

THE ROLE OF AUGMENTED REALITY IN DESTINATION BRANDING

Original scientific paper

Received 7 April 2020

Revised 25 June 2020

1 November 2020

Accepted 26 November 2020

<https://doi.org/10.20867/thm.26.2.8>

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Abstract

Purpose – The goals of this study are to find out which factors contribute to AR applications generating satisfactory tourism experiences; analyze the impact of AR on destination brand communication; and examine whether the act of communicating the destination brand also increases satisfactory tourist experiences.

Design – The research is based on a case study of an AR application that belongs to the city of Tarragona (Spain) that reproduces its main monuments dating from the Roman era.

Methodology – The study includes one survey conducted on 150 participants (75 tourists, 75 residents) and 15 in-depth interviews with respondents who used the *Imageen* application.

Approach – The analysis provides detailed information on the users' experiences and opinions, highlighting the different variables that provide the most satisfactory tourist experiences.

Findings – The study shows that the AR application creates highly satisfactory tourism experiences, although not extraordinary. The main contribution of this study has been to demonstrate that the AR application has the potential to communicate the destination brand.

Originality of the research – This study provides knowledge on the AR role in constructing a destination brand and its relationship with the tourism experience. Particularly, the findings of this paper have significant implications for DMOs and their marketing and communication strategies.

Keywords augmented reality, destination image, brand communication, experience, presence

1. INTRODUCTION ¶

The development of technology and the spread of smartphones have led to changes in the way tourists seek and share information when travelling (Del Chiappa and Baggio 2015; Jung et al. 2015; Sotiriadis 2017). Likewise, tourist destinations have begun to introduce new technologies to communicate their identity and their brand (Jabreel et al. 2018) to achieve a good image of the destination among users and a higher number of decisions to visit (Buhalis and Amaranggana 2015; Gretzel et al. 2015).

This technological evolution has also behaved a new way to enjoy and understand the tourist experience (Huertas 2018). Tourism is increasingly experiential (Hyun et al. 2009) and previous studies have shown that satisfactory tourist experiences have a positive influence on the formation of the image of destinations (Beerli and Martin 2004; Kim et al. 2012; Kim 2014), which also generate a higher number of decisions to visit (Llodrà-Riera et al. 2015).

Moreover, in order to attract tourists and wealth to the region, tourist destinations need to communicate their brand (Morgan et al. 2007). The destination brand, which has been widely studied (Blain, Levy and Ritchie 2005; Morgan, Pritchard and Piggott 2003), distinguishes destinations from their competitors and makes them more attractive, generating greater tourist demand (Choi et al. 2007; Ekinici and Hosany 2006; Pike and Ryan 2004).

Therefore, currently, tourist destinations implement new technologies to achieve better brand communication (Jabreel et al. 2018; Lalicic et al. 2018), a better image (Morgan, Pritchard and Pride 2007) and to attract tourists (Pike and Page 2014). In this race for technological implementation and smartness, destinations are integrating technology infrastructure and end-user devices to make the tourist experience more satisfactory (Buhalis and Amaranggana 2014; 2015). Advances in mobile computing, computer graphics, wireless and sensor technologies have allowed the rapid development of Virtual Reality (VR) and Augmented Reality (AR) (Yovcheva et al. 2012). AR applications enable mobile devices to superimpose additional virtual information on the heritage (Kounavis et al. 2012) or on destinations.

Augmented Reality has proved to be of great value to attract tourism and to disseminate cultural heritage. Given its rapid and extensive development in the field of tourism, numerous academic studies have dealt with analysing them. Some have analysed their technological acceptance by the users (Lee et al. 2015) and their accessibility (Leue et al. 2015; tom Dieck et al. 2016; 2018), while others have shown their importance for promoting heritage and tourism (Cranmer et al. 2017; Jung et al. 2018; tom Dieck and Jung 2018), and others have analysed the impact of AR applications in generating satisfactory tourist experiences (Chung et al. 2015; Han et al. 2018; Jung et al. 2015; Kourouthanassis et al. 2015; Tscheu and Buhalis 2016). But none has examined the role and the influence of AR on destination brand communication. Since destination branding is a key factor in creating destination image (Blain, Levy and Ritchie 2005; Morgan, Pritchard and Piggott 2003) and for attracting tourists (Choi et al. 2007; Ekinici and Hosany 2006; Pike and Ryan 2004), its study in relation to AR is absolutely necessary.

