Multisensory VR Experiences in Destination Management

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Abstract. The rapid development of information and communication technologies (ICTs) and the high level of consumer acceptance have made it increasingly complex to retain loyal customers. Virtual Reality (VR) has become a solution that allows tourism providers to design technology-enhanced experiences along the entire customer journey. While most VR offers focus on pre-travel experiences, the potential of VR in the post-travel phase is still little explored. Considering that multisensory tourism experiences contribute to memory formation, the multisensory extension of VR (4D VR) in post-travel experiences is of interest. Thus, through a quantitative field experiment, this study aims to detect what effect the stimulation of different senses during the use of VR has on the overall experience and how this influences the brand relationship quality. The results revealed elevated levels of technology acceptance, which consequently enhances the traveler's overall VR experience. The multisensory component positively affects one realm of an experience in the area of escapism and thus correlates with the overall experience. However, there is no significant difference between 3D and 4D regarding the level of brand relationship quality. The study expands the literature on 4D VR experiences and supports tourism practitioners in the implementation to strengthen the relationship between a destination and its guests.

Keywords: Multisensory virtual reality · Brand relationship quality · Experience economy

1 Introduction

Attaining and maintaining loyal customers has become a progressively complex challenge in today's market. This can be attributed to the widespread adaptation and acceptance of various ICTs, which customers engage with the brand [1]. One developing sector of technology progression is VR [2]. VR is expected to revolutionize tourism experiences by providing extensive sensory information [3] representing a source of education, entertainment, information, planning, heritage preservation and accessibility [4] and thus, improving customer experiences along all phases of the customer journey [5, 6].

The evolution of VR is based on the desire of people to escape their physical space. This aspiration is to some extent related to travel motives, such as the urge to be

temporarily able to leave one's familiar surroundings [7]. In this regard, virtual tours of destinations are becoming an increasingly popular approach for tourism marketing [3] and alter how tourism services and products are promoted and consumed [8]. The number of organizations that incorporate VR activities in their marketing is growing, although the implementation of VR is still nascent [6, 9].

Fully immersive virtual touristic experiences that trigger the user's visual and potentially other senses are enabled by isolating the user from the real world into a virtual environment through 360-degree real-life or synthetic content within a non-, semi-, or fully immersive VR system [4]. For tourism businesses, it is suggested to integrate at least two more senses in the use of VR [3, 10]. Instead of 3D VR, which is reduced to auditory and visual sensory stimuli, multisensory VR (4D VR) provides DMOs with an opportunity to present their services in a more engaging way [3, 4]. The multisensory approach in the context of sight, hearing, touch, smell and taste intensifies emotions and influences the overall VR experience. It does not only better appeal to the customer, but the combination also enriches the perceived value, encourages the actual consumer behavior and decision-making process [10].

The growing field of VR demonstrates the need for further research in the context of tourism [4]. Towards this aim, previous studies focused on the effect of VR technologies on the pre-travel and on-site phases [4, 5]. Nevertheless, the investigation of the post-travel phase is lacking [4]. The post-travel phase is however of major interest, as tourism organizations aim for elevated Brand Relation Quality (BRQ) by triggering post-experience related memory and relationship formation. To achieve a higher level of BRQ, VR experiences need to be authentic, personalized and relevant.

This study thus takes an integrated approach, to examine not only VR in the post-travel phase, but also to assess the effect of technology acceptance and a multisensory VR experience on the levels of BRQ. The following research questions have been identified:

1. How does the user's technology acceptance influence the overall VR experience?
2. How does the olfactory and haptic component influence the overall VR experience?
3. How does a multisensory VR experience in the post-travel phase affect the levels of Brand Relationship Quality towards a destination?

2 Literature Review

2.1 Experiences as Value Propositions

Over the last years, less attention has been paid to products and services, due to the significant shift from service-based to experience-based value propositions in tourism and hospitality [11]. Creating positive emotions and long-term memories has become the main focus [12]. Consumers want to be engaged in an inherently personal way and want to have a good time while enjoying memorable experiences [13]. Additionally, ICTs are nowadays an integral part in the way tourism experiences are designed and consumed [14]. While experiences are multidimensional constructs, the factors of

entertainment, education, escapist and esthetics need to be considered when designing experiences. All four realms form the “sweet spot” [15].

