



The Effects of Virtual Reality on Destination Image Formation

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Abstract. The mental image potential visitors have of a destination is a critical factor when making travel decisions. Research has shown that destination image formation correlates with users' involvement with a device or platform, such as virtual reality (VR). While the impact of VR on the formation of a destination image has only received limited attention, literature suggests that the use of VR could have a positive influence on destination image. This study set out to examine the impact of VR on the formation of a destination image in comparison to an identical video viewed on a computer. An experiment with a post-user survey was conducted. The analysis confirms that the higher levels of involvement through using VR goggles do have a positive correlation with destination image formation. For destination marketing, this study suggests VR as a tool to positively influence the image of a destination.

Keywords: Virtual reality · Destination image formation · 360-degree video
Virtual destination image

1 Introduction

In 1938, the French author and dramaturgist Antonin Artaud presented the concept of virtual reality for the first time in his collection of essays *Le Théâtre et son Double*. However, VR as a device that engaged multiple senses at once was not introduced until the 1960s by cinematographer Morton Heilig [1]. The device called “Sensorama” provided users with the opportunity to choose from multiple rides, which were emphasized by sounds, smells and wind machines. VR has since been implemented into areas such as medicine, entertainment, design and simulation training [2, 3].

While this technology was not developed specifically for the tourism industry, VR plays an increasingly important role in this sector [3]; this is particularly true for the area of eTourism [4]. In line with latest developments, including social media and interactive websites, which facilitate potential tourists to be informed about locations without travelling to the destination [4–6], VR may influence the tourists' destination image formation process. Recent research has shown that destination image formation correlates with users' involvement with a device or platform, while traditional printed materials, websites and videos no longer have a major impact on the perceived destination image [5, 7]. Although VR may still face several challenges, such as user

acceptance and authenticity of the destination representation, tourism may also take advantage of the opportunities that this technology presents [3].

In terms of destination image, Kisali et al. [8] stated that the image of a destination can be formed through four factors: sociocultural factors, project image, user generated content and technology. Additionally, there are three forms of images according to Gartner [9]: the cognitive, affective and conative images. In a tourism marketing setting, those images may be influenced through VR, which may help to promote the image of a destination and attract more tourists. This can be done through several unique characteristics, including “visualization components”, the “immersion into the experience” and the “interactivity involved in the experience” [10].

The image of the destination is significant. Destinations that have a clear, distinctive and noticeable image have a higher chance of being selected by the traveller [11]. The image represents an essential part of tourists’ decision-making [12, 13] since it encompasses a personal mental image made of characteristics of a destination [11]. As consumers are becoming more familiar with this VR, it may become an important tool to help develop, promote and enhance a destination. Hence this paper seeks to contribute to the field of destination image formation, by focusing on the device perspective and not solely on the content. In the following sections, this paper provides an overview of destination image, VR and the virtual destination image. The subsequent sections present the operationalized research model and offer an outline of the method and sampling techniques. Lastly, the outcome of this study, its limitations and suggestions for further research are discussed.

2 Literature Review

2.1 Destination Image

The concept of destination image has been broadly utilized in empirical research, however, a proper definition and a substantial structured concept is yet to be established [11, 13]. One of the first scholars to conceptualize destination image formation was Gartner [9] and since then, numerous authors have done research on the topic [11–15]. As a result, multiple definitions exist on destination image [5, 9, 13, 16, 17]. One such definition by Lai and Li [18] regards tourism destination image as “a voluntary, multisensory, primarily picture-like, qualia-arousing, conscious, and quasi-perceptual mental (i.e., private, nonspatial, and intentional) experience held by tourists about a destination”. This encounter is combined with other cerebral factors, such as senses, feelings, beliefs and biases of the destination [18]. The image of a destination is highly subjective.

According to Kisali et al. [8], the image of a destination can be formed through four factors: sociocultural factors, projected image, user generated content and technology. These factors play a twofold role in destination image formation. The first is that the sociocultural aspects and the projected image have a high impact on what the destination offers. Secondly, technology and user generated content are increasingly important for the formation of the destination. These are especially important factors since they play a role in the information that is shared between the destination and tourists, and among consumers [8]. Destination marketing organisations can also resort to other tools, such

as direct marketing, brochures and tourism fairs [19]. Generally, image can be understood as a collection of beliefs made up of a combination of information from multiple sources [9, 13, 20, 21]. Therefore, the actual information and the way the information is shared are crucial in the process of forming the image of a destination.