For this reason, this study raises the following research questions: what is the role of AR in destination branding? Particularly, which items of AR applications create more satisfactory experiences? Does AR help to communicate the brand of destinations? Does destination brand communication through AR generate satisfying experiences? Consequently, the aims of this paper are to (1) find out which factors contribute to AR applications generating satisfactory tourism experiences; (2) analyse the impact of AR on destination brand communication (i.e. explore if AR fosters the communication of destination branding); and (3) find out whether the act of communicating the destination brand also increases satisfactory tourist experiences.

The research is based on a case study of an AR application that belongs to the city of Tarragona (Spain) and reproduces its main monuments dating from the Roman era, as they were and how they were used. This case study was chosen precisely because Tarragona is a UNESCO World Heritage Site for all its Roman heritage but is also little known compared to other heritage cities. Although this study is mainly qualitative, it includes both a quantitative and a qualitative part. The quantitative part is based on a

survey conducted on both residents and tourists of the destination analysed. The qualitative part is based on in-depth interviews with respondents who used the *Imageen* application.

2. LITERATURE REVIEW

2.1. The impact of AR in creating satisfactory tourist experiences

There is a whole school of previous studies that focus on the influence of new technologies on the tourist experience (Cho et al. 2002; Hyun et al. 2009). They have shown that technology increases the experiential process in time and space and improves the co-creation of value on the part of users (Neuhofer et al. 2014). Social media, mobile applications and mobile technologies allow users to live rich and colourful tourism experiences, either through videos or pictures (Huertas 2018) or sharing the experiences of others at a destination (Hyun et al. 2009). Some authors (Cho et al. 2002; Hyun et al. 2009) even analyse the virtual experience (VE), referring to the tourism experience in the virtual environment (Cho et al. 2002).

Focusing on studies on AR applications, it should be noted that much research remains to be conducted from the academic perspective (Cranmer et al. 2016; Jung et al. 2016; Yung and Khoo-Lattimore 2017) on that topic. Some studies have shown that AR applications enhance the tourist experience (Jung et al. 2015; Leue et al. 2015; Yovcheva et al. 2013), add value to the heritage (Cranmer et al. 2016; tom Dieck and Jung 2017; Tscheu and Buhalis 2016), and even create economic value to the destination (Cranmer et al. 2017). Tourists' expectations of AR applications at heritage sites have been studied (Han et al. 2018) as well as their satisfaction with these applications (Jung et al. 2015). Their emotional impact has also been studied (Kourouthanassis et al. 2015), demonstrating that the application arouses in the user feelings of excitement and emotion, which in turn influence their visiting behaviour.

Jung et al. (2015) showed that these applications in the tourism sector promote users' tourism experiences. According to Jung et al. (2015), personal innovativeness or users' ability to adapt to technology (Mazman and Usluel 2009) increases user satisfaction towards the AR application and its viewing recommendations (Chen, 2013). Chung et al. (2015) also showed that the user-friendliness of AR applications increases their viewing. At the same time, viewing AR applications maximizes tourists' satisfaction and intentions to visit destinations. In addition, Lee et al. (2015) stated that aesthetic and visually attractive applications have a great influence on the enjoyment and the experience. Consequently, in the line with the above, we suggest the following proposition:

P1: AR applications generate satisfactory tourist experience in destinations

Other factors of AR applications that foster satisfactory experiences include authenticity (Dueholm and Smed 2014), sense of presence (Leue et al. 2015; Tussyadiah et al. 2018), usability or ease of use (Huang et al. 2013; tom Dieck and Jung 2018; Tscheu and Buhalis 2016), quality of the system (tom Dieck and Jung 2018) and quality of information (Leue

et al. 2014; Chung et al. 2015; tom Dieck and Jung 2018). In this study, we have focused on examining how the sense of presence, quality of information and destination brand communication (as a new factor of AR applications) influences in the generation of satisfactory tourism experiences.