2.2 Technology Acceptance

The consumer’s willingness to adopt new technologies and to deal with different systems and devices that have not been used before, is crucial for the success of new applications [16]. Factors that strongly influence the acceptance of technologies have been researched across multiple ICTs and user populations [17], whereas Davis’ [18] Technology Acceptance Model (TAM) has been widely validated because of its robustness, generalizability and explanatory power by various scholars in the past [19]. The variables perceived usefulness and the perceived ease of use of a certain application comprise the user’s technology acceptance [18]. Customers with a high degree of technology acceptance immediately adapt to new products and are to know their features [20]. This leads to the following hypothesis:

H1: Participants with a higher technology acceptance have a better overall VR experience.

2.3 Multisensory VR in Tourism

Latest research in the field of VR is grounded in the human desire to escape the boundaries of the real world and experience new places by embracing the cyber world [20]. Virtual tours of destinations are becoming an increasingly popular approach in tourism marketing [3] and have altered the ways in which tourism services and products are promoted and consumed [7]. VR is often labeled as the future of tourism marketing [21]. Tourism can benefit from VR in the areas of entertainment, education, management, planning, heritage preservation [2, 22] or accessibility before, during and after travel [4], enriching the customer experience along the customer journey [5, 6]. With the possibility to rotate 360-degree around a certain angle, VR enables tourists to experience a destination before the actual consumption [3]. To echo the travel experience and review the journey after the departure, travelers can share 360-degree-videos through VR with family and friends at home. This inspires other people during their pre-trip inspiration phase [4]. It is said that VR has a stronger influence on the desire to visit a destination as other promotional materials [23], which contradicts Tussyadiah et al. [8] who emphasize that fully immersive VR experiences are less powerful than traditional travel guides.

One of the main recent developments has been the shift from 3D to 4D multisensory VR [3]. The nature of a tourism experience is intangible, yet physical and multisensory [24]. To allow an experience that is close to the real one, it is suggested to engage all five human senses [25]. It does not only better appeal to the customer, but the combination also enriches the level of immersion, perceived value, and encourages consumer behavior and decision making [10]. Multisensory VR provides DMOs with the opportunity to present their services and products in a more engaging way [3], as the multisensory approach in the context of sight, hearing, touch, smell and taste intensifies emotions linked to the overall experience [10]. Offering the user unexpected

sensory input, such as audio or a new scenery, takes the person off the cognitive track [26]. This results in the following hypothesis and sub-hypotheses:

H2: Multisensory stimuli enhance the user's overall VR experience.

H2a: Multisensory stimuli enhance the educational realm of the user's VR experience.

H2b: Multisensory stimuli enhance the entertainment realm of the user's VR experience.

H2c: Multisensory stimuli enhance the esthetic realm of the user's VR experience.

H2d: Multisensory stimuli enhance the escapist realm of the user's VR experience.

2.4 Brand Relationship Quality

An essential strategic factor in the long-term relationship between the brand and its customers, is customer retention in brand management [27]. Relationship quality itself inherits the perception of another party regarding social, cultural, economic, or political aspects [28]. To debate the importance of long-term relationships, the concept has been applied in various fields. In the tourism industry, entities are realizing the need for an in-depth understanding of the established bonds between travelers and the destination [29], because a tourist's commitment to a destination defines the competitiveness of a region, which is considered as a pillar of brand quality [30]. Marketing-based VR could play a critical role in facilitating a brand's performance, whereas negatively perceived VR could diminish the brand relationship [30].

There are multiple constructs and factors measuring BRQ [32]. As BRQ evolves through a meaningful interaction between a brand and its consumers, actions shape the quality of the relationships by fostering, diluting or even dissolving them [33]. The strength of the brand relationship is discussed by six indicators, including: *"love and passion, self-connection, commitment, interdependence, intimacy and brand partner quality"* [33, p. 366].

