CAN SMART TECHNOLOGIES ENHANCE CO-CREATION AND DESTINATION PERCEIVED AUTHENTICITY? CULTURE'S MODERATING EFFECT

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Abstract

When it comes to tourists' selection of the next destination to visit, among the current trends are the search for authenticity and the search for experiences, and technology plays a key role in satisfying both of these desires. The aim of this research is to better understand, from a cross-cultural perspective, how smart technologies may influence the co-creation of tourism experiences and enhance the perception of authenticity that travelers increasingly look for in a tourist destination. The study seeks to determine the moderating role of the tourist's national culture—in terms of the "uncertainty avoidance" dimension—in the following effects: 1) smart technology use on the consumer's search for destination authenticity; 2) smart technology use on tourism-experience co-creation; and 3) co-creation on destination perceived authenticity. The results suggest that it is important for destinations and suppliers of tourism services to implement smart technologies that enhance co-creation, as these affect the perceived authenticity of the destination visited—a growing contributor to tourist satisfaction.

Keywords: *Smart tourism technology, Co-creation, Destination perceived authenticity, Uncertainty avoidance*

1. Introduction

When a major public health crisis occurs, even though tourism activity eventually recovers (UNWTO, 2023), a change in tourist behavior has been observed, in the sense that many travelers now demand more unusual experiences—of the kind that constitute a personal challenge or impact on their everyday behavior in some way (Kirillova et al., 2017). This search for the new and the challenging is a key factor that tourism service providers and destinations must take into account if they are to remain competitive (Amaro et al., 2023). Furthermore, individuals increasingly seek to participate directly in creating their own tourism experiences and designing what they want to see and do at the destination (Cai et al., 2020; Yu et al., 2020). This is because many travelers are no longer looking for commonplace, "typical" products but, rather, want to experience greater immersion and integration in the place, enjoy direct interaction with residents, and acquire knowledge and understanding through greater awareness of the local culture (Kim and Kim, 2020; Loureiro, 2020). The genuine, real, or true experiences that tourists now look for are thus related to the authenticity of the destination itself (Shi et al., 2022). The literature has found that perceptions of this authenticity can be improved through the co-creation of tourism experiences between the visitor and the destination, because active tourist participation can lead to a deeper understanding and appreciation of its unique characteristics, thus contributing to a more authentic tourism experience (Mohammadi et al., 2021).

Importantly, both perceived authenticity and co-creation can be improved with the judicious use of the smart technologies already available in tourist destinations. Examples include 5G, apps, social networks, artificial intelligence (AI), augmented reality, virtual reality (VR), the Internet of Things, radio frequency identification, free local Wi-Fi access throughout the destination, cryptocurrency, and blockchain, among others (Buhalis et al., 2019). Different authors show that, in order for people to want to use smart technologies, these must present four

attributes: accessibility; informativeness; interactivity; and personalization (Huang et al., 2017; Lee et al., 2018).

In the tourism context, the characteristics of these technologies and the benefits they offer can support the co-creation of experiences between tourists and destinations. As such, they can become an important predictor of a memorable tourist experience (Tussyadiah and Fesenmaier, 2009). This is because, in many markets, including tourism, co-creation enables customers and firms to jointly create value (Buhalis et al., 2019). On this point, recent studies demonstrate the relationship between technology and the tourist experience (Sustacha et al., 2023), on the basis that technology can make it easier for the destination to provide experiences that stand out in the minds of travelers and that help ensure they will want to repeat the visit (Kim, 2014; Pearce and Packer, 2013). Other authors, including Shekhar and Valeri (2024) and Gao et al. (2022), point to the importance of conducting research to better understand the impact of technology on the authenticity of the tourist destination, as technology can contribute to enhancing this via innovation or greater personalization of the tourist experience (Pratisto et al., 2022; Sustacha et al., 2023). For example, technology-enhanced tourism activities that lead to a more immersive and interactive experience (Gao et al., 2022) can have this effect. Greater knowledge of the influence of technology on the co-creation of destination experiences is also needed in the literature (Mohammadi et al., 2021) because, through technology use, tourists' co-creation may be supported by having access to tools that enhance, for example, their connectivity with other tourists, with service providers, or with destination residents (Fu and Lehto, 2018; McLeay et al., 2019).

Turning to the question of how tourists interpret their experiences, their culture of origin has been found to play an influential role (Kim, 2013). In international contexts such as tourism, "uncertainty avoidance" is considered the most significant cultural dimension to study (Lee et al., 2013; Litvin et al., 2004). Tourists' national culture influences their behavior at all levels of

their experience at the destination, including their choice of activities and their degree of satisfaction (Manrai and Manrai, 2011; Huang and Crotts, 2019). Culture also affects how readily a society accepts a technology to begin with, and how it responds to innovations (Erumban and De Jong, 2006; Van Everdingen and Waarts, 2003; Yaveroglu and Donthu, 2002). This is because certain inherent cultural characteristics lend themselves to a greater or lesser predisposition toward using a given technology, and influence how and why people use it—for example, during the tourist experience (Coves-Martínez et al., 2023). However, no research, to date, has examined how culture may influence the degree to which smart technologies can support destination authenticity or the formation of value through the co-creation of tourism experiences, thanks to visitors' interaction with the destination and immersion in it. Previous studies call for more research into the question of how culture may be influential in the effect of technology use among tourists on tourist destinations (Coves-Martínez et al., 2023).