2.2. Sense of presence in AR applications

Some studies on VR analyse the “presence” (Schuemie et al. 2001; Tussyadiah et al. 2018), others the “social presence” (Kang and Gretzel 2012) and others the “telepresence” (Hyun and O’Keefe 2012) that virtual technologies create in users as key components in the formation of the technological experience and of the image of the destination. These three concepts relate to the user’s sense of being in the place through the virtual recreation (Diemer et al. 2015). According to Hyun and O’Keefe (2012), telepresence influences both the virtual cognitive image and the virtual affective image, which are key for the overall formation of the DI (Beerli and Martin 2004). In the same vein, Tussyadiah et al. (2018) showed that VR applications increase the sense of presence in the virtual environment, which increases the enjoyment of the experiences, improves the preference for destinations and increases intention to visit. It should be noted, however, that VR is a superior virtual immersion to AR. It is therefore necessary to examine whether presence also has the same impact in the field of AR and also its influence on the user experience. Hence, we suggest the following propositions:

P2: AR applications generate a sense of presence among users

P3: The sense of presence of AR applications have a positive impact on tourist experiences.

2.3. Qualified information in AR applications

The qualified information or informativeness (Jung et al. 2015; Olsson et al. 2012) has been shown to be an important factor for the AR acceptance. Moreover, qualified information or content quality increase the social value of the application, user satisfaction and subsequent recommendations for use (Lee, Park and Han 2014). It has also been shown that AR applications add value to the heritage and to destinations (tom Dieck and Jung 2017; Tscheu and Buhalis 2016); and the more value they provide, the higher the users’ satisfaction with and loyalty to a destination.

It has been found that this qualified information of AR enhances the knowledge of the heritage among tourists (Chung et al. 2018; Cranmer and Jung 2014; Han et al. 2018; Jung et al. 2016; tom Dieck and Jung 2017). But more research is needed on the knowledge of the information of AR generates the history of destination and how people lived and the influence of that knowledge on satisfactory tourism experiences. Therefore, we suggest the following propositions:

P4.1: The qualified information of AR applications provide knowledge about heritage.

P4.2: The qualified information of AR applications provide knowledge about how people lived.

P4.3: The qualified information of AR applications provide knowledge about the history of the destination.

P5.1: The knowledge of the heritage of a destination through AR applications has a positive impact on tourist experiences.

P5.2: The knowledge of how people lived in a destination through AR applications has a positive impact on tourist experiences.

P5.3: The knowledge of the history of a destination through AR applications has a positive impact on tourist experiences.

2.4. Destination brand communication in AR applications

Tourist destinations need strategically to communicate their identity and brand to be more attractive and attract more tourists (Morgan et al. 2007). It has also been demonstrated (Kim et al. 2014) that destination brands are crucial in the creation of the DI, which has a decisive influence on decisions to visit (Lee and Gretzel 2012). Therefore, the Destination Marketing Organizations (DMOs) need to communicate their brands (Jabreel et al. 2018). The advancement of technology and digital communication have provided great opportunities in this area, which have also generated great interest in academic research. Initially, the importance of destination brand communication via destinations' websites was demonstrated (Choi et al. 2007; Fernández-Cavia et al. 2013; Huertas et al. 2011). Subsequently, several studies have examined the influence of social media in the creation of brand image (Valentini 2015, Wigley and Lewis 2012), in DI and in the relationships established by users with these brands (Stepchenkova and Zhan 2013).

But technology continues to evolve and new applications such as VR and AR emerge with infinite new potential for communicating destinations and their brands. Previous studies have acknowledged that VR (Guttentag 2010; Huang et al. 2016) and AR (Kourouthanassis et al. 2015) are very powerful tourism marketing tools, but they have not studied their potential in destination branding. Bogicevic et al. (2019) have shown that the sense of presence that VR applications create foments the brand experience in hotels. Guttentag (2010) highlighted all the potential of AR for communicating tourism, for tourism marketing and the promotion of destinations. Kourouthanassis et al. (2015) even claimed that if applied correctly, AR applications can promote the branding of destinations and attract tourists, although they have not provided empirical proof of this. There is, therefore, a need for academic research to demonstrate the potential of AR in destination brand communication. We therefore propose the following propositions:

P6: Do AR applications foster/communicate destination brand?

P7: Does the brand communication of the AR have a positive impact on satisfactory tourism experiences?

3. METHODOLOGY

The case study is focused on the application *IMAGEEN TARRACO*, that since 2015 has provided augmented reality contents for four Roman monuments in the city of Tarragona: the amphitheatre, the circus, the Temple of Augustus and the Forum.

