman living in a small city under 20 years of age who does not usually carry out more than five tourist activities per year.

Table 1. Socio-demographic profile of the respondents. Source: own research

Gender (GEN)		**Age (AGE)**	
Male	42.65%	Up to 20 years old	50.36%
Female	57.35%	21–30 years old	27.95%
City population (POP)		31–40 years old	9.88%
Less than 10,000 inhabitants	20.48%	More than 40 years old	11.81%
From 10,001 to 50,000 inhabitants	31.81%	**Tourist activities (average per year) (ACT)**	
From 50,001 to 150,000 inhabitants	15.18%	From 0 to 5	67.71%
From 150,001 to 250,000 inhabitants	5.78%	From 6 to 10	21.69%
From 250,001 to 500,000 inhabitants	9.64%	From 11 to 15	5.06%
From 500,001 to 1,000,000 inhabitants	9.88%	From 16 to 20	3.37%
More than 1,000,000 inhabitants	7.23%	More than 20	2.17%

Questions on a seven-point Likert scale on self-assessment (SA) about the use of technology, video games and VR are presented in Table 2 and the willingness to carry out immersive virtual tourism activities (WA) in Table 3. To measure the reliability of the scale of these two groups (SA, WA), Cronbach's Alpha (α) is used (1951). All the values reached are above the figures that confirm this reliability (Nunnally & Bernstein, 1994). High knowledge of technology (SA01) and video games (SA02) is perceived. Online video games (SA03) present little less familiarity among respondents, which keeps descending in programming (SA06), VR and virtual environments (SA04, SA05).

Table 2. Self-assessment in technology, video games, VR and programming question set. Source: own research

Code	**Question**	**Mean**	**Std. Dev.**
Self-assessment (SA; α=0.796)			
SA01	How would you self-assess your overall experience with technology?	5.28	1.37
SA02	How would you self-assess your experience with video games?	4.03	1.96
SA03	How would you self-assess your experience with online video games?	3.53	2.00
SA04	How would you self-assess your experience with video games involving virtual reality –	2.35	1.70

	immersive glasses? Either locally or online.		
SA05	How would you self-assess your experience with virtual environments such as Second Life or the Metaverse?	2.04	1.56
SA06	How would you self-assess your experience with computer/web page programming?	3.32	1.81

Immersive virtual tourism activities can be divided into two types. Firstly, as an entertainment device for itself (Table 3, WA01, WA02, WA03), and secondly, as an instrument to select future real tourist activities (Table 3, WA04). Table 3 presents a high willingness to carry out immersive tourism activities in all questions raised, primarily which is employed as a previous step in selecting a tourist destination (WA04), connecting with the purpose previously stated in the present research. HoIever, as noted, all items reflect high values; a slightly less valuation in the first group (WA01, WA02, WA03) than in the second (WA04) is perceived.

Table 3. Willingness to practice activities question set. Source: own research

Code	Question	Mean	Std. Dev.
Willingness to practice immersive virtual tourism activities (WA; α=0.899)			
WA01	I would carry out immersive virtual tourism (3D glasses) related to visits to specific environments built from real images, such as the interior of a monument, a virtual visit to a museum or a natural location of particular landscape value, to get to know it remotely.	4.33	2.11
WA02	I would carry out immersive virtual tourism (3D glasses) related to a longer-lasting experience involving interaction with other people, conversations, exploring a virtual environment created from real images, etc.	4.12	2.03
WA03	I would carry out immersive virtual tourism (3D glasses) related to visiting environments created virtually, with virtual shops, virtual accommodations, virtual	3.86	2.10

	attractions different from real images, etc.		
WA04	I would carry out a virtual tourism experience created from real images as a preliminary step to select a tourist destination I would physically travel to.	4.64	2.05