In light of these findings from the literature, the aim of the present study is to determine, from a cross-cultural perspective, how smart tourism technologies used at the tourist destination influence co-creation and destination perceived authenticity (hereinafter: DPA). The study seeks to determine the moderating role of tourist national culture, in terms of uncertainty avoidance, in: 1) the effect of technology use on the consumer's search for destination authenticity; 2) the effect of smart technology use on tourism-experience co-creation; and 3) the effect of co-creation on DPA. The results of this research highlight the importance of smart technologies in encouraging tourists to participate more actively in their experience at the destination and show how culture plays a role in this relationship.

2. Literature review and hypotheses

2.1 The influence of culture on technology and tourism

Culture is an abstract construct with an anthropological foundation that influences and molds individual perceptions, inclinations, and conduct. As such, it is extremely important in understanding consumer behavior (De Mooij, 2019). In recent years, there has been increasing research interest in the influence of culture on consumer behavior (Steenkamp, 2019; De Mooij and Hofstede, 2011). Cultural differences between societies are manifested in the attitudes, values, beliefs, and behaviors of individuals, which, in turn, influence their decision-making processes and purchasing behaviors (Hofstede et al., 2010). This reality affects almost all firms and all consumers, worldwide (Arnould and Thompson, 2018). Many of the extant studies dealing with intercultural consumer behavior employ the Hofstede dimensional model of national culture (De Mooij and Hofstede, 2011), which has long been considered the most relevant for cross-cultural research (Hsu et al., 2013; Jackson, 2020).

Previous studies dealing with culture have found that cultural dimensions affect how travelers live their tourist experiences at the destination (Huang and Crotts, 2019). The literature has also found that culture and technology acceptance are related (Coves-Martínez et al., 2023; Venkatesh and Davis, 2000). However, given that people's use of technology can be affected both by their national culture and by the characteristics of the technology itself, it is important to continue progressing toward a better understanding of the influence of culture on technology acceptance (Jan et al., 2022). According to Hofstede et al. (2010), culture comprises six dimensions: power distance, individualism/collectivism, masculinity/femininity, uncertainty avoidance, long-term vs. short-term orientation, and indulgence vs. moderation.

As noted earlier, the literature review shows that uncertainty avoidance is the most significant cultural dimension in international settings (Lee et al., 2013; Litvin et al., 2004). It is also one of the most widely-used dimensions in cross-cultural studies in the tourism–

technology field (Chopdar et al., 2018; Coves-Martínez et al., 2023), particularly because tourism services are essentially intangible experiences (Kandampully, 2000). This dimension reflects the degree to which members of a culture feel threatened by ambiguous or unknown situations. All societies have to tolerate the fact that the future can never be known, but different cultures have different ways of managing the anxiety that this provokes (Hofstede, 2024). On this point, various authors find that those cultures associated with low uncertainty avoidance are more predisposed to innovate, try new products or experiences, and use technology (Franque et al., 2020; Lynn and Gelb, 1996). Tourists from such cultures tend to feel more comfortable with uncertainty and present certain characteristics related to greater risk-taking, greater orientation toward innovation, or entrepreneurship (Lee et al., 2013; Yaveroglu and Donthu, 2002). In addition, they are less likely to see technologies as a threat to traditional procedures or customs (Lynn and Gelb 1996; Shore and Venkatachalam, 1996). In contrast, societies characterized by high uncertainty avoidance have a strong attachment to customs and traditions, as well as being resistant to change (Hofstede, 1984), and their organizations are characterized by highly conservative management practices (Hofstede, 2001). The most highly uncertainty-avoidant societies value security and are less inclined to accept innovations (La Ferle et al., 2002; Lee et al. 2013; Van Everdingen and Waarts, 2003; Yeniyurt and Townsend, 2003). These cultural differences have been confirmed by several studies in the technology–tourism sphere. These include the work of Coves-Martinez et al. (2024), dealing with travel apps; Wang et al. (2017), on airline travel technology; and Jung et al. (2018), in the context of augmented reality.

In the tourism field, specifically, travelers' culture of origin is an important concept that affects their behavior and how they live their tourist experiences at the destination. Tourists from less uncertainty-avoidant cultures tend to be more innovative and prefer to experience greater cultural immersion in the life of the destination (Manrai and Manrai, 2011; Money and

Crotts, 2003), while tourists from uncertainty-avoidant societies tend to want to minimize risk in their experiences and avoid uncertainty in their quest for leisure (Hofstede 2011; Huang and Crotts, 2019).

2.2 The effect of uncertainty avoidance on the relationship between smart tourism technology use and DPA

The search for authenticity has become one of the key trends analyzed in the academic literature on tourism (Belhassen et al., 2008, p. 668). This interest is due to the fact that authenticity helps destinations develop and maintain strong relationships with travelers, providing numerous benefits to both parties (Kumar et al., 2023). Once at the destination, tourists look to experience the local culture directly, to integrate themselves into it, and to enjoy a true sense of cultural immersion. It is for this reason that perceived authenticity has been identified as a basic concept in tourism marketing (Kim and Kim, 2020; Loureiro, 2020). Different researchers identify this concept as an individual's overall evaluation of their experience in a specific tourist destination (Park et al., 2019). According to authors such as Spielmann et al. (2018), authenticity comprises three factors: **conformity,** which underlines the importance of meeting the tourist's expectations vis-à-vis their experiences and value-creation at the destination; **transformation,** which points to the role of feelings and emotions surrounding the individual's tourism experience; and **realness,** which relates to the tourist's immersion in the experience in order to perceive authenticity. The effect of perceived authenticity on key behavioral variables has also been studied in the literature. Such variables include destination image (Lu et al., 2015), satisfaction (Girish and Chen, 2017); destination loyalty (Kumar et al., 2023; Park et al., 2019; Yi et al., 2017); and engagement (Kim and Kim, 2020). In light of these perspectives, it is helpful for destinations to understand the antecedents of this construct.

