



Article

# Virtual Reality Experience of Mega Sports Events: A Technology Acceptance Study

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**Abstract:** Digitalization has advanced to become an opportunity to spectate sports during the pandemic and its restrictions for traveling to competitions. The purpose of this study is to investigate the antecedents of using virtual reality technology for spectating mega sports events. Based on a literature review, the authors created a model of behavioral intention, built on the unified theory of acceptance and use of technology and technology acceptance model to examine the curiosity and self-construal of spectators. An online survey obtained empirical evidence from 339 sports enthusiasts. The research model was fitted using the partial least squares algorithm. The results show that all the antecedents significantly affected the intention to use a VR device to spectate mega sports events, which explains a significant variance. Surprisingly, influences arising from social norm predominated over those arising from curiosity and the hedonic exploration of VR (enjoyment, and experience). The social norm strongly influences a VR device's perceived usefulness, implying that people believe using VR will enhance their position in society and that they will thus perceive the technology as being more beneficial. The novelty of this study arises from quantifying the importance of curiosity's relationship to VR acceptance and pinpointing the relevance of self-construal for VR acceptance.

**Keywords:** unified theory of acceptance and use of technology; technology acceptance model; virtual reality; self-construal; curiosity; mega sports events



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## 1. Introduction

Digitization has started to gain ground in modern sports, especially the digitization of spectator experiences [1,2] and the purposeful design of experiential spaces and websites [3,4] offers new opportunities in sports marketing [5]. Virtual reality (VR) is one of the technologies shifting the role of digitalization “from being a driver of marginal efficiency to an enabler of fundamental innovation and disruption” [6] (p. 83).

The reality–virtuality continuum [7] has been the starting point for researchers to classify realities in four classes [8]: real environment, augmented reality, augmented virtuality and virtual environment. The real environment encompassing the reality itself, including direct or indirect (via displays) views of a scene, represents the one extreme of the continuum. The virtual environment represents the other extreme. Here the environment is entirely computer generated, and the objects actually do not exist. In between is the technology-mediated-mixed reality with a wide variety of augmented reality, such as additional information on the mobile phone or augmented virtuality such as the videogame Pokémon Go [9]. Flavián et al. [8] extended the taxonomy by incorporating pure mixed reality, where users are placed in the real world with totally integrated digital content to their surroundings. Pure mixed reality allows users to interact with digital and real-world content, and these elements can also interact with each other.

The market for VR technology is growing with its rapid development [10,11]. With the emergence of affordable, consumer-ready VR headsets for gaming and entertainment,

VR offers new entertainment applications. The technology provides opportunities for spectators to use VR devices to feel as though they are physically attending an event while enjoying it at home or to experience competition from the perspective of athletes. Researchers highlight the impact of VR experience on affective responses and attitude toward a winter sport—luge [1]. In doing so, they establish a new form of sports experience. The opportunity to use various technologies to follow mega sports events emerged during the 2018 Olympic Games in Pyeongchang. So far, little research has focused on experiences enhanced by VR devices in the context of sporting events [1,6,12].

VR environments stimulate users, who are immersed to the extent that they feel “being there” [13]. There is a narrow understanding of virtual environments as settings for brand-enabled relationships [14]. However, VR and also augmented reality applications and potential can be substantially different. The theory of technological mediation [15] aims to explain human–technology mediation processes. Here, embodiment is a state in which technological devices mediate users’ experiences. Devices become intertwined with users and allow them to perceive, interpret and interact with their immediate environment [16]. Technologies range from no or minimum embodiment to fully integrated devices [17]. With the embodiment–presence–interactivity cube (EPI Cube; [8]), this taxonomy is developed further, enabling understanding of technological embodiment as the degree of contact between the device and the human senses. Stationary external devices (e.g., desktop computers) represent the lowest level of technological embodiment, as they are detached from the body. Portable devices such as smartphones are in the medium-low part of the continuum, and wearables such as VR headsets have a medium-high position, as they are more physically integrated with the users’ bodies. When the technology and the human body are abundantly integrated (e.g., smart contact lenses), forming the same entity, the maximum level of the technological embodiment is achieved [16].