In addition to these four factors, the image of a destination is created through the combination of three types of images: the cognitive, affective and conative image. The cognitive image is formed when an individual intrinsically accepts the values associated with an object; the affective image is formed during the search phase of the customer journey. This is associated with the individual's intrinsic and extrinsic reasons for travelling [9]. Lastly, Gartner [9] stated that "the conative image component is analogous to behaviour because it is the action component". Generally, the cognitive image is related to the individual, while the affective image is related to the product, for example the destination [22]. A combination of these two aspects is what creates the conative image since it represents the actual decision to travel to a selected destination. According to MacKay and Fesenmaier [13] the image of a destination hence is an amalgam of multiple services and characteristics knotted together to form an overall perception.

Baloglu and McCleary [12] stated that stimulus factors and personal factors are two major agents that guide the image of a destination. Personal factors include demographics and psychological characteristics, while stimulus factors focus on the source, type and the amount of information [12]. Information seems to be the constant in destination image since tourists highly depend on it to make their travel decisions [5, 11, 12]. Thus, it is important to understand how destination image is formed through websites, social media and other technologies (e.g. VR) to market a tourism destination [5, 14, 23]. A destination image can be enhanced by contemporary technologies, such as 360-degree videos and virtual reality.

2.2 VR and 360-Degree Video

A review of the literature on VR shows that a common definition is missing as scholars ascribe different properties to what is necessary for an experience to be classified as VR [3, 24, 25]. Guttentag [3] defines VR as a "computer-generated 3D environment" that the user can control and potentially interact with; this leads to a simulative real-time situation including the five senses of the user [1, 3, 25]. VR is described as an experience that enables individuals to physically immerse into and be psychologically present in the virtual environment. VR tools using head-mounted displays can be rated as fully immersive. The full immersion alludes to the degree of how strongly isolated the user is from the real world, which should add to the effectiveness of the experience, while requiring a high level of involvement [1].

Quite a significant amount of attention has been dedicated to the level of involvement and its influence on destination image. 'Involvement' is highlighted as one of the most significant features influencing a person's destination image [5, 16, 26]. The concept of involvement is rooted in the assumption that a person's beliefs and attitude are provoked through arousal and this can anticipate prospective conduct [39]. Specifically, Havitz and Dimanche [27] describe involvement in tourism as an individual's mental state characterized by stimulation, concern or motivation in relation with the destination or leisure activities.

The study by Frias et al. [16] found a correlation of individuals' level of involvement during the information gathering process and the effect on their destination image, concluding that the level of involvement benefits the destination image of potential visitors. Punj and Moore [28] suggest that the higher the involvement level of individuals, the higher the cognitive attempt to arrive at a sound judgement. When dealing with cognitive capacity, VR has the potential to transmit information with both low equivocation and low uncertainty due to its ability to capture a complete environment accurately. Its media richness is what sets it apart from other technologies according to a model by Draft and Lengel [29].

For tourism, VR has the potential to revolutionize the way companies promote and sell tourist products, services and experiences [30]. Previously, the tourism industry was not capable of offering potential customers trials before purchase [3, 31–33]. Virtual environments can provide an experience so close to reality that it enables communication and creates a destination image through the presentation of sketches, pictures and videos [34]. Virtual experiences can offer realistic experiences due to sophisticated information technology [35], such as a 360-degree video.

A 360-degree video can be seen as a virtual tour of a destination. Although this technical form of presenting a destination has improved dramatically, it is still less costly compared to other forms of virtual tours, such as virtual reality. This full-screen panoramic image presentation allows the viewer to virtually experience a scene in 360° [36]. Although the production of a 360-degree video is relatively easy, it provides the consumer with an authentic image of reality. This means of presentation may help viewers to become immersed in the consumption before booking a trip [31].

For tourism destinations, this implies that virtual experiences may enhance a destination image through virtual tours [34]. These experiences may help potential visitors to pre-experience a destination and have a clearer image of the location. However, reality shows that fully immersive videos within the industry are not yet widespread and often 360-degree videos are used instead. 360-degree videos are becoming increasingly popular marketing materials. When consuming the video, the user is fully empowered to choose the angle and what the user sees through an individual dragging and rotation function [37]. This may capture the consumers' attention and thus render them more interested in visiting the destination.