Brand love is part of the multidimensional attachment construct, including the items passion, affection and connection [34]. Not consuming the brand for a while is experienced as "something is missing" [33]. It is not only based on passion, but also on frequency and an ongoing long-term relationship [34]. Within the facet of self-connection, the brand sends out important identity values, themes and tasks, communicating and stating an aspect of self. Commitment is the psychological or emotional attachment to a brand and its product class [33]. This develops more from the person's attitudinal rather than behavioral trait [35], preferring one product or service over another. Intimacy arises through the customer's elaborate knowledge about the company and its personal brand stories [36]. By advertising cues, such as slogans or a specific character, the personalized brand information enters the long-term memory [37]. Brand partner quality is the positive alignment of the brand towards its customers. People should feel respected, listened to, wanted and cared for, building the base for the customer's judgement about the brands performance [33]. Therefore, the following hypothesis and sub-hypothesis have been formed:

H3: A 4D VR experience has a stronger influence on the levels of BRQ than a 3D experience.

H3a: A multisensory VR experience in the post-travel phase will increase the love and passion of travelers towards a destination.

H3b: A multisensory VR experience in the post-travel phase will increase the self-connection of travelers towards a destination.

H3c: A multisensory VR experience in the post-travel phase will increase the commitment of travelers towards a destination.

H3d: A multisensory VR experience in the post-travel phase will increase the interdependence of travelers towards a destination.

H3e: A multisensory VR experience in the post-travel phase will increase the intimacy of travelers towards a destination.

H3f: A multisensory VR experience in the post-travel phase will increase brand partner quality towards a destination.

2.5 Conceptual Framework

The following hypothesis model designed for this research indicates, that the overall VR experience is dependent on Pine & Gilmore's [15] four realms of an experience formed by education, entertainment, esthetic and escapist factors. The VR experience depends on the user's technology acceptance, resulting from the user's perceived usefulness and perceived ease of use [18]. The influence of the overall VR experience on the six levels of brand relationship quality concludes the construct (Fig. 1).

Fig. 1. Conceptual framework based on Pine & Gilmore [15], Davis [18] and Fournier [33].

3 Methodology

The study is based on an experimental research design. Laboratory experiments are commonly chosen as a methodology to explore causal knowledge in life and physical sciences but have been criticized for their lack of generalizability and realism. In contrast, field experiments are logistically more difficult, time-consuming and costly

[38]. To enable the quantitative field experiment by examining a DMO's real use of VR, the tourism destination "Wagrain-Kleinarl" has been chosen as a case study region. To expand research on the use of VR in the post-travel phase, participants of the study have been guests who spent their vacations in the destination in the past. In the research process, study participants were recruited via the destination's Facebook page which has more than 15,000 followers and Instagram channel with over 9,300 subscribers. Within one hour, the limited number of participants, willing to be part of the project, was achieved. In total, 100 guests of the destination agreed to participate in the field experiment.

All participants were randomly assigned to Group A, the experimental group, and Group B, the control group. Within the framework of a post-test-only control group design, both groups did not conduct a pre-test and underwent the same visual and auditory VR experience. The goal was to add a different intervention to only the experimental group, in this case an olfactory and haptic component to the VR experience. An online questionnaire was utilized as a measurement tool. Levitt and List [39] pointed out that the same degree of control as in laboratory experiments cannot be achieved in field-experiments. For this reason, all other factors that could influence the outcome must be controlled [40] and possible confounding variables detected [41].

For this study's research design, a prototype of a multisensory VR experience, tailored to the destination's corporate identity was sent with a package to the guests' homes. Both groups received a box, including a pair of VR cardboard glasses, detailed instructions on how to conduct the VR experience, a QR code leading to a tailored 360-degree-video hosted on YouTube and a second QR code guiding to the online survey. The VR video was shot with an Insta360 in April 2021. Within 3:18 min, the user experienced a sunrise above the destination of Wagrain-Kleinarl, a farm, a stable with two children playing in the hay, a mountain and lake scenery. In addition, the experimental group received the olfactory and haptic component of hay and herbs from the region as intervention. In the first step, the participants were instructed to sit down in a quiet place. The second step was to take the VR cardboard goggles out of the box and open the flap for the smartphone. After that, the participant scanned the QR code on the instructions, whereupon a video opened. After selecting the VR mode and turning the device to landscape, the user placed the smartphone in the goggles. Additionally, the experimental group was instructed to pick up the hay and take a deep breath. After both groups watched the same 360-degree-video in the goggles, the QR code for the online survey was scanned.