Tarragona is a city of about 140,000 inhabitants located in the north-east of Spain and is a destination on the Costa Daurada (Gold Coast). Its main economic sectors are the chemical industry and tourism. The archaeological site of Tarragona was declared a World Heritage Site by UNESCO in 2000.

The objectives of this study are: to find out which factors contribute to AR applications generating more satisfactory tourist experiences, to analyse the role of AR in destination brand communication, and to ascertain whether this destination brand communication also increases satisfactory tourist experiences.

The study was divided into two parts with two complementary methods of analysis, although was mainly a qualitative study. The first part, quantitative, was based on a survey conducted on both residents and tourists of the destination just to show the relations among variables. But the second, the qualitative part, was based on in-depth interviews with respondents who used the *Imageen* application. It brings an in-depth information about the experiences and opinions of users and widely shows the influence weight of the different variables.

3.1. Quantitative study: questionnaire, analysis and sample variables

The questionnaire was distributed to tourist offices, city hotels, heritage sites and tourist attractions that offered the AR application. We also administered the survey to other institutions within the territory, such as the university. The participation in the study was voluntary, and individuals were asked if they wanted to answer a questionnaire on the AR experience. The study includes a final sample of 150 participants that were randomly selected, ensuring an equal proportion between tourists (75) and residents (75). Only the individuals who responded the part of the survey on the AR application were included in the final sample.

The survey questionnaire consisted of three sections. The first enquired as to sociodemographic data and whether or not the respondent knew the application. If the answer was affirmative, a second section was proceeded with, enquiring as to how they had found out about the application and if they had used it. Again, if the answer was affirmative, a third section was proceeded with, which dealt with various aspects for analysis that comprise our study variables: the tourist experience and sense of presence generated, the information about the heritage, about the society and the history of the destination, and the assessment of the application as a tool for brand communication.

Table 1: Variables analysed by means of surveys and interviews

Parameter	Definition
Satisfactory Tourist Experience	The degree of satisfaction with the application users' tourist experience (Jung et al. 2015; Leue et al. 2015; Yovcheva et al. 2013).
Sense of Presence	The feeling of having been transported to a new context or reality (Hyun and O'Keefe 2012; Kang and Gretzel 2012; Schuemie et al. 2001; Tussyadiah et al. 2018).
Information about Heritage	The information/knowledge acquired about the heritage (Chung et al. 2018; Cranmer and Jung 2014; Han et al. 2018; Jung et al. 2016; tom Dieck and Jung 2017).
Information about Lifestyle	The information/knowledge acquired about the society and how its inhabitants lived.
Information about History	The information/knowledge gained about the history of the destination.
Brand communication	Assessment of whether the application communicates the brand.

Source: (authors' own) ¶

It should be noted that the level of experience generated by the application was measured using a rating of adjectives on a scale from less to more (negative, indifferent, satisfactory, exciting, and extraordinary). The remaining variables generated by the application were measured using Likert scales from 1 (nothing) to 5 (very much).

The surveys were conducted between August and December 2018 at the DMO, in hotels and in different parts of the region; and they were analysed in January 2019. First, we analysed the percentage of assessments of each variable by users, and second, because the quantitative analysis sample was not very large, we analysed the relationship between variables to find out which of the variables analysed generated the most satisfactory tourist experiences.

The sample analysed in the study and its sociodemographic characteristics are shown in Table 2. It should be noted that of the 150 questionnaires obtained, 75 were completed by residents and the 75 by tourists.

Table 2: Sample sociodemographic data

Dimension	Value	Total	Percentage
Origin	Locals	75	50%
	Spain	28	18.7%
	Other EU Countries	34	22.6%
	Outside of EU	13	8.7%
Dimension	Value	Total	Percentage

Dimension	Value	Total	Percentage
Gender	Male	68	45.3%
	Female	73	48.7%
	Not Specified	9	6%
Age	< 20	5	3.3%
	20 – 29	28	18.7%
	30 – 39	22	14.7%
	40 – 49	46	30.6%
	50 – 59	33	22%
	60 and over	13	8.7%
	Not Specified	3	2%
Education	School graduate	19	12.7%
	Professional Tr	27	18%
	University graduate	86	57.3%
	Not Specified	18	12%
Occupation	Student	26	17.3%
	Unemployed	1	0.7%
	Retired	15	10%
	Unqualified	7	4.7%
	Public Administration	37	24.6%
	Liberal Professional	36	24%
	Not Specified	28	18.7%