In the last few years, the creation of content and industry applications has become critical. Services share attributes, such as intangibility, heterogeneity, and inseparability of production and consumption [18]. Additionally, 360-degree videos have the potential to even resemble real-life experiences [19] and have become more and more popular among customers [20]. Compared to desktop computers and mobile phones, virtual reality devices evoke more positive emotional reactions and higher levels of psychological and behavioral engagement [17]. These results derived in the context of hospitality management [18,20] might be transferable to spectating mega sports events because both industries have comparable characteristics of being service based and experiential in nature, with the impossibility to experience in advance [8].

VR’s applications and their potentials have been studied in various non-sports contexts, such as tourism and hospitality [18,21–23], theme parks [21], aeronautics [24], shopping [25,26], learning [27], gaming [28,29], and clinical settings [30]. Given the potential importance of these technologies, researchers and practitioners need to better understand how consumers respond to experiences in order to effectively address current trends and develop valuable proposals [18]. In this line, previous research lacks insights into why people intend to use VR in specific situations [9]. Notably, research has stressed the relevance of investigating curiosity concerning VR acceptance [31] and highlighted the influence of self-construal when studying the acceptance of new technology [32]. The current study provides valuable insights into consumers’ adoption of VR for spectating mega sports events. Specifically, we draw from the unified theory of acceptance and use of technology (UTAUT) to build a broad intention model that captures the cognitive-, social-, and personality-related influences that affect the use of VR. Evaluating evidence provided by 339 respondents, we aimed to answer the research question of whether spectator’s curiosity or the fulfilment of an expectation mainly drives the adoption of VR technology to spectate mega sports events.

To address this question, we complement technology acceptance model 3 (TAM3) and the unified theory of acceptance and use of technology 2 (UTAUT2) by considering curiosity and the components of construal level theory. Construal level theory provides

insights that explain the relationship between an individual's abstract or concrete thinking and psychological distance [33,34].

This study contributes to the scholarly discussion by highlighting the relevance of social- and personality-related drivers. From a manager's point of view, the findings are relevant because the conception of a marketing campaign differs depending on whether the social norm or joy and fun elements are more important in explaining the spectators' intention to use.

The research is reported as follows: first, the theoretical framing is described along with the deviation between the research hypotheses and the model; next, the methodology and the data analysis are provided; lastly, the contributions are outlined.

## 2. Related Research and Conceptual Model

### 2.1. VR and Its Application for Media Consumption in Mega Sports Events

Contemporary VR usually involves head-mounted displays that allow users to immerse themselves in a virtual world by blocking out the real world [35]. The VR user can interact with a simulated environment [36].

Following [37], VR research focuses on two distinct areas: (i) the technology itself and (ii) the user's viewpoint. The latter focus examines the user experience of VR and, therefore, the primary determinants of expectations, the experience itself, and the post hoc evaluation of being immersed in the artificial environment [1,31,38].

Concerns about the affordability of VR have been resolved, as people and industries willing to buy VR devices use the technology at an affordable cost [35,39]. Hartl and Berger [37] stress that the emergence of VR glasses transformed VR into a more advanced technology, which started to be cost effective and involve human senses [40], making it suitable for the mass market. VR is used in sports to give spectators the experience of a great view [12].

VR has significant relevance as a medium that enables athletes to improve their performance while training [41–43], allowing them to analyze what they do while exercising and consider possible improvements [44]. Little research, however, has considered the spectators' perspective of using VR in the context of mega sports events [45] beyond the examples of the National Basketball Association and the National Football League [12]. In conclusion, VR offers more intense experiences than just watching TV.

### 2.2. Technology Acceptance of VR for Spectating Mega Sports Events

The TAM is the framing most suited to this study [46], as it evaluates the acceptance of a specific technology (in this case, VR) and can be adapted to various fields and situations [47,48]. The TAM3 was adopted for our research design to study the acceptance of VR regarding perceived usefulness, the subjective norm, image, perceived ease of use, perceived enjoyment, usage attitude, intention to use, and experience [49–51]. Components of other theories have enriched the TAM model to strengthen its explanatory power.