4. RESULTS

The architecture of the MLP-type ANN obtained is presented in Table 4 and graphically in Figure 2. The input values correspond to the respondent's socio-demographic profile and self-assessment in technology, video games and VR. These values are standardised to incorporate into the model. Subsequently, they are multiplied by their respective synaptic weights (Figure 2), producing the input values of the PEs of the hidden layer, which is transformed through the hyperbolic tangent type activation function. Next, these values are multiplied by their synaptic weights generating the output values of the network. Finally, the standardisation is inverted to obtain values included in the original scale of one to seven points. Table 5 shows the training and testing groups' division of the ANN and the errors made by them during synaptic weights elaboration. The stopping rule used, and the overall model's goodness of fit attained through root mean squared error (which presented values around two for each output value) are also shown (Table 5).

Table 4. Model structure. Source: own research

Input Layer	Bias	Value=1
	Factors	GEN=1 (male), GEN=2 (female)
	Covariates	AGE
		POP
		ACT
		SA01
		SA02
		SA03
		SA04
		SA05
		SA06
	Number of Units (excluding bias)	11
Hidden Layer	Rescaling Method for Covariates	Standardised
	Number of Hidden Layers	1
	Number of Units in Hidden Layer (excluding bias)	6
	Activation Function	Hyperbolic tangent
Output Layer	Dependent Variables	WA01
		WA02

		WA03
		WA04
	Number of Units	4
	Rescaling Method for Scale Dependents	Standardised
	Activation Function	Identity
	Error Function	Sum of Squares

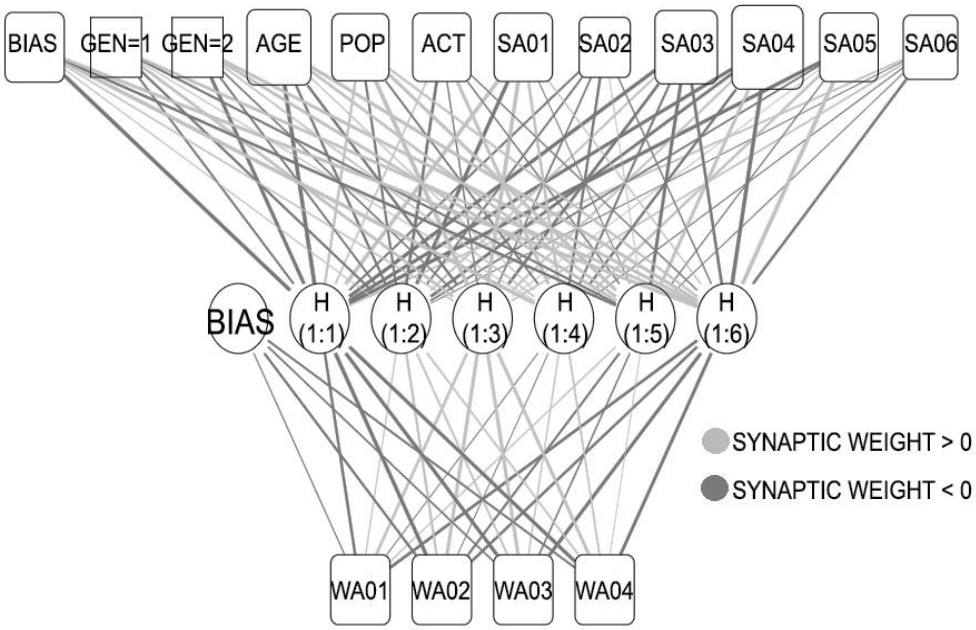

Fig. 2. Model's graphic representation. Source: own research

Table 5. Model development summary. Source: own research

Training (N=287; 69.16%)	Sum of Squares Error		546.426
	Average Overall Relative Error		0.955
	Relative Error for Scale Dependents	WA01	0.950
		WA02	0.968
		WA03	0.976
		WA04	0.928
	Stopping Rule Used		One consecutive step with no decrease in error (based on the testing sample)
	Training Time		0:00:00.35
	Sum of Squares Error		214.422