It is also important to highlight the significant transformation witnessed in the tourism sector in recent years thanks to the development of information and communication technologies (ICTs). However, one of the continued challenges that all new technologies face in the sector is how to convey the authenticity of the experience offered by destinations (Zhu et al., 2023). Technology can play a major role in shaping DPA because it offers a set of tools that can help realize tourists' desire for exposure to the genuine and the authentic (Dong et al., 2023). It can help improve this perceived authenticity by enhancing visitors' overall experience of a destination, bringing innovation to that experience, and rendering it more immersive, memorable, appealing, and personalized (Neuhofer et al., 2012; Pratisto et al., 2022; Sustacha et al., 2023). Thus, by providing immersive and interactive experiences, technology-enhanced tourism experiences—using VR, for instance—can contribute to perceived authenticity, enabling tourists to feel a genuine connection to the place (Neuhofer and Buhalis, 2014). In sum, achieving DPA enhanced by technology requires destinations to leverage ICTs to create immersive experiences that are both appealing and authentic for tourists. By incorporating elements of authenticity, these technologies can improve visitors' overall satisfaction and enjoyment of the travel experience (Gao et al., 2022). While previous studies deal with the relationship between technology and authenticity, there has been no published research, to date, that studies how the tourist's culture of origin may influence the effect of technology use on their perception of a destination's authenticity. The present study seeks to address that gap.

Tourists from less uncertainty-avoidant cultures tend to be more innovative when it comes to using technologies (Abbasi et al., 2015; Manrai and Manrai, 2011; Hung and Chou, 2014). Furthermore, certain key factors that are known to contribute to perceived authenticity—such as a sense of connection with the place or interactions with the community (Kim and Kim, 2020)—are also associated with cultures that are not prone to uncertainty avoidance. In view of this association, it is logical to assume that, being more inclined to use smart technologies,

tourists from such cultures will take greater advantage of activities or experiences that facilitate more intense participation and immersion in the destination, which are key contributors to perceived authenticity (Spielmann et al., 2018). In contrast, for tourists from highly uncertainty-avoidant cultures, technology is not expected to play such a powerful role in achieving perceived authenticity, since they are more resistant to change and tend to display less acceptance of technological innovations (Lee et al., 2013). What is more, they also tend to focus more on leisure and off-the-shelf experiences, rather than true immersion; they are not typically risk-takers; and they generally prefer to follow established rules or their own traditions (Hofstede 2011; Huang and Crotts, 2019; Manrai and Manrai, 2011). Based on the foregoing reasoning, the following research hypothesis is proposed:

H1: The use of smart tourism technologies exerts a significant and positive effect on destination perceived authenticity, this effect being greater for tourists from less uncertainty-avoidant cultures than for those from more uncertainty-avoidant cultures.

2.3 Effect of uncertainty avoidance on the relationship between smart tourism technology use and co-creation

According to the principles of service-dominant logic (SDL), firms cannot create value *per se* but can only offer value propositions and *co-create* value with consumers. Hence, value co-creation is a complex process resulting from interactions between consumers and other agents (Frías-Jamilena et al., 2017). Value co-creation can be defined as the value that arises out of consumers' interactive, joint, collaborative, or personalized activities with the brand (Carvalho and Alves, 2023). In the tourism sector, in the online context, co-creation derives from the interactions between tourists and destination agents through online media (Lam et al., 2020). Through online media, then, consumers participate in co-creating the image of the brands with which they interact (Borges-Tiago et al., 2021).

However, the literature has yet to examine in depth the relationship between value co-creation and brand image, and certainly not in the online context. Among the exceptions, we find the work of Foroudi et al. (2019), which demonstrates the relationship between value co-creation in online media and brand image in the higher education context.

According to several authors, technology supports co-creation in the tourist experience (Neuhofer et al., 2014; Sughatan and Ranjan, 2019). Technology use has been found to affect co-creation before, during, and after the tourist experience (Carvalho and Alves, 2023; McLeay et al., 2019). For example, co-creation is positively related to the use of social networks (Buonincontri et al., 2017; Suntikul and Jachna, 2016), online destination platforms (Zhang et al., 2018), interactive technologies applied to tourism (Ponsignon and Derbaix, 2020), and hotel client management systems (Neuhofer et al., 2012).

In view of these findings, it follows that there is likely a positive relationship between technology use and co-creation. However, there is no previous research analyzing how this relationship may be moderated by the tourist's culture of origin—a question addressed in the present study. Individuals from less uncertainty-avoidant cultures are characterized by their focus on personal freedom, independence, greater risk-taking, and tolerance (Franque et al., 2020; Van Everdingen and Waarts, 2003). All of these characteristics are associated with key elements of co-creation, such as: active participation in experiences that involve immersion in the destination (Carvalho and Alves, 2023); interaction and information exchange with other tourists, suppliers, and residents (Campos et al., 2018); and sustainable development (Prebensen et al., 2014). Hence, it is anticipated that the influence of technology on co-creation will be greater among tourists from cultures that are not highly uncertainty-avoidant. Conversely, individuals from more uncertainty-avoidant cultures have lower rates of technology acceptance, due to certain characteristics specific to these cultures—such as resistance to change or risk aversion—that lead them to be less inclined to use innovations (Gales, 2008; Van Everdingen

and Waarts, 2003). In these less flexible, less open societies, consumers are likely to be slower to adopt new technologies (Hofstede et al., 2010). In turn, as tourists, they prefer less immersion and less innovation at the destination (Hofstede, 2011; Money and Crotts, 2003). Hence, the following research hypothesis is proposed:

H2: The use of smart tourism technologies exerts a significant and positive effect on co-creation, this effect being greater among tourists from less uncertainty-avoidant cultures than for tourists from more uncertainty-avoidant cultures.