Previous research has successfully integrated the literature on curiosity with TAM [31, 52–54]. Curiosity is defined as the degree to which individuals are willing to increase their knowledge about the innovation to understand as many things as possible. Furthermore, the price value derived from UTAUT2 is interesting in the context of the consumption of mega sports events, as it reflects a technology user's trade-off between the benefit of a given technology and the monetary cost of using it [44]. It provides evidence of whether spectating mega sports events through VR is a potentially profitable market.

In mega sports events, emotions and enjoyment usually play a central role in consumption [55–57]. Therefore, it is crucial to apply construal level theory in the context of the acceptance of VR for consuming mega sports events. Previous research [32,58,59] has already combined construal level theory with TAM to understand the role of emotions and enjoyment when using a specific technology.

Construal level theory provides insights into the relationship between the individual's abstract or concrete thinking and the psychological distance between the object and the

individual [33,60]. This distance can be of four distinct dimensions [58,59]: spatial (here or there), temporal (near or distant future), social (in-group or alone, self or other), and hypothetical (certainty or uncertainty). The closer an arbitrary object or incidence is, the more the individual's thinking about it will be concrete and the greater the fun of spectating the event. However, this boost of fun and excitement will be the opposite resulting in frustration if technical challenges thwart the spectator. Choi and Totten [32] have already provided evidence of the relevance of (expected) self-construal to technology acceptance. Building upon Kuhnen's work [45], they argue that self-construal positively influences the use of mobile TV technologies.

### 3. Research Hypotheses

This study contributes to the recent stream of adoption studies developed in the context of other technologies that are currently in the process of implementation, such as artificial intelligence [61–63], e-wallets [64] or online streaming services [65]. In the context of VR acceptance in the context of sports, the initial TAM hypotheses have been verified in various studies [6,27,30,37,66–68].

#### 3.1. Subjective Norm

Subjective norm has been defined as “a person's perception that most people who are important to him think he should or should not perform the behavior in question” [69] (p. 90). Previous research [51] highlighted that the subjective norm positively influences the individual's image, in this case the spectator's image. This influence comes from relevant members of the user's social group, who impact the user and his or her decision to use the technology, which elevates the user's position within the group [70–72]. Therefore, the following hypothesis is proposed:

**Hypothesis 1a (H1a).** *The subjective norm positively affects the spectator's image.*

In the same study, Venkatesh and Davis [51] support the idea that the social norm positively influences the perceived usefulness of innovative technology. Indeed, following the earlier work [73–77] suggests that identification affects the subjective norm concerning the user's perception of the usefulness of the technology, already well-established in previous research [50,78–80]. Therefore, a second hypothesis regarding the subjective norm is proposed:

**Hypothesis 1b (H1b).** *The subjective norm has positive effects on perceived usefulness.*

Enlarging the TAM [51] points out the influence of the subjective norm on image and perceived usefulness but also suggests that the subjective norm affects the intention to use. Previous research [62,81,82] indicated subjective norms to root in interpersonal sources and external sources of information. In line with previous research [61] on technology-based innovations, this demonstrates how the opinion of society affects the individuals' behavior. Therefore, the following hypothesis is proposed:

**Hypothesis 1c (H1c).** *The subjective norm has positive effects on intention to use.*

#### 3.2. Image

The reasoning applied to the impact of the subjective norm on the image also applies to the spectators' image itself, which positively affects the perceived usefulness of a technology. Indeed, the status, and therefore the image, of individuals within a group enhances their opinions on a topic within the same group [51]; if a high-status person in the group perceives VR as valuable, that person's image will positively affect the perceived usefulness of VR within the group. This gives rise to the second research hypothesis:

**Hypothesis 2 (H2).** *Image positively affects perceived usefulness.*

### 3.3. Output Quality

The output quality is defined as “over and above considerations of what tasks a system is capable of performing and the degree to which those tasks match their job goals (job relevance), people will take into consideration how well the system performs those tasks” [51] (p. 191).