Testing (N=128; 30.84%)	Average Overall Relative Error		0.819
	Relative Error for Scale Dependents	WA01	0.806
		WA02	0.823
		WA03	0.847
		WA04	0.797
Total (N=415; 100%)	Root Mean Squared Error	WA01	2.03
		WA02	1.98
		WA03	2.05
		WA04	1.96

The methodology also allows knowing the relevance of each input value to the model. For example, Figure 3 shows how self-assessment in VR (SA04) and online (SA03) video games, as well as age (AGE), were the most influential factors in ANN. Conversely, gender (GEN) and self-assessment in video games (SA02) and in computer and/or web page programming (SA06) were the least decisive in estimating network output values.

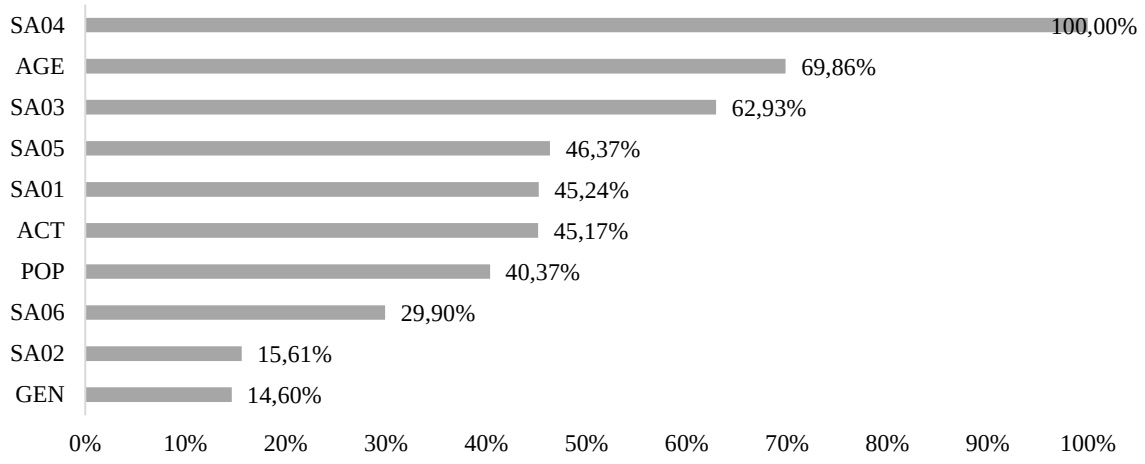

Fig. 3. Model exogenous variables' relevance. Source: own research

Regarding the degree of influence (either positive or negative) that each input value contributes to every output value, and following a representativeness criterion, Table 6 shows the ten most significant increases and Table 7 the ten largest decreases. Thus, Table 6 shows how the more significant the knowledge of VR video games (SA04), the greater the willingness to carry out all-immersive virtual tourism activities. Furthermore, a higher experience in online video games (SA03) also implies a higher desire to visit virtual environments (WA03), interact with people (WA02) or use it as a preliminary step to select a tourist destination (WA04). To a lesser extent, a more incredible experience in virtual environments such as Second Life or Metaverse (SA05) also entails a greater willingness towards WA02 (13.60%) and WA04 (7.95%).

Table 6. Items with the most direct influence on willingness to practise immersive virtual tourism activities. Source: own research