2.4 Effect of uncertainty avoidance on the relationship between co-creation and DPA

Co-creation entails the active participation of customers in the creation of products or services using resources such as time, effort, or skill (Sugathan and Ranjan, 2023). This concept is especially relevant in the tourism context because it helps service providers to be more competitive by offering unique and memorable experiences that require customer participation and interpersonal connection (Gao et al., 2022). The genuine, real, or true experiences that tourists seek are related to the authenticity of the destination (Shi et al., 2022). In turn, authenticity is concerned with the originality of objects, places, or symbols found at the destination, extending to tourists' personal experiences and emotions during their visit (Gao et al., 2022). Active participation can lead to a deeper understanding and appreciation of the unique characteristics of the place, thus contributing to a more authentic experience (Mohammadi et al., 2021).

Against this backdrop, co-creation can improve DPA by directly involving tourists in various activities and experiences that enable them to interact with the local culture, environment, and people. For example, in the context of food and wine tourism, co-creation can involve tourists in activities such as cooking classes, wine tasting, or organized tours to learn about local traditions and interact directly with local producers and suppliers (Rachão et

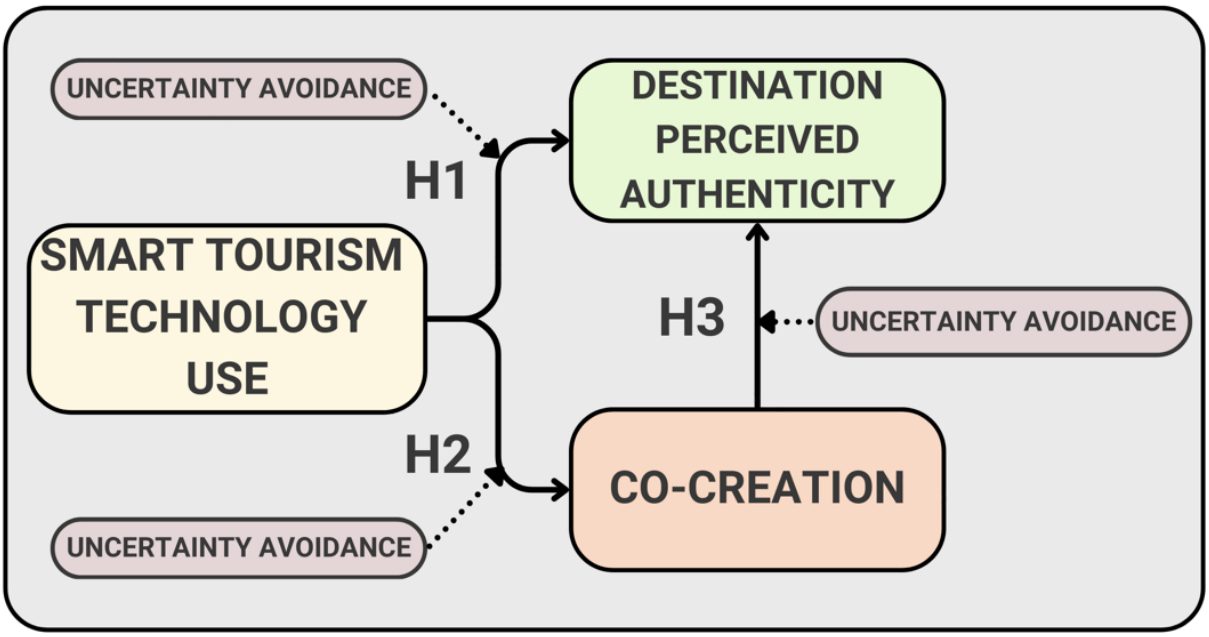
al., 2021). Similarly, co-creation can involve tourists in activities such as workshops, entertainment shows, or guided tours, where they can learn first-hand about local history, art, and traditions (Liu et al., 2021).

In light of the findings of previous studies, co-creation is expected to influence DPA. But this relationship may also be influenced by the visitor's culture of origin—an effect not demonstrated by the literature, to date. Tourists from cultures characterized by being less uncertainty-avoidant are more innovative, more persevering in their efforts to adapt to unfamiliar settings, and more likely to engage in activities and experiences that enable them to come into direct contact with the local culture, environment, and people (Hofstede, 2011; Manrai and Manrai, 2011; Huang and Crotts, 2019). Furthermore, coming into contact with locals and other travelers in a natural, authentic, and friendly way can mark the beginning of genuine, lasting relationships (Fu, 2019; Yi et al. 2017). Certainly, this active participation can lead to a deeper understanding and appreciation of the unique characteristics of the destination, thus contributing to a more authentic experience.