Source: (authors' own)

3.2. Qualitative study: interview script, implementation and analysis

The script for the in-depth interviews is structured into the same variables as the questionnaire (if the AR platform behaved satisfactory tourist experience, sense of presence, information about heritage, information about lifestyle, information about history, brand communication), but with open-ended questions so that respondents could go into greater depth as to the reasons for their responses and the reasons for the relationship between the variables.

A total of 15 in-depth interviews were conducted on members of the sample who had completed the questionnaire (i.e. those who used the AR application), seeking their representativeness according to gender and age groups.

Table 3. Sample of interviews

Locals	Gender	Age	Tourist	Gender	Age
1	Female	28 years	1	Male	21 years
2	Female	52 years	2	Female	29 years
3	Male	30 years	3	Male	40 years
4	Male	50 years	4	Female	37 years
5	Male	35 years			

Source: (authors' own)

The interviews were conducted during the fall of 2019. They were recorded, transcribed and analysed based on an analysis template.

4. RESULTS

4.1. Assessment of the variables

4.1.1. Satisfactory tourist experience

With regard to whether the AR applications generate a satisfactory tourist experience among users (P1), respondents who used the application place their experience at between Satisfactory (48.72%) and Exciting (35.90%), although with low percentages in the Extraordinary category. Thus, P1 is confirmed, in line with the findings of previous studies (Jung et al. 2015; Leue et al. 2015; Yovcheva et al. 2013) that the using of AR applications generates satisfactory tourism experiences.

Table 4: Percentages of users' assessments for each variable

	Don't know/ Don't answer	Negative	Indifferent	Satisfactory	Exciting	Extraordinary
Experience	7.69%	2.56%		48.72%	35.90%	5.13%
	Don't know/ Don't answer	1	2	3	4	5
Sense Presence	5.13%			7.69%	41.03%	46.15%
Inf. Heritage	7.69%			5.13%	35.90%	51.28%
Inf. Lifestyle	10.26%	10.26%	15.38%	20.51%	23.08%	20.51%
Inf. History	5.13%		2.56%	7.69%	35.90%	48.72%
Brand communication	7.69%		2.56%	20.51%	23.08%	46.15%

Source: (authors' own)

The in-depth interviews provide different views regarding the emotions and the experience generated. While one interviewee (E1) states that viewing the platform did not arouse any emotions in him, the rest affirms that it did. All those interviewed agree that viewing the heritage in its original state provided a most satisfying experience: *"Being able to see exactly what the Roman monuments were like at that time and seeing what happened there is a unique, really cool experience"* (E12).

4.1.2. Sense of Presence

If we look at presence (P2), we can see that 87.18% of respondents believe that the application generates a high (41.03%) or a very high (46.15%) sense of presence. Thus, as have been previously demonstrated that VR applications generate sense of presence (Hyun and O'Keefe 2012; Kang and Gretzel 2012; Schuemie et al. 2001; Tussyadiah et al. 2018), AR applications are also seen to generate high percentages of presence, confirming P2.

In the qualitative study, the respondents identify the technology of reproduction as one of the factors that influence presence: *“It depends on the medium you are using. I saw it on a screen. I reckon that if you do it with a visor it improves the immersion and you must feel you are inside”* (E4). All in all the majority opinion is: *“Imageen takes you back to the Roman era. Absolutely! You can see yourself as the emperor!”* (E5). However, some interviewees also said that the application was very spectacular, but also a bit unreal, and this has the opposite effect on the sense of presence. Very few have even said that despite the overlap of images, it did not transport it to the place and the time. *“You see how it was and even what they did in that monuments, but it does not transport you to the place”* (E9). Thus, it appears that quantitative study shows high levels of presence but the qualitative deepens in the reflections of the interviewees and all the opinions are expressed.