SA04	How would you self-assess your experience with video games involving virtual reality – immersive glasses? Either locally or online.	WA03	I would carry out immersive virtual tourism (3D glasses) related to visiting environments created virtually, with virtual shops, virtual accommodations, virtual attractions different from real images, etc.	36.24%
SA04	How would you self-assess your experience with video games involving virtual reality – immersive glasses? Either locally or online.	WA04	I would carry out a virtual tourism experience created from real images as a preliminary step to select a tourist destination I would physically travel to.	32.70%
SA04	How would you self-assess your experience with video games involving virtual reality – immersive glasses? Either locally or online.	WA02	I would carry out immersive virtual tourism (3D glasses) related to a longer-lasting experience involving interaction with other people, conversations, exploring a virtual environment created from real images, etc.	32.05%
SA04	How would you self-assess your experience with video games involving virtual reality – immersive glasses? Either locally or online.	WA01	I would carry out immersive virtual tourism (3D glasses) related to visits to specific environments built from real images, such as the interior of a monument, a virtual visit to a museum or a natural location of particular landscape value, to get to know it remotely.	26.20%
SA03	How would you self-assess your experience with online video games?	WA03	I would carry out immersive virtual tourism (3D glasses) related to visiting environments created virtually, with virtual shops, virtual accommodations, virtual attractions different from real images, etc.	17.93%
SA03	How would you self-assess your experience with online video games?	WA02	I would carry out immersive virtual tourism (3D glasses) related to a longer-lasting experience involving interaction with other people, conversations, exploring a virtual environment created from real images, etc.	17.13%
SA03	How would you self-assess your experience with online video games?	WA04	I would carry out a virtual tourism experience created from real images as a preliminary step to select a tourist destination I would physically travel to.	16.23%
SA05	How would you self-assess your experience with virtual environments such as Second Life or the Metaverse?	WA02	I would carry out immersive virtual tourism (3D glasses) related to a longer-lasting experience involving interaction with other people, conversations, exploring a virtual environment created from real images, etc.	13.60%

SA06	How would you self-assess your experience with computer/web page programming?	WA03	I would carry out immersive virtual tourism (3D glasses) related to visiting environments created virtually, with virtual shops, virtual accommodations, virtual attractions different from real images, etc.	9.55%
SA05	How would you self-assess your experience with virtual environments such as Second Life or the Metaverse?	WA04	I would carry out a virtual tourism experience created from real images as a preliminary step to select a tourist destination I would physically travel to.	7.95%

Conversely (Table 7), it is detected that the greater the number of tourist activities carried out per year (ACT), the lower the intention to develop immersive virtual tourism experiences. Higher decreases in more profound and longer activities are perceived, from WA02 by -28.23% to WA01 by -11.55%. Regarding age (AGE), there is a clear relation between younger profiles and willingness to be involved in this type of activity. To a lesser extent (11.70% on average), there is also an inverse relationship between positive self-assessment in experiences with technology (SA01) and WA02, WA03 and WA04, so having a certain level of technology knowledge is not a condition that favours interest in immersive virtual tourism, contrary to what might be expected.

Table 7. Items with the most inverse influence in willingness to practise immersive virtual tourism activities. Source: own research

ACT	Tourist activities (average per year)	WA02	I would carry out immersive virtual tourism (3D glasses) related to a longer-lasting experience involving interaction with other people, conversations, exploring a virtual environment created from real images, etc.	-28.23%
AGE	Age	WA03	I would carry out immersive virtual tourism (3D glasses) related to visiting environments created virtually, with virtual shops, virtual accommodations, virtual attractions different from real images, etc.	-25.01%
ACT	Tourist activities (average per year)	WA03	I would carry out immersive virtual tourism (3D glasses) related to visiting environments created virtually, with virtual shops, virtual accommodations, virtual attractions different from real images, etc.	-18.55%
AGE	Age	WA01	I would carry out immersive virtual tourism (3D glasses) related to visits to specific environments built from real images, such as the interior of a monument, a virtual visit to a museum or a natural location of particular landscape value, to get to know it remotely.	-14.30%