A recent Google study found that 360-degree videos received considerably more subscriptions, shares and views when compared to traditional videos [38]. Interactivity of 360-degree videos on websites has been endorsed by marketing specialists to intrigue online customers, increase online purchasing and strengthen loyalty [4]. This is because virtual tours convey richer information of a destination, which increase the destination's image quality [39]. Through virtual tours, future visitors could assess the destination and the travel experience more precisely because they experience the venue more intensively [34]. 360-degree tours are viewed as one of the best sources of information for potential visitors. When they can freely navigate and experience the tours independently, users can focus and seek attributes and information they are most interested in [34]. As a result, many destination management organisations have devoted vast resources to creating web-based virtual experiences [31] to influence destination image formation.

2.3 Virtual Destination Image Formation

To develop a model of virtual destination image formation, our study builds on Hyun and O’Keefe [7], who expanded Gartner’s original image formation model, by adding the telepresence lens. Telepresence is defined as a feeling of “being there” [40]. While this term was first introduced in relation to virtual reality, scholars agree that any medium has the potential to produce telepresence [41]. Their findings suggest that interactive web-based media can affect telepresence in a way that offline material cannot. Telepresence from web-based materials demonstrates a minimal effect on the affective image [7]. Recent research confirms that traditional websites, unlike social media, do not influence the affective image [5]. However, VR technology may induce high physiological emotions [42, in Press]. VR is considered more suitable for triggering emotions than its predecessors and seems to create a stronger affective image [43], and the absorbed information while being aroused is more likely to be recalled later [44].

Thus, previous research suggests that VR positively influences the affective image and that VR’s telepresence may influence the cognitive image. This hypothesis is supported by the fact that virtual environments give users reliable and accurate information quicker and cheaper than traditional promotional materials [4]. An experiment comparing VR and traditional brochures indicates that VR does have a positive influence on the tourist’s information search as well as the decision-making process [45]. As a result, this research aims to find out whether VR can positively influence the image formation process of users. The guiding research question is: Does viewing a 360-degree video through VR goggles lead to an increased intention to visit a destination in comparison to a computer platform? To answer the research question, the study has developed six hypotheses regarding cognitive, affective and conative image based on the model presented by Molinillo et al. [5] as follows:

- H1: Virtual reality (high level of involvement) has a positive impact on the cognitive image.
- H2: Virtual reality (high level of involvement) has a positive impact on the affective image.
- H3: A favourable cognitive image has a positive impact on the overall image.
- H4: A favourable cognitive image has a positive impact on the affective image.
- H5: A favourable affective image has a positive impact on the overall image.
- H6: A favourable overall image has a positive impact on tourists’ intention to visit.

The literature has clarified that VR influences the affective image of a destination. This study’s aim was to test the reliability of this previous study and, beyond that, test whether VR has a stronger influence on the cognitive image when compared to a 360-degree video containing the same information. As such, the study used the original model (Fig. 1) of Molinillo et al. [5] and implemented it into the research process.

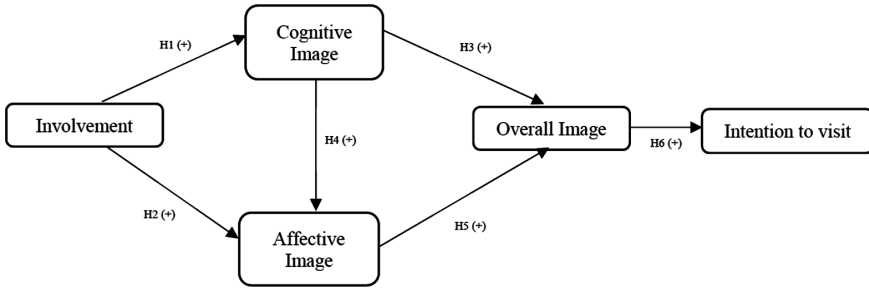


Fig. 1. Research model

3 Research Design

An experimental research design was conducted. A 360-degree video available on YouTube about the destination of Madrid was used. The video was determined as suitable and neutral and researchers were able to observe a potential conversion factor. Data collection was conducted in two groups. The first test group visited the destination through watching the 360-degree video via the Samsung Gear VR headset, while the second control group watched the same 360-degree video on a computer device using the mouse as navigation to rotate to the desired angle while watching. The video lasted for 2.33 min.

A purposive convenience sampling strategy was used to recruit participants via e-mail and personal approach close to the experiment location, the Salzburg University of Applied Sciences. The convenience sampling strategy was selected given that there was a greater opportunity of collecting the necessary data [46]. Upon arrival, the participants were randomly assigned to the computer or VR goggles group on the basis of counting in twos. As an additional measure, it was vital to overcome the novelty effect of using VR the first time [47] since, according to Rooney et al. [48], there is a high possibility that the test group is more fascinated and enthusiastic when trying a new technology for the first time. Therefore, a criterion for the researchers was to ensure that the participants using the VR goggles had used the device before. For participants who had not used a VR goggles before, they were first shown a video of the Niagara Falls, which was a highly-rated promoted 360-degree video within the Samsung Gear VR goggle interface at the time.