TAM measures the output quality [83,84], stressing that output quality positively influences users’ propensity to adopt certain technologies. Therefore, this hypothesis of the model aims to study whether, contrasting to the original TAM, the output quality directly affects the usage attitude instead of the perceived usefulness.

**Hypothesis 3 (H3).** *Output quality positively affects usage attitude.*

### 3.4. Perceived Enjoyment

Lee [29] presents evidence of perceived enjoyment’s effects on perceived ease of use. Moreover, other studies [48,80,85] underline the fact that enjoyment plays a crucial role in analyzing the acceptance of VR; indeed, entertainment devices that are diverting for users have been proven to have positive effects on the perceived ease of use of the technology. Consequently, the fourth hypothesis is proposed:

**Hypothesis 4 (H4).** *Perceived enjoyment of a VR device positively affects perceived ease of use.*

### 3.5. Perceived Ease of Use

Perceived ease of use is not only affected by other constructs, but also influences other variables. Consequently, Sagnier [24] underlines the positive effects that the perceived ease of use has on the perceived usefulness of VR, basing that hypothesis on the study of Davis [49] and confirming it using the computations of King and He [86]. Moreover, the same work [24] presents evidence of such an influence [79,87–89]. To strengthen the underpinning of this relationship, Venkatesh and Davis [51] add a further explanation: the more accessible a technology is and the more effortless it is to use, the more valuable it will be perceived to be (taking all the other variables as constant). This inspires the following hypothesis:

**Hypothesis 5a (H5a).** *The perceived ease of use of a VR device positively affects perceived usefulness.*

Further investigating the influence that a technology’s perceived ease of use has on other constructs of the model, [90] affirms that innovative technology is likely to be accepted if it is perceived as easy to use, which creates a positive attitude in the consumer. The same hypothesis was formulated by previous researchers [32,62,65]. Therefore, the following hypothesis is proposed:

**Hypothesis 5b (H5b).** *The perceived ease of use of a VR device positively affects usage attitude.*

### 3.6. Perceived Usefulness

Wallace and Sheetz [74] apply similar reasoning to perceived usefulness as was mentioned in regard to perceived ease of use: an innovative technology that is perceived as useful creates a positive attitude among consumers. Based on previous studies [62,64] findings, perceived usefulness positively and significantly influences consumer’s attitude.

A valuable technology is more suitable for use, which inspires a positive attitude toward the technology itself. The sixth research hypothesis is based on this evidence:

**Hypothesis 6 (H6).** *The perceived usefulness of a VR device positively affects usage attitude.*

### 3.7. Usage Attitude

The development of the following hypothesis begins with previous research [62], investigating usage attitudes toward a technology. An earlier study of VR acceptance [29] clearly found that user attitude toward the use of a technology positively influences the intention to use it. Adapting the well-established TAM relationships, the following hypothesis is proposed:

**Hypothesis 7 (H7).** *Usage attitude toward a VR device positively affects intention to use.*

### 3.8. Experience

Venkatesh and Bala [50] discovered a link between the one-time use of a technology and its perceived enjoyment: users who have already experienced the use of the technology perceive it as more entertaining than those who have never tried it. This inspires the following hypothesis:

**Hypothesis 8a (H8a).** *Experience has positive effects on perceived enjoyment.*

Moreover, [50] underlines the relevance of experience in relation to perceived ease of use; people who use a technology more strongly perceive it to be more straightforward to use than those who are trying the technology for the first time. Accordingly, the following hypothesis is proposed:

**Hypothesis 8b (H8b).** *Experience positively affects perceived ease of use.*

### 3.9. Price Value

Price value is a relevant variable affecting usage attitude. In the second version of UTAUT, this construct positively affects the usage attitude toward the technology investigated in the model [54]. Therefore, the ninth hypothesis is as follows:

**Hypothesis 9 (H9).** *Price value positively affects usage attitude.*

### 3.10. Curiosity

Curiosity affects perceived ease of use [31]. The current research aims to understand whether curiosity affects the usage attitude in addition to perceived ease of use. Thus, the following hypothesis is proposed:

**Hypothesis 10a (H10a).** *Curiosity positively affects usage attitude.*

Research underlines that people who seem to be more curious by nature are more motivated to try new technology [31], inspiring the following hypothesis:

**Hypothesis 10b (H10b).** *Curiosity positively affects intention to use.*

### 3.11. Self-Constraint

The final hypothesis derived from construal level theory in this study focuses on the importance of self-construal. This considers the self as a dynamic creation in which an individual's self-views, emotions, and motivations form a consistent structure of preferences, convictions, and goals [34,91,92]. Clearly, using VR technology can support the individual by reducing the distance to athletes in mega sport events, allowing the user to become immersed in the event rather than merely being an external spectator [76]. Therefore, the last hypothesis is as follows:

**Hypothesis 11 (H11).** *Self-construal positively affects intention to use.*

Based on the previous research discussed above, we developed the research model in Figure 1 to examine VR acceptance in the consumption of mega sports events.

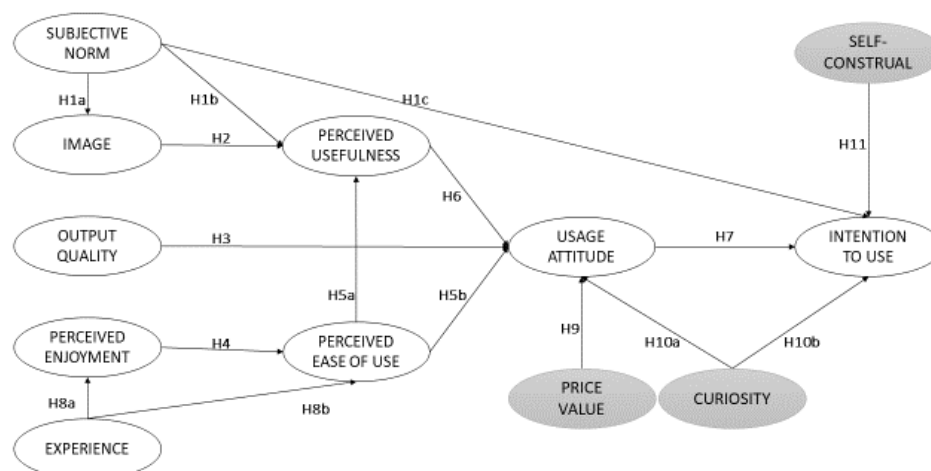


Figure 1. Research model.

#### 4. Materials, Methods, and Data

##### Data Gathering

To obtain empirical evidence, an online survey was developed in English. After pretesting, it was translated to and backtranslated from Italian. The survey was spread in Italian and English via social media in a purposive sampling procedure. The target population, interested in spectating sports events (on-site or digital), is unknown, but we assume that individuals who are practicing sports activities by themselves have a higher interest to spectate sports events. In general, younger people are more likely to practice sport activities than older ones. Moreover, young people might score higher in curiosity with respect to digital innovation. Young consumers become familiar with innovative devices easily [63], as they have grown up in a world of digitization in various domains including sports (e.g., goal line technology or video referee in soccer). To meet the sampling advice of [93], the target respondents qualified by being sports enthusiasts who were active members of clubs or teams, by having a particular interest in the Olympic disciplines, or by having previously virtually attended the Olympic Games. The prior experience of participants was validated by means of self-reports. Consolidating the criteria applied ensured that the respondents were sampled from the target population. The questionnaire was distributed online through sports clubs, university sports centers, and sporting events. Respondents were not incentivized, but participated due to their intrinsic motivation and curiosity for new sport spectating experience. All questions of the survey were measured through a 7-point Likert scale. The online questionnaire also includes a video that provides an example for VR, a video produced during the 2018 Winter Olympic Games. To ensure a common understanding, participants were given an explanation of VR as well as an exemplary video. The respondents could not progress in answering the questionnaire without watching the video.

The sample includes 348 responses. Following [94], nine replies were deleted due to incomplete and inconsistent responses.

As shown in Table 1, a target group of young sports enthusiasts was recruited. The sample embraces a substantial variety of disciplines, so we expected it to provide us with valid, reliable information to answer the research question of whether curiosity or the fulfilment of an expectation is the main driver for adopting VR technology to spectate mega sports events.