ACT	Tourist activities (average per year)	WA04	I would carry out a virtual tourism experience created from real images as a preliminary step to select a tourist destination I would physically travel to.	-13.72%
SA01	How would you self-assess your overall experience with technology?	WA02	I would carry out immersive virtual tourism (3D glasses) related to a longer-lasting experience involving interaction with other people, conversations, exploring a virtual environment created from real images, etc.	-13.55%
AGE	Tourist activities (average per year)	WA02	I would carry out immersive virtual tourism (3D glasses) related to a longer-lasting experience involving interaction with other people, conversations, exploring a virtual environment created from real images, etc.	-13.50%
SA01	How would you self-assess your overall experience with technology?	WA04	I would carry out a virtual tourism experience created from real images as a preliminary step to select a tourist destination I would physically travel to.	-12.03%
ACT	Tourist activities (average per year)	WA01	I would carry out immersive virtual tourism (3D glasses) related to visits to specific environments built from real images, such as the interior of a monument, a virtual visit to a museum or a natural location of particular landscape value, to get to know it remotely.	-11.55%
SA01	How would you self-assess your overall experience with technology?	WA03	I would carry out immersive virtual tourism (3D glasses) related to visiting environments created virtually, with virtual shops, virtual accommodations, virtual attractions different from real images, etc.	-9.56%

5. CONCLUSIONS AND DISCUSSION

This study allows for knowing the influence of the socio-demographic profile and the self-evaluation in technology, video games and VR on the willingness to carry out different immersive virtual tourism activities. Regarding the theoretical contributions detected and replying to RQ1 (which tourist profile is more receptive to carrying out virtual tourism activities?), it is observed how the socio-demographic profile is shown to be a determining factor, as older age and a more significant number of tourist activities carried out per year imply a lower willingness to experience immersive virtual tourism. Gender and population of the place of residence are not shown as prominent conditioning variables in any case. Given that small groups of pioneers adopt new technologies, marketing actions should focus on the population groups defined in this study. This study points out the socio-demographic characteristics of these pioneers of virtual tourism. Regarding RQ2 (what role does previous experience in

technology, video games, VR and programming play in the willingness to carry out virtual tourism activities?), it can be stated that knowledge of VR and online games imply a greater willingness to carry out immersive virtual tourism activities. Still, the contrary happens with a positive self-assessment in the experience with technologies, generally raised, as it includes respondents who are receptive to tech-world and electronic devices but not necessarily related to video games and/or VR. Therefore, advertising and marketing actions related to virtual tourism should be oriented towards targeting users who have prior knowledge of virtual reality and previous experience with online games. Thes“ groups would b” the "early adopters," who would help this type of service penetrate society. In this way, the ideal profile of a potential consumer of immersive virtual tourism experiences corresponds to a young person (mainly an adolescent) who carries out few tourist activities per year, with a positive self-assessment regarding experiences in online video games and VR, bearing in mind that having experience in the world of technology is not a condition related to this willingness to develop these activities. As Buhalis et al. (2023) pointed out, the commercial possibilities of tourism developed in virtual environments are still to be developed and are important, with the potential to enhance and enrich physically based travel. In a context characterized by innovation and the development of new services, entrepreneurship is key (Kraus et al., 2023; Lacarcel & Huete, 2023; Medina et al., 2022; Tagscherer & Carbon, 2023; Martínez et al., 2022).

The practical application of this work consists of using the model obtained, which allows for estimating the willingness to carry out different immersive virtual tourism activities based on the socio-demographic profile and the self-assessment in technology, video games and VR of the respondent. Thus, a collection of input values, easily customisable by the researcher, will produce particular output values. This utility may interest companies dedicated to offering this experience to discover their potential customer profile and adapt their offer (Rai & Srivastava, 2013). Proactive and innovative activity in the tourism sector is essential in order to maintain a high level of competitiveness (Fraj et al., 2015; Gabčanová, 2012; Urbancová, 2013; Hurtado-Palomio, et al., 2022; Olczyk et al., 2022; Guaita et al., 2021; Tsai et al., 2009). However, the limitations of this study should be considered, given that the sample of respondents is limited to a single country. Moreover, given the rapid advances in technology, this fieldwork should be repeated with some frequency.

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