Therefore, travelers from this type of culture, who are more inclined to engage in co-creation, will perceive the destination to be more authentic than tourists from cultures characterized by high levels of uncertainty avoidance. Travelers from highly uncertainty-avoidant cultures prefer a more predictable, structured environment and are not so naturally inclined to immerse themselves in the local culture as they prefer to maintain their own customs even while at the destination (Rasmi et al., 2014). Doing so helps them avoid uncomfortable situations that may challenge their values and social norms and that involve a degree of risk and uncertainty (Hofstede, 2011; Manrai and Manrai, 2011). Equally, however, this outlook will also lead them to develop weaker perceptions of destination authenticity, precisely because they do not allow themselves to have a complete tourist experience. The following research hypothesis is therefore proposed:

H3: Co-creation exerts a significant and positive effect on destination perceived authenticity, this effect being greater among tourists from less uncertainty-avoidant cultures than tourists from more uncertainty-avoidant cultures.

Figure 1. Proposed research model



3. Methodology

3.1 Sample design and data collection

The initial sample comprised 1,374 tourists (685 Spanish and 689 German), all of whom had visited Spain in the six months prior to responding to the survey. The participants were selected through an online user panel managed by Dynata SL. The fieldwork was conducted between March 4 and May 10, 2022, and was based on a self-administered questionnaire organized by the online panel. To detect any atypical cases, the Mahalanobis distance was used (Hair et al., 2018), resulting in a final sample of 1,350 tourists (681 Spanish and 669 German). After observing that the existence of invariance could not be affirmed (Appendix 1) and confirming that there was a bias arising from the culturally different samples, to correct this problem, the

sample was standardized to eliminate cross-cultural differences that were not due to the variables under study (Dolnicar and Grün, 2007; Van de Vijver and Leung, 1997).

Of the total sample, 46% were women and 54% men; 70% were between 25 and 54 years old; 47% had studied to university level; 42% had a monthly income of between €1,800 and €3,600; and 50% had spent between €51 and €100 per person per day on their trip. Most of those surveyed (75%) were in paid work, had visited the destination for leisure purposes (83%), and usually traveled accompanied by their partner (57%). On the basis of the analyses conducted (see Appendix 2), it can be affirmed that the sociodemographic variables were equitable between the Spanish and German groups and that no bias was present in the research.

Tourists of these two particular nationalities were chosen for the sample because Spain and Germany present significant differences from one another in their respective scores in the uncertainty-avoidance cultural dimension (Spain: 86; Germany: 65). Furthermore, German tourists are one of the nationalities that most visit Spain (National Institute of Statistics of Spain, 2023), with all the economic and social impact that this implies for this tourist destination.

3.2 Measurement scales

Based on the literature review, scales were identified to measure the variables studied in the research (see Appendix 3). To measure smart tourism technology use, a list of smart technologies that are typically found in tourist destinations—according to authors such as Buhalis et al. (2019), Liberato et al. (2018), or Wang et al. (2016)—was included in the questionnaire. To measure DPA, a scale was adapted from the work of Kim and Kim (2020), which was originally based on the research of Spielmann et al. (2018). The scale used here comprised three dimensions: conformity, reality, and transformation. To measure co-creation, a scale adapted from Frías-Jamilena et al. (2017) was used. All scales were 7-point Likert scales, ranging from 1 (“never”) to 7 (“often”) in the case of technology use; and 1 (“totally disagree”) to 7 (“totally agree”), in the case of authenticity and co-creation.

4. Results

4.1 Analysis of the validity of the measurement scales

Before testing the hypotheses, the construct scales were validated using a confirmatory factor analysis (CFA). The maximum likelihood estimation method (MLM) was used for this purpose, as the sample did not follow a normal distribution (Bollen, 1989). As shown in Table 1, the model presented an acceptable level of individual reliability, as the relationship between each item and its respective dimension was statistically significant and the standardized loadings were greater than 0.5 in all cases (Anderson and Gerbing, 1988). Regarding internal consistency, the composite reliability (CR) values were greater than 0.70 and the variance extracted (AVE) values were greater than 0.50 (Hair et al., 2018). Therefore, the measurement model can be considered reliable (Table 1).

Table 1. Confirmatory factor analysis

Causal relationships			**Standardized estimators**	**z**	**p**	**CR**	**AVE**
TECH	→	TECH1	0.52	-	0		
TECH	→	TECH2	0.77	10.29	0		
TECH	→	TECH3	0.57	10.50	0		
TECH	→	TECH4	0.77	10.30	0		
TECH	→	TECH5	0.96	9.91	0		
TECH	→	TECH6	0.84	10.18	0		
TECH	→	TECH7	0.68	10.31	0		
TECH	→	TECH8	0.56	10.16	0		
TECH	→	TECH9	0.51	8.98	0	**0.93**	**0.51**
TECH	→	TECH10	0.84	9.96	0		
TECH	→	TECH11	0.61	10.06	0		
TECH	→	TECH12	0.92	9.89	0		
TECH	→	TECH13	0.84	9.95	0		
TECH	→	TECH14	0.98	9.71	0		
TECH	→	TECH15	0.99	9.75	0		
TECH	→	TECH16	0.98	9.80	0		
TECH	→	TECH17	0.93	9.59	0		
CONFORMITY	→	CONFORMITY1	0.69	-	-		
CONFORMITY	→	CONFORMITY2	0.76	26.90	0		
CONFORMITY	→	CONFORMITY3	0.81	28.13	0	**0.89**	**0.68**
CONFORMITY	→	CONFORMITY4	0.86	29.54	0		
CONFORMITY	→	CONFORMITY5	0.82	26.68	0		
REALITY	→	REALITY1	0.86	-	-		