**Table 1.** Sample description.

Variable		Cases (%)	Variable		Cases (%)
Gender	Male	148 (43.66%)	Education	Secondary school	119 (35.1%)
	Female	188 (55.46%)		College degree	57 (16.82%)
	I prefer not to answer	3 (0.88%)		Bachelor’s degree	111 (32.74%)
Do you do any sports?	Yes	219 (64.6%)	Master’s degree	44 (12.98%)	
	No	120 (35.4%)	Doctorate degree	8 (2.36%)	
What sport do you do? (multiple responses)	Tennis	20 (6.23%)	Age	18–30	229 (67.55%)
	Swimming	23 (7.16%)		31–40	30 (8.85%)
	Volleyball	12 (3.74%)		41–50	37 (10.92%)
	Basketball	13 (4.05%)		51–60	34 (10.03%)
	Gymnastics	36 (11.21%)		61–70	6 (1.77%)
	Fencing	32 (9.97%)	71–80	3 (0.88%)	
	Jogging	56 (17.45%)	Country	Italy	221 (65.19%)
	Athletics	7 (2.18%)		France	68 (20.06%)
	Football	25 (7.79%)		Poland	13 (3.84%)
	Other	97 (30.22%)		Germany	5 (1.47%)
		Spain		4 (1.18%)	
		United Kingdom	4 (1.18%)		
		Other	24 (7.08%)		

**5. Results**

The results described in this section were obtained by applying the consistent partial least squares (PLS) procedure [95,96] in SmartPLS version 3.3.3 [97]. PLS fitting is well established and very prominent in technology acceptance analysis [98,99].

*5.1. Reliability and Validity Assessment*

Table 2 presents the outer loadings, Cronbach’s alpha, Rho\_A, CR, and AVE. The measurement specifications of all the constructs met the common quality standards. Hair [83] points out that outer loadings should not be higher than 0.950 to avoid redundancy, which could compromise the items’ validity. As shown in Table 2, none of the values exceeds that limit. We conducted the Harman–Test for assessing the common method variance. The result of 0.318 of common variance is far below the threshold of 0.5.

**Table 2.** Measurement model validity.

	Outer Loading	Cronbach’s Alpha	Rho_A	CR	AVE
<b>Self-construal [88,100]</b>					
When you are using a VR device ...					
Do you think about how useful it is to support you in watching sports?	0.880	0.838	0.841	0.839	0.723
Do you think about how easy it is to use it to watch sports?	0.819				
<b>Curiosity [101]</b>					
I like to shop around and look at displays.	0.657	0.739	0.787	0.756	0.614
I often read advertisements just out of curiosity.	0.892				
<b>Experience [102,103]</b>					
I feel comfortable using a VR device.	0.844	0.851	0.852	0.851	0.741
I feel competent using a VR device.	0.878				
<b>Image [50,51]</b>					
Among my friends, people who use VR devices attract more attention.	0.824	0.777	0.779	0.778	0.637
Having a VR device is a status symbol among my friends.	0.771				



Table 2. Cont.