Both groups conducted the same questionnaire, measuring the user's technology acceptance in case of perceived usefulness, perceived ease of use and attitude towards using [18, 20]. This allows a better understanding of the tourist's use of the virtual environment, which in turn influences travel intentions [19]. To measure the experience dimensions within the virtual environment, Pine and Gilmore's [15] four realms of an experience, i.e. entertainment, educational, escapist and esthetic, have been adopted as items. Fournier's [33] construct of BRQ explored the six factors of brand partner quality regarding the traveler's intimacy, commitment, self-connection, interdependence as well as love and passion towards the destination. The online survey was a fully standardized questionnaire, based on predominantly closed questions with suggested answers and statements to assess on a Likert scale ranking 1 "totally agree" to 5 "don't agree at all". Subsequently, the data analysis was executed by using SPSS20.

4 Results

4.1 Sample Description and Reliability Analysis

The tested sample consisted of 100 participants, whereas a response rate of 85% ($n = 85$) has been achieved. 41 of those participants belong to the experimental group and 44 to the control group. The majority of the participants were female with 65.9%. The age groups were well distributed: 34% were under 31 years old, 31.8% between 31 and 40 years and 34.1% over 40 years old. 50% of the questioned travelers were Austrians, closely followed with 40% German guests. In total, six European nations were represented. The highest education of 30% of the participants is high school, followed by Master's and Bachelor's degree. With 60% of the participants of the study are currently employees. By investigating the reliability, the stability and consistency of each constructed was evaluated. No statistical differences between the control and experimental group were identified. The dimensions of technology acceptance reached a Cronbach's Alpha from .609 to .756, the four dimensions of the overall VR experience achieved values from .627 in education and the highest value of .902 in the realm of escapist. All six dimensions of BRQ have a Cronbach's Alpha over .709.

4.2 Test of Normality and Hypotheses

With the Shapiro-Wilk and Kolmogorov-Smirnov test, the questionnaire was tested for normality. A normal distribution was present in H2, H2a, H2c and H3d. A T-Test was used to compare the two samples. For the remaining hypotheses, the U-Test according to Mann and Whitney test was generated. Regarding the hypothesis testing in Table 1, the questionnaire applied a 5-point Likert scale with 1 representing the best rating and 5 the worst, showcasing with values ≤ 2.5 the more positive answers. In the following table, the hypothesis testing is presented. With significant values from .29 to .91, H3a to H3f had to be rejected and are therefore not separately presented in the table below.

Table 1. Hypotheses testing

Hypotheses	Dep. variable	Group	M	p	Decision
H1	Technology Acceptance	3D	1,7	.000	Supported
		4D	1,5		
H2	Overall VR experience	3D	2,2	.037	Supported*
		4D	1,9		
H2a	Education	3D	2,6	.045	Supported*
		4D	2,2		
H2b	Entertainment	3D	1,8	.294	Rejected
		4D	1,8		
H2c	Esthetic	3D	2,0	.068	Rejected
		4D	1,8		
H2d	Escapism	3D	2,3	.024	Supported
		4D	1,9		
H3	BRQ	3D	1,9	.916	Rejected
		4D	1,9		

* Rejected by T-Test

4.3 Further Correlation Analysis

Examining the technological acceptance in correlation with the fact that the respondents have a VR experience, no significant correlations were found ($p = 0.096$). Thus, it can be said that technology acceptance does not depend on prior experience of using VR. A highly significant result was shown by the Kruskal Wallis test ($p = 0.002$). Accordingly, it can be said that technology acceptance is related to age. The youngest age group (>31 years) had a significantly higher technology acceptance compared to the eldest respondents (>40 years). Differences were not only apparent in age. There were also significant differences ($p = 0.036$) in technology acceptance regarding the highest level of education completed. In the middle ranks, it could be observed that those with a bachelor's degree have a significantly higher technology acceptance than those with a completed primary school education. Furthermore, the T-test showed that participants with prior experience of VR did not enjoy a more intense VR experience than those who had never experienced VR before ($p = 0.692$). Thus, the overall VR-experience was not related to whether someone had experienced VR before. The T-test which was used to evaluate whether a difference occurs with respect to the overall VR experience, indicated that there was no such difference ($p = 0.544$) regarding distractions, such as noise from a radio or TV. Upon further review, it appeared that other people in the room in fact do not make a difference on the VR experience ($p = 0.425$).