REALITY →	REALITY2	0.85	39.94	0	**0.86**	**0.67**
REALITY →	REALITY3	0.75	34.19	0		
TRANSFORMATION →	TRANSFORMATION1	0.71	-	-	**0.82**	**0.66**
TRANSFORMATION →	TRANSFORMATION2	0.85	20.38	0		
TRANSFORMATION →	TRANSFORMATION3	0.78	17.82	0		
AUTHENTICITY →	CONFORMITY	0.99	-	-	**0.96**	**0.88**
AUTHENTICITY →	REALITY	0.96	28.53	0		
AUTHENTICITY →	TRANSFORMATION	0.86	16.76	0		
CO-CREATION →	CO-CREATION1	0.85	-	-	**0.88**	**0.65**
CO-CREATION →	CO-CREATION2	0.84	37.78	0		
CO-CREATION →	CO-CREATION3	0.70	20.21	0		
CO-CREATION →	CO-CREATION4	0.83	35.12	0		

The discriminant validity of the scales was also verified, by analyzing the correlations between the dimensions. This showed that the correlations were lower than the square root of the AVE of each variable. It can be observed from Table 2 that the square roots of all the AVEs were greater than the elements in the off-diagonal. Therefore, the variables measured in this study can also be considered to present discriminant validity.

Table 2. Evaluation of discriminant validity

VARIABLES	TECHNOLOGY	CONFORMITY	REALITY	TRANSFORM.	CO-CREATION
TECHNOLOGY	**0.72**				
CONFORMITY	0.37	**0.82**			
REALITY	0.36	0.78	**0.82**		
TRANSFORM.	0.32	0.80	0.79	**0.81**	
CO-CREATION	0.60	0.59	0.57	0.51	**0.81**

4.2 Testing the hypotheses

To test the research hypotheses, the psychometric properties of the proposed model were estimated and evaluated. To this end, a structural equation model (SEM) was used (Figure 1), employing the maximum likelihood estimation method combined with bootstrapping (Yuan and Hayashi, 2003). The software used for data analysis was Rstudio 1.3.959. The results of the model suggested acceptable fit indices, according to the thresholds recommended in the

literature (Hair et al., 2018; Mathieu and Taylor, 2006) (χ 2(211) = 1207.39, p = 0.000; CFI = 0.93; NFI=0.92, NNFI=0.92, IFI= 0.93, TLI=0.92, RMSEA = 0.08, SRMR=0.06).

The results of the analyses (Table 3) show that, contrary to expectations, technology use does not appear to exert an influence on DPA either in the case of Spanish tourists (ß =-0.01, p = 0.62) or German tourists (ß = -0.03, p = 0.28). Therefore, H1 does not find empirical support. Regarding the relationship between technology use and co-creation (H2), the results point to a positive and significant relationship among Spanish tourists (ß = 0.39, p = 0.00) and Germans (ß = 0.49, p = 0.00) alike. However, there are differences between the two groups (p= 0.02), with the influence being greater for tourists from Germany (a more uncertainty-tolerant culture) than for tourists from Spain (a more uncertainty-avoidant culture). Therefore, it can be affirmed that cultural dimensions do moderate the relationship and that H2 obtains empirical support. Regarding H3, the results determine that co-creation positively and significantly influences DPA among both Spanish (ß = 0.38, p = 0.00) and German (ß = 0.48, p = 0.00) tourists, this influence being significantly greater for the German travelers (that is, from a less uncertainty-avoidant culture) (p= 0.08). Therefore, H3 finds empirical support.

Table 3. Relationships

Regressions	**SPAIN**			**GERMANY**			**Differences test**	**Hypothesis**
	Estim.	**p**	**Z-value**	**Estim.**	**P**	**Z-value**		
Technology use ⟶ Authenticity	-0.01	0.62	-0.49	-0.03	0.28	-1.07	-	H1
Technology use ⟶ Co-creation	0.39	0	12.41	0.49	0	16.58	0.02*	H2
Co-creation ⟶ Authenticity	0.38	0	10.51	0.48	0	9.92	0.08.	H3

Key: Signif. codes: 0 ****; 0.001 ***; 0.01 **; 0.05 *; 0.1.; 1

5. Discussion of the results and conclusions

Growing competitiveness in the tourism sector has led tourism providers and destinations to offer experiences that help visitors perceive the destination as authentic. Increasingly, many tourists look for experiences that provide complete immersion in the destination's culture so that they can feel a sense of connection to the place and genuine interaction with the residents. Such travelers also seek knowledge of locals' traditions and values, a world away from typical products aimed specifically at tourists (Kirillova et al., 2017). One way to help tourists perceive the destination as more authentic is through co-creation (Rihova et al., 2018). Co-creation responds to a growing demand among certain tourists that calls for suppliers and destinations to enable them to actively get involved in generating their own tourism experiences (Cai et al., 2020). By taking this approach to their vacations, tourists can successfully perceive greater authenticity and achieve experiences that lead to a genuine personal transformation that positively affects day-to-day life for the individual, even once they return home after their holiday (Kirillova et al., 2017).

The smart technologies that are used in tourist destinations help to meet this challenge by bringing tourists closer to the heart of the place, facilitating access to relevant information, personalizing tourist experiences, or bringing heritage to life with appealing resources such as VR or AI (Pratisto et al., 2022; Suganthn and Ranjan, 2019). Many smart technologies are already part of consumers' daily lives (Wang et al., 2016) and, thus, affect how tourists plan their trips, organize their experience while at the destination, and even follow up on that experience post-travel (Coves-Martínez et al., 2023). With this in mind, the present study makes several contributions to the literature.