After watching the video either in the goggles or on the computer, both groups answered the same quantitative questionnaire. The questionnaire was created and distributed using Jotform.com and was administered using laptop computers. The questionnaire included a total of 25 questions broken down into sections based on the three types of images by Gartner [9], as demonstrated in Table 1.

The responses were analysed using SPSS Version 25. A total of 156 responses were gathered, while 30 responses were eliminated in the data cleaning process due to missing variables, leaving a total sample of 126 respondents. The sample size is acceptable however borderline and results therefore need to be interpreted with caution. These responses constitute 72 participants of the VR goggles group and 54 participants

Table 1. Source(s) of questions for the quantitative research instrument

Type of image	No. of items	Source(s)
Cognitive	7	Lin et al. (2007); Smith et al. (2015)
Affective	4	Lin et al. (2007)
Overall	1	Molinillo et al. (2018)
Intention of visit	4	Molinillo et al. (2018)

were part of the computer group. Cronbach's Alpha test was conducted to test internal reliability, resulting in an average of 0.788 and the Spearman's Rho test was conducted to test the hypotheses.

4 Findings

4.1 Demographic Sample Profile and Reliability Analysis

The tested sample consisted of 126 respondents, 57% of these respondents were assigned to the VR goggles and 43% were assigned to the computer. Most of the respondents, 51% were between the ages 25–34, and consisted of 55% male and 44% female. Furthermore, the highest education level represented was 27% from A-Levels. To measure how consistently and completely the items represent the construct, a reliability analysis was conducted with Cronbach's alpha. All constructs, except one, exceed the suggested minimum Cronbach's alpha of .70 [49] (Table 2). The cognitive image's internal reliability may be low because two question types were used.

Table 2. Reliability analysis with Cronbach's alpha

Construct	Number of factors	Cronbach's alpha
Affective image	4	.728
Cognitive image	7	.629
Involvement	3	.766
Overall image	1	1
Intention of visit	4	.818

4.2 Comparison VR Goggles and 360-Degree Computer Group

Spearman's Rho correlation analysis was used to test each hypothesis including both groups and then separately for the VR goggles group and the computer group. The results of the full sample (Table 3) show that the three types of images correlate positively with each other. The cognitive image correlates positively with the overall image with a value of 0.596. The cognitive image correlates positively with the affective image (0.596) and the affective image positively correlates with the overall image (0.556). This means that H3, H4 and H5 could be supported.

Table 3. Correlation Results of Full Sample

Full sample (n = 126)	Spearman’s Rho	Effects
H1: Involvement → Cognitive	0.385**	Supported
H2: Involvement → Affective	0.292**	Supported
H3: Cognitive → Overall image	0.526**	Supported
H4: Cognitive → Affective	0.596**	Supported
H5: Affective → Overall image	0.556**	Supported
H6: Overall Image → Intention of visit	0.468**	Supported

**Correlation is significant at the 0.01 level (2-tailed)

With regard to H1, H2 and H6 in the full sample calculation, these have been supported. Each hypothesis shows a positive correlation between the dependent and the independent variable. The next correlation test conducted was for the VR goggles group. The results in Table 4 show that all hypotheses are supported. Here again, all three types of images correlate positively with each other. The cognitive image correlates with the overall image (0.525) in Spearman’s Rho and it correlates positively with the affective image (0.646). The affective image positively correlates with the overall image (0.450).

Table 4. Results of hypotheses testing for both groups

Hypotheses	VR Goggles group (n = 72)		Computer group (n = 54)	
	Spearman’s Rho	Effects	Spearman’s Rho	Effects
H1: Involvement → Cognitive	0.451**	Supported	0.24*	Not Supported
H2: Involvement → Affective	0.309**	Supported	0.273*	Not Supported
H3: Cognitive → Overall Image	0.525**	Supported	0.508**	Supported
H4: Cognitive → Affective	0.646**	Supported	0.535**	Supported
H5: Affective → Overall Image	0.450**	Supported	0.656**	Supported
H6: Overall Image → Intention of visit	0.354**	Supported	0.535**	Supported
# Involvement → Intention to visit	0.468**	Supported	0.374**	Not Supported

**Correlation is significant at the 0.01 level (2-tailed)

#Test done to measure direct link

The final correlation test conducted was for the computer group. The results (Table 4) show that H3, H4, H5 and H6 are supported while H1 and H2 are not. Again, the three types of images correlate positively with the computer group. Cognitive image positively correlates with the overall image (0.508) in Spearman’s Rho.