	Outer Loading	Cronbach's Alpha	Rho_A	CR	AVE
<b>Intention to use [50]</b>					
There is a high likelihood that I will use a VR device during the next Olympic Games.	0.879	0.923	0.924	0.924	0.801
I will use a VR device during the next Olympic Games.	0.902				
Using a VR device during the next Olympic Games is important to me.	0.905				
<b>Output quality [50,51]</b>					
I have no problem with the quality of VR's video/image output.	0.878	0.806	0.816	0.809	0.681
I rate the video/image I get from VR as excellent.	0.769				
<b>Perceived ease of use [49]</b>					
I believe it would be easy to get a VR device to do what I want it to do.	0.791	0.839	0.840	0.839	0.635
I would find a VR device flexible to interact with.	0.827				
It would be easy for me to become skillful at using a VR device.	0.772				
<b>Perceived enjoyment [49]</b>					
I believe I would find using a VR device enjoyable.	0.893	0.896	0.896	0.896	0.811
Using a VR device would be enjoyable.	0.908				
<b>Perceived usefulness [49]</b>					
I believe using a VR device would help me to be more effective.	0.825	0.837	0.839	0.838	0.722
Using a VR device would improve my life.	0.873				
<b>Price value [54]</b>					
The current average price of a VR device is €100: A VR device is a good value for the money.	0.869	0.900	0.904	0.901	0.821
At the current average price, a VR device provides a good value.	0.941				
<b>Subjective norm [32]</b>					
I feel envy toward people who own a VR device.	0.676	0.812	0.829	0.820	0.606
People important to me think I should use a VR device.	0.855				
People I look up to expect me to use a VR device.	0.793				
<b>Usage attitude [49]</b>					
My impression of using a VR device is: bad–good.	0.918	0.966	0.966	0.966	0.852
My impression of using a VR device is: negative–positive.	0.925				
My impression of using a VR device is: unsatisfactory–satisfactory.	0.937				
My impression of using a VR device is: unfavorable–favorable.	0.913				
My impression of using a VR device is: unpleasant–pleasant.	0.923				

The overall model fit confirms the above conceptual reasoning with an SRMR of 0.043. Hu and Bentler [104] affirm that a good SRMR value should be lower than 0.080. The chi-square/degrees of freedom ratio is 3.49, far below the threshold of 5.00, providing evidence to substantially explain the models' response patterns. Discriminant validity is established by the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT) in Table 3.

**Table 3.** Fornell–Larcker criterion and HTMT.

	SC	C	EX	IM	IU	OQ	PEOU	PE	PU	PV	SN	UA
SC	<b>0.850</b>	0.179	0.273	0.321	0.517	0.180	0.173	0.145	0.354	0.167	0.240	0.247
C	0.183	<b>0.783</b>	0.174	0.215	0.351	0.028	0.111	0.218	0.186	0.184	0.174	0.213
EX	0.271	0.168	<b>0.861</b>	0.222	0.291	0.260	0.678	0.488	0.347	0.243	0.313	0.386
IM	0.319	0.213	0.223	<b>0.798</b>	0.482	0.311	0.324	0.328	0.656	0.181	0.756	0.311
IU	0.516	0.352	0.290	0.482	<b>0.895</b>	0.186	0.284	0.234	0.594	0.238	0.539	0.313
OQ	0.177	−0.004	0.261	0.309	0.183	<b>0.825</b>	0.288	0.263	0.230	0.431	0.156	0.641
PEOU	0.172	0.104	0.677	0.328	0.285	0.290	<b>0.797</b>	0.657	0.586	0.299	0.391	0.440
PE	0.145	0.204	0.488	0.331	0.233	0.263	0.658	<b>0.901</b>	0.507	0.393	0.310	0.599
PU	0.353	0.185	0.346	0.657	0.591	0.227	0.588	0.507	<b>0.849</b>	0.246	0.667	0.417
PV	0.166	0.171	0.244	0.185	0.237	0.428	0.301	0.393	0.245	<b>0.906</b>	0.182	0.487
SN	0.239	0.175	0.307	0.747	0.539	0.149	0.380	0.296	0.658	0.176	<b>0.778</b>	0.203
UA	0.247	0.202	0.385	0.312	0.312	0.639	0.441	0.599	0.416	0.486	0.195	<b>0.923</b>

**Note:** The diagonal elements (in bold) are the square root of the AVE. Values below the diagonal indicate the Fornell–Larcker criterion ratio. Values above the diagonal elements are the HTMT.

5.2. Inner Model and Hypotheses Evaluation

The variance explained by the R<sup>2</sup> of the model’s endogenous constructs exceeds the 0.5 threshold. The Q<sup>2</sup> values are all strongly predictive as is the f<sup>2</sup> value shown in Table 4. Furthermore, we tested the characteristics of gender, age, education, and income for structural differences with the multi-group analysis [105]. The results do not indicate meaningful differences among distinct groups. The results in Table 4 clarify that VR is likely to be adopted by the spectator when relevant peers have (or are assumed to have) a favorable opinion of the technology so that adopting VR elevates the spectator’s position within the peer group. Obviously, status maintenance substantially impacts perceived usefulness (hypotheses H1a, H1b, and H2). These results support the previous studies’ findings [51,80], revealing the relationships between subjective norm, image, perceived usefulness, and intention to use.