First, contrary to expectations, technology use was found not to influence DPA. This is likely due to the fact that smart technologies are already firmly embedded in the daily lives of tourists, meaning that it does not constitute a novel proposition that makes a strong impact on

how they perceive the destination in terms of its authenticity. This finding is consonant with the study by Coves-Martínez et al. (2023), which concluded that, when individuals are already familiar with smart tourism technologies, they do not find them fun; rather, using them becomes unremarkable and mundane, which ultimately dampens satisfaction with the technology, for instance. Furthermore, the digital transformation of tourism has given rise to debate over the precise role of technology in shaping the authenticity of destinations and experiences. Authors such as Gao et al. (2022) argue that technology itself does not directly influence destination authenticity per se; rather, tourists' *perceptions* and *interpretations* of authenticity are shaped through the technology they use. It is also important to note that technology alone cannot guarantee perceived authenticity. While technology can *enhance* tourism experiences, ultimately it is the destination's unique heritage and cultural offerings—and its commitment to conserving these resources—that form the bedrock of its authenticity (Kirillova et al., 2017). On a related point, authors including Grundner and Neuhofer (2021) argue that technologies such as AI can help improve personalization and efficiency but can also lead to a loss of human interaction and a more standardized and *less* authentic experience.

Second, it is demonstrated here that smart technology use during the tourist experience influences co-creation, with this effect being more marked among German tourists (that is, from a culture associated with being relatively uncertainty-avoidant). This can be explained by the fact that these tourists prefer the greater immersion in the destination's culture that co-creation provides, thanks to the personalization and exchange of experiences in real time that are facilitated by technologies such as smart devices and services (Femenia-Serra and Neuhofer, 2018). In contrast, for Spanish tourists (that is, from a more uncertainty-avoidant culture), although the effect of technology on co-creation is also evident in this case, the influence is smaller. This is because the characteristics of these cultures—such as lower tolerance of risk,

uncertainty, or ambiguity—predispose them to be less innovative and less enterprising when it comes to applying technology for co-creation purposes.

Third, the influence of co-creation on DPA is verified in this study, with culture being a key factor that moderates this relationship: co-creation exerts a greater effect among German tourists (whose culture is less uncertainty-avoidant). This is because co-creation has a component of active participation and collaboration with the destination's environment, both of which create experiences (Sugathan and Ranjan, 2019). This finding is also linked to perceived authenticity, which is influenced by interaction with, learning about, and understanding of the destination (Hofstede, 2011; Kim and Kim, 2020). However, co-creation has less influence on perceived authenticity for tourists from cultures that are more uncertainty-avoidant (in this case, the Spanish culture). This type of society is characterized by a strong attachment to traditions and norms, less flexibility when it comes to dealing with change or novelty, and less tolerance for unfamiliar cultures (Hofstede et al., 2010). Aside from the fact that such tourists focus on the search for pleasure and ready-made experiences, often with no desire to get to know the destination they are visiting in any depth (Hofstede, 2011), the emphasis on traditions and norms leads to less co-creation. Hence, the influence of the latter on perceptions of destination authenticity will also be less marked.

6. Professional implications, limitations, and future lines of research

6.1. Professional implications

From a management perspective, providers of tourism products and services must compete in a market in which certain kinds of tourists now seek authentic experiences that provide the opportunity to connect on a deeper level with the destinations they visit (Kumar et al., 2023). Therefore, the first implication of this research for destination professionals is that this understanding is crucial when it comes to showcasing their authenticity and making it possible

for tourists, through co-creation, to be directly involved in shaping their own experience by interacting with local suppliers and residents. This objective is fundamental because it leads to a greater intention to revisit the destination and greater tourist satisfaction (Meng and Cui, 2020).

Second, the study finds that suppliers and managers of tourist destinations should actively implement smart technologies—such as chatbots or virtual environments—as these directly affect co-creation and indirectly affect perceived authenticity. This contribution is in line with the findings of Richards (2020). Those studies, which focus on hotel chains, conclude that these tourism firms must co-create value with guests (for example, by incorporating knowledge through big data) in addition to maintaining open collaboration with employees and customers. For example, performance workshops or guided tours can be an effective way to learn about art, history, or local traditions. As indicated by Mohammadi et al. (2021), this active participation can lead to a deeper understanding and appreciation of the unique characteristics of the destination, thus contributing to a more authentic experience.

Third, given the global nature of the tourism sector, destination professionals must consider the culture of origin of their visitors, since culture affects how tourists relate to the destination and engage with the activities and experiences on offer. Tourist national culture also influences technology use. Destination managers must therefore create high-quality tourism programs, specifically with co-creation in mind, that account for these cultural differences when designing the tourist experience (De Carlos et al., 2019). In the case of uncertainty-avoidant tourists, destinations are advised to co-create experiences with them that enhance perceived authenticity while focusing on the fun and leisure aspects of their stay. In contrast, for tourists who are less uncertainty-avoidant, it is more important to offer experiences that take into account the use of smart technologies in the co-creation process, to foster DPA. This can be

achieved, for example, by using VR and AI programs to help tourists learn about the place, bring it to life for them, and immerse themselves in the local culture.

6.2. Limitations and future lines of research

Finally, this research presents certain limitations that serve as a starting point for future lines of research. First, it should be noted that many destinations depend mainly (or exclusively) on domestic tourism, especially in times of economic vulnerability (Canh and Thanh, 2020). Where this is the case, this dependence can limit exposure to a diverse range of cultures and, therefore, reduce a destination's capacity to effectively recognize cultural differences. Hence, when the destination does implement activities and experiences that attempt to take cultural differences into account, these may not be as effective as in more international destinations. In this scenario, both the destinations and their service providers should be sensitive to the specific characteristics of their *domestic* culture—for example, whether it is high or low on the uncertainty-avoidance scale—to ensure that the services, communications, activities, and experiences they provide are well suited to the cultural profile of their domestic visitors. Future studies could therefore be extended to destinations that do not depend so much on foreign tourists and observe the influence of the domestic national culture on authenticity and co-creation through technology.