Cognitive image positively correlates with the affective image (0.535) and the affective image correlates with the overall image (0.656). Finally, the overall image correlates positively with the intention to visit with a result of 0.535.

In conclusion, a t-test was conducted (Table 5) to see how far apart the means are between the two groups within the variable of involvement, cognitive image, affective image and intention to visit. The results show that the variables of affective image, cognitive image and intention to visit do not vary largely from each other in each group. Within the variable of involvement, however, there was a large variance. Specifically, the calculated means had a difference of approximately 1. Furthermore, the SD for the computer group was 0.913 and for the VR goggles group 0.629, showing a difference of 29%.

Table 5. Results of t-test

Images	Device	Mean	Std. Deviation (SD)
Involvement	VR	1.986	0.629
	Computer	2.419	0.913
Affective	VR	2.166	0.061
	Computer	2.194	0.079
Cognitive	VR	2.039	0.051
	Computer	2.153	0.064
Intention to visit	VR	3.288	0.912
	Computer	3.393	1.131

While the results of the t-test may not seem very distinct, they can be considered as useful for destination image formation and marketing practice, which are explained next.

5 Discussion

Previous research done by Marchiori et al. [45] found that traditional printed materials had almost no effect on image and that web platforms also fail to significantly influence the affective image. This study compared 360-degree videos via two different tools to test image formation and it was found that the computer does not influence the affective image, however, the VR goggles do. Furthermore, research done by Molinillo et al. [5] found that traditional websites and promotional videos do not create significant affective or cognitive images, but similar information shared through social media sites do. This result suggests that image formation is not solely dependent on content, but rather on the medium through which it is displayed. This is in line with our study, which reveals differences in the image formation process based on the tool. The study shows that VR has a positive impact on affective and cognitive image. The assumption that the usage of a computer also influences the affective and cognitive image could not be supported.

The analysis further revealed that there is a clear difference in involvement and cognitive image, and involvement and affective image among the two tools. The respondents using the VR goggles felt more involved than the computer group. This reflects results from recent literature suggesting that involvement is regarded as one of the most significant features that influences a person's destination image [5, 16]. Another interesting difference is that the impact of involvement on the intention to visit is only highly significant within the VR group, while no significance within the computer group was found. This is based on the findings that higher involvement leads to positive affective and cognitive image resulting in an overall positive image, confirming the study by Molinillo et al. [5]. What sets this research apart from its predecessors was that both the VR and the computer group received the exact same information in the same format. By controlling the format, this study concludes that the used device, and not the information itself, significantly impacts the image formation.

6 Conclusion and Implications

This research shows that the use of VR goggles has a more significant impact on the destination image formation when compared to identical content viewed on a computer, and therefore shows an increased intention to visit a destination. For the tourism industry, this study recommends VR as a useful tool for travel agents, presenting destinations to potential customers at either exhibition booths or at the agencies. For content production companies, the findings suggest to focus on activities delivering 360-degree video formats, which are compatible with VR goggles, as this viewing platform leads to higher consumer engagement. This can also be beneficial for destinations in their promotional activities of less-known tourist areas to manage both overcrowding and seasonality.

In terms of theoretical implications, the study validates Molinillo's et al. [5] model and expands that it is reliable across various media platforms (computer and VR goggles). Our study further indicates that VR shows higher levels of consumer involvement when compared to the computer platform, despite having the same medium displayed. It can therefore be concluded that 80 years after Antonin Artaud wrote about VR, the technology has proven to be a valuable tool for the tourism industry. In terms of limitations, it is acknowledged that the purposive convenience sample led to a limited generalisability of the results. The majority of the respondents are aged between 18 and 34 years old, which gives a dominant focus on a young age group. Additionally, the number of participants of the VR group (72 respondents) and the computer group (54 respondents) is uneven and could be more evenly distributed when replicating our work. For future research, it is recommended to test the model and content across a wider range of platforms and devices. Moreover, studies could expand the used model with further interesting dimensions worthy of investigation (e.g. concept of flow or willingness to pay construct) and further tap into the experiential aspects of the VR viewing experience by examining the involvement of a user's sensory dimensions and the effect on image formation.

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