5 Discussion

Previous research stated that the success of new applications depends on the willingness of customers to adopt them [16]. In this study, the openness towards new technologies was elevated among the participants with a mean value of 1.4. Both groups indicated a relatively high technology acceptance regarding the perceived ease of use and usefulness of the VR application. With a positive correlation according to Pearson (0.602), the assertion proves to be true. People with a high technology acceptance enjoyed a greater overall VR experience. The study's findings differ from the literature, as the participants' prior experience with VR did not influence the user's degree of technology acceptance [42].

In the design of VR experiences, Hopf et al. [3] suggested, that at least two more senses should be involved in the use of VR. In this study, no major deviation between the purely audio-visual experience and the advanced experience with the haptic and olfactory components was detected. Although the means demonstrated, that 4D improves the VR experience, according to the T-Test, statistically significant differences could not be found in this data. Therefore, engaging additional senses besides visual and auditory do not enable a better overall VR experience. Reflecting deeper on the overall VR experience, a rich experience consists of all four realms [15]. Here it can be stated that the additional multisensory components allowed a greater degree of escapism compared to a 3D experience. Contradictory results were similarly obtained for education and esthetics. Solely the area of entertainment, with equal mean values and a U-Test after normal distribution showed, that the hypothesis had to be rejected.

This study also explored the effect of a multisensory experience on the levels of BRQ. Findings revealed, that with a score of 0.916, there was no significant difference between a 4D and a 3D experience, even though each level represented elevated levels. Regarding the most important aspect of BRQ, love and passion towards a brand [43], all items presented very good to good mean values. The study supports Fournier [33] by declaring, that “something is missing” when one cannot consume a brand for a certain period of time. The multisensory component did not lead to any deviations.

6 Conclusions and Implications

This study aimed to explore the effect of multisensory VR on the levels of BRQ in destination management. By considering the user’s degree of technology acceptance, this study supports prior research in agreeing to the positive contribution to the overall VR experience. The study contributes to the experience economy, stating that experiences are multidimensional. Specifically, the engagement of the senses contributes significantly to intensity and authenticity [25]. Applying the four realms of a memorable experience as a benchmark proved to be useful. It was confirmed that the haptic and olfactory components positively influence the audio-visual VR experience in the area of escapism. However, this research clearly revealed that the additional sensory stimuli do not enhance the overall VR experience in the post-travel phase, although guests did feel more immersed in the virtual world. Thus, there is no different impact on the relationship between the guest and the region when more than audio-visual senses are engaged in a virtual reality experience. One possible reason for this could be that, in general, a VR experience in the post-travel phase is very novel to customers and thus this single factor of the multisensory component does not entail a significant difference on the BRQ.

In terms of theoretical implications, this study opened a novel research area by bridging multisensory VR experiences, post-travel experiences and BRQ. The study partly contradicts previous research highlighting the importance of the implementation of additional senses in the design of VR experiences. Limitations have been discovered, since the experiment did not take place in a laboratory setting under observation, unmediated confounding variables, such as noise, other odor influences or social presence from other individuals or subjects could have influenced the results. Due to the choice of the post-test only control-group design, no pretest was conducted. For further research it is suggested to apply different objective and subjective measurement techniques, such as personal observations or post-experiment interviews to verify the results and to gain further insights into the traveler’s perception of multisensory VR in the post-travel phase. The same prototype could be tested to explore emotional arousal or booking intentions. The study provides implications for tourism providers in the design of multisensory VR applications. Herewith, the implementation of the four realms education, entertainment, esthetics and escapism is recommended. Especially in the fourth variable, the additional multisensory components allow for a stronger

immersion. Ultimately, the participant's high technology acceptance revealed that multisensory VR applications in the post-travel phase are highly appreciated by the destination's guests.

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