Second, in using a single dimension (uncertainty avoidance) of Hofstede's cultural framework, we must note that this research framework is not without its critics. Some authors question the validity of Hofstede's original sample, for instance (Müller and Gelbrich, 2015). Hofstede's framework also presents certain limitations when it comes to dealing with the cultural complexity and diversity within each country (McSweeney, 2002) or the changes produced by globalization (Reisinger, 2009). However, despite such criticisms, it remains the

main framework employed by the literature for studying national culture (Sent and Kroese, 2022), and the framework's cultural values have recently been updated (see Hofstede, 2024).

Third, it would be interesting to test the effect of the culture of origin of tourists of other nationalities—such as, for example, British tourists, who have different scores in the cultural dimensions compared to Spanish and German tourists. Fourth, other moderating variables such as the type of tourism carried out could be included in the model. Finally, it would be interesting to incorporate into the research different variables derived from culture, such as tourists' cultural quotient (CQ), a key factor in adapting to foreign cultural environments (Ang and Van Dynne, 2015), and observe whether it influences technology use, destination authenticity, or co-creation.

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Appendix 1. ***Invariance test***

Model	Degrees of freedom (df)	AIC	BIC	Chi-squared	Chi-squared difference	df for the difference	p-value for the difference
M1	198	35499	36030	1144	-	-	-
M2	211	35536	35999	1207	49	13	0.00***
M3	221	35743	36154	1434	68	10	0.00***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Appendix 2. ***Chi-square Test***

Pearson's Chi-square	value	gl	Asymptotic significance (bilateral)
Gender	3.32	2	0.19
Age	1.57	1	0.21
Education	2.57	1	0.12
Income level	0.63	2	0.73
Daily vacation spend per person	2.44	1	0.12
Employment status	0.35	1	0.55
Purpose of visit to destination (leisure, work …)	1.40	1	0.24
Travel companion(s)	1.53	1	0.69

Appendix 3. Final items

What is your nationality?
What is your country of residence?
Have you taken a holiday trip within Spain in the last six months? ☐Yes ☐No
During that previous trip within Spain, which city or locality did you spend the most time in? And which province is that located in?

SMART TECHNOLOGY USE	**Please indicate the degree to which you used the following technologies on your last trip within Spain ("1" =never and "7" =often),**
TECH1	Geolocation apps (Google Maps, Yelp, Foursquare, etc.)
TECH2	Transport apps (Ryanair, Kayak, Blablacar, Renfe, Uber, etc.)
TECH3	Accommodation apps (Booking, Airbnb, Trivago, Expedia, etc.)
TECH4	Activities and experiences apps (TripAdvisor, Triptl, Groupalia, etc.)
TECH5	Active tourism and sports apps (Alltrails, Strava, etc.)
TECH6	Tourist guide apps (Civitatis, Lonely Planet, museums, monuments, etc.)
TECH7	Apps for other utilities (translators, weather, digital wallets, etc.)
TECH8	Social networks (Instagram, Facebook, TikTok, Twitter/X, etc.)
TECH9	Wi-Fi access in the city (paid or free)
TECH10	5G
TECH11	QR codes
TECH12	Mobile payment (Google Pay)
TECH13	Wearable devices (smart watches, smart bands, bracelets, smart glasses or lenses, etc.)
TECH14	Virtual reality and augmented reality (360º virtual visits, etc.)
TECH15	Artificial intelligence (chatbots, virtual assistants, etc.)
TECH16	Shared bicycles and motorcycles (bikesharing, scooter sharing system, etc.)
TECH17	Cryptocurrencies or blockchain.
DESTINATION PERCEIVED AUTHENTICITY	**Please rate from 1 to 7 ("1"= totally disagree and "7" = totally agree) the extent to which you agree with the following statements:**
CONFORMITY	
CONFORMITY1	The destination made a real effort to create an accurate reproduction of products, events, and places from days gone by.
CONFORMITY2	The destination's heritage is well-known.

CONFORMITY3	Overall, I would say I now have an idea of the local history and legends.
CONFORMITY4	I experienced the local culture up close.
CONFORMITY5	It felt like the sites/events/products were really authentic.
REALITY	
REALITY1	The offer helped me to get a sense of the sites/events/products I encountered at the destination.
REALITY2	I felt my experience was historically accurate.
REALITY3	I re-live the cultural traditions that I learned about during my visit to the destination.
TRANSFORMATION	
TRANSFORM1	I strove to respect the cultural traditions of the destination.
TRANSFORM2	I made an effort to learn about the cultural traditions of the destination.
TRANSFORM3	The experience enabled me to know more about the destination.
CO-CREATION	**Please rate from 1 to 7 ("1"= totally disagree and "7" = totally agree) the extent to which you agree with the following statements:**
	My interactions with destination agents, other tourists, or the local population through social networks and other technologies enabled me to …
CO-CREATION1	Customize a sustainable trip.
CO-CREATION2	Design an authentic local experience.
CO-CREATION3	Enjoy my trip to the fullest while respecting the local community and the environment.
CO-CREATION4	Feel that it is really worthwhile to share my experiences about the sustainability of the destination.