4.1.3. Information about heritage, lifestyle and history

The quantitative results on the information provided by the application (Table 3) vary with respect to heritage, people’s lives and the history of the destination (P4). The results indicate, in line with the findings of previous studies (Chung et al. 2018; Cranmer and Jung 2014; Han et al. 2018; Jung et al. 2016; tom Dieck and Jung 2017), that AR applications provide high levels of information and knowledge of the monumental heritage viewed on the application (87.18%), thus confirming P4.1. The results also indicate that the AR application generates a high level of information of the history of the destination (84.62%), thus corroborating P4.3. However, it provides low (35.90%) and very low information about the society and how they lived at the time, not confirming P4.2. These responses are linked to the kind of representation offered by *Imageen*, far more focused on the reproduction of monuments than on offering a vision of the society.

The results of the in-depth interviews on this variable confirm the quantitative results. They acknowledge the importance of the application to present the heritage (E3: *“The application is very helpful to find out what Tarragona’s Roman heritage was like. If you can only see stones and what remains now you can’t get an idea of exactly what it was like”*), but they also believe it does not reveal how people lived in that era (E1: *“Seeing chariots race doesn’t help much to find out how they lived. I would like to see what people ate, what they drank...”*).

4.1.4. Brand communication

With regard to brand communication (P10), it should be noted that the respondents consider that the AR application communicates destination brand quite a lot (23.08%) and a lot (46.15%), although 20.51% scores this aspect on a medium level. Thus, P10 is confirmed.

The in-depth interviews show the potential of the application to communicate the brand: *“One of the strengths of the Tarragona brand that distinguishes us from many other cities is its Roman heritage. Therefore, it does help communicate the brand”* (E3). But they also explain the medium level of responses due to the users’ scarce knowledge of *Imageen* and highlight shortcomings in the visibility of the application as one of the factors that also affects brand communication: (speaking about the application) *“I think*

it is sold as being an attraction once you're here. But it should be promoted more to encourage visitors to come" (E14); "*Imageen should be made known and people should be able to see it from Madrid. It would help to know Tarragona and attract more tourists*" (E1).

4.2. Variables influence in satisfactory tourist experiences

Table 4 shows the relationships of the sense of presence and information variables with the experience generated among users to identify the impact that each of these variables has on the creation of satisfactory tourist experiences.

Table 5: Influence of variables on users' experience

	Sense of Presence					Information about Heritage				
	1	2	3	4	5	1	2	3	4	5
Experience										
1				2.86%						2.94%
2										
3			8.57%	17.14%	25.71%			2.94%	20.59%	26.47%
4				25.71%	14.29%			2.94%	14.71%	23.53%
5					5.72%					5.88%
	Information about Lifestyle					Information about History				
	1	2	3	4	5	1	2	3	4	5
Experience										
1	2.94%									2.86%
2										
3	5.88%	20.59%	11.76%	11.76%	5.88%			2.86%	28.57%	20.00%
4			11.76%	8.83%	14.72%			5.71%	11.43%	22.86%
5				2.94%	2.94%					5.71%

Source: (authors' own) ¶

In the Table can be observed the relationship of the sense of presence entailed by the AR application with the experience it generates (P3). We can see that there is a relationship and a positive impact between the variables. This means that in addition to the sense of presence among users generated by the AR application, the users' tourist experience is also very satisfactory. However, it should be noted that few users have appraised the experience generated at the highest level.

These results are also confirmed by the in-depth interviews: "*The more you feel you're there, the more exciting it is. Furthermore, it has this visual, playful thing that makes the experience fun*" (E2). "*Seeing what the monument was like and what people did there at that time makes you feel part of it, and this is much more exciting than seeing only the remaining stones*" (E8).

If we look at Table 4, the impact of the three aspects of information in the AR application in the experience it generates among users, we find some differences. Again, the intersection between the information about heritage (P5.1) and the information about the history of a destination (P5.3) demonstrate high levels of positive influence on the experience, while the information about how the people lived (P5.2) is the variable that has the least positive influence on the creation of the users' experience. The experience focuses on immersing the user in the buildings of the Roman era, dedicated to finding out about these monuments and the history of the destination. But how the inhabitants of the city lived does not result in being so interesting. Therefore, the propositions P5.1 and P5.3 are confirmed, but P5.2 is not.

The in-depth interviews also confirm these relationships: *“If people find out more about the monuments and heritage of a place, the place will seem more interesting, they will be more expectant and will feel more like going there”* (E2). *“For me the most shocking thing is to see what the circus was like, the stands, the track... so high ... watching all this live is awesome”* (E12).

Table 6: Influence of brand communication on users' experience

		Brand Communication				
		1	2	3	4	5
Experience	1					2.94%
	2					
	3			14.71%	11.76%	23.54%
	4		2.94%	8.82%	8.82%	20.59%
	5					5.88%

Source: (authors' own) ¶

Finally, the relationship between brand communication and the experience generated by the AR application (P7) is also positive, as previous studies have shown for other type of technologies (Choi et al. 2007; Morgan et al. 2007). 23.54% place the highest level of brand communication with average levels of satisfactory tourist experience creation and 26.47% with the highest levels of satisfactory tourist experience creation. Therefore, P13 is also confirmed and demonstrates that the more the destination brand is communicated via the AR application, the better the satisfactory tourist experiences generated.

The results of the in-depth interviews concurred and again highlighted the potential of the application if it were better known: *“Imageen helps to communicate the brand of the city, and if the application was better advertised, it would help Tarragona to become better known and more people would like to come to visit the city”*. (E5) *“If you communicate the Roman heritage of Tarragona, you are communicating its brand. So the cooler the application is and the more impact have, the better the tourist experience will be”* (E8).

5. CONCLUSION

The study shows that the AR application creates highly satisfactory, though not extraordinary, tourism experiences. According to previous studies, VR and AR applications involve emotional experiences (Marasco et al. 2018; Prayag et al. 2013). In the same vein, this study also demonstrates that AR applications generate satisfactory tourist experiences. Both the surveys and the interviews identify the application as an added, complementary value to the image generated for the destination's attractions. This shows the great potential of these technologies for the tourism marketing of destinations.

Another contribution of the study is to show that there are two variables that are enhanced through AR applications and have a direct influence on the generation of users' tourist experience: the sense of presence and the information about the heritage and the history. It has been shown that as with VR applications, which generate a high sense of presence among users (Hyun and O'Keefe 2012; Kang and Gretzel 2012; Schuemie et al. 2001; Tussyadiah et al. 2018), AR applications also generate them. In line with the conclusions of previous studies (Chung et al. 2018; Cranmer and Jung 2014; Han et al. 2018; Jung et al. 2016; tom Dieck and Jung 2017), the study shows that the information offered by AR applications generate knowledge of the heritage but it also demonstrates innovatively that they reveal the history of the destination. However, they do not promote information and knowledge of how people lived at that time, because the application studied does not provide this information. Therefore, DMOs must consider which information tourists want to promote with the AR applications before implementing them. Moreover, it has also been shown that both the sense of presence and the information about the heritage and the history provided by the AR application also influence the generation of satisfactory tourism experiences, which shows the DMOs their potential for tourism marketing.

The main contribution of this study has been to demonstrate that the AR application has the potential to communicate and indeed does communicate destination brand. This entails significant implications for DMOs, who could use AR applications as a new channel for communicating the brand. Therefore, DMOs that have the possibility to communicate the attributes of their brand through AR applications should consider their use as new channels for brand communication.

Finally, a positive influence of this brand communication by the AR application in generating satisfactory tourist experiences has also been demonstrated. Thus, AR applications must be seen as a key tool for generating satisfactory tourist experiences through the sense of presence they involve or the knowledge they create.

However, the study has also demonstrated that despite the significant potential of AR applications to communicate brands and generate satisfactory tourism experiences, these platforms have still limitations that should be more explored based on technology, content, immersion level, and tourist interest among others. Therefore, as Yung and Khoo-Lattimore (2017) stated, future research is needed on how to adapt AR applications so that they become an ideal tool for tourism marketing. Although the sample includes information from both locals and tourists, one limitations of this study is that all data were analysed jointly. Further research should explore the differences in constructing a

destination brand between locals and tourists. This would give information on how the sense of presence, quality of information and destination brand communication of the AR application influences in the creation of satisfactory tourism experiences of both groups, thus allowing their comparison.

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Please cite this article as:

Huertas, A., Gonzalo, J. (2020), The Role of Augmented Reality in Destination Branding, Tourism and Hospitality Management, Vol. 26, No. 2, pp. 419-436, <https://doi.org/10.20867/thm.26.2.8>



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