Our results highlight the equally strong influence of perceived enjoyment (H4) and experience (H8b) on perceived ease of use. This result supports that of previous research [29,31,50] affirms this ease-of-use relationship for other technologies. In line with [106], our study highlights the importance of experience. When spectators have previous experience of using VR, they perceive watching sports with such a device as more entertaining (H8a). Therefore, regarding technologies in general [107,108] and specifically in the context of VR [31,80], perceived ease of use positively influences the perceived usefulness for spectating mega sports events (H5a). In general, it can be stated that the intention to use VR technology increases with knowledge about the devices. Expanded knowledge reduces.

Perceived usefulness (H6) and perceived ease of use (H5b) positively influence usage attitude. These findings are in line with previous research [108] in a general technological context and, specifically, in the context of VR [31,80]. This study’s finding of a positive effect of usage attitude on intention to use supports what was previously found for technologies in general [32,108] and specifically for VR [80,106]. Price value (H9) and curiosity (H10a) positively influence usage attitude, but technical output quality (H3) plays a more substantial role in explaining usage attitude than the social, personality, economic, and skill-related constructs mentioned earlier.

**Table 4.** Q<sup>2</sup>, R<sup>2</sup>, path coefficient, T-statistics, p-values, f<sup>2</sup>, VIF.

	Stone–Geisser Q <sup>2</sup> = 0.292	R <sup>2</sup> = 0.558	R <sup>2</sup> adjusted = 0.556						
Image	Coefficient	Path Coefficient	T-Statistics	p-Values	f <sup>2</sup>	VIF	Hypothesis		
	Subjective Norm	0.747	14.603	<0.001	***	1.260	1.000	H1a (strongly supported)	
	Stone–Geisser Q <sup>2</sup> = 0.350	R <sup>2</sup> = 0.502	R <sup>2</sup> adjusted = 0.496						
	Coefficient	Path Coefficient	T-Statistics	p-Values	f <sup>2</sup>	VIF	Hypothesis		
Intention to use	Curiosity	0.195	4.163	<0.001	***	0.071	1.078	H10b (strongly supported)	
	Self-Construal	0.359	7.132	<0.001	***	0.231	1.125	H11 (strongly supported)	
	Subjective Norm	0.398	7.178	<0.001	***	0.290	1.098	H1c (strongly supported)	
	Usage Attitude	0.107	2.254	0.025	*	0.021	1.112	H7 (weakly supported)	
	Stone–Geisser Q <sup>2</sup> = 0.341	R <sup>2</sup> = 0.599	R <sup>2</sup> adjusted = 0.597						
Perceived ease of use	Coefficient	Path Coefficient	T-Statistics	p-Values	f <sup>2</sup>	VIF	Hypothesis		
	Experience	0.468	7.531	<0.001	***	0.416	1.312	H8b (strongly supported)	
	Perceived Enjoyment	0.429	7.113	<0.001	***	0.351	1.312	H4 (strongly supported)	
	Stone–Geisser Q <sup>2</sup> = 0.161	R <sup>2</sup> = 0.238	R <sup>2</sup> adjusted = 0.235						
Perceived enjoyment	Coefficient	Path Coefficient	T-Statistics	p-Values	f <sup>2</sup>	VIF	Hypothesis		
	Experience	0.488	9.766	<0.001	***	0.312	1.000	H8a (strongly supported)	
	Stone–Geisser Q <sup>2</sup> = 0.390	R <sup>2</sup> = 0.616	R <sup>2</sup> adjusted = 0.613						
Perceived usefulness	Coefficient	Path Coefficient	T-Statistics	p-Values	f <sup>2</sup>	VIF	Hypothesis		
	Image	0.336	2.936	0.003	**	0.129	2.272	H2 (supported)	
	Perceived Ease of Use	0.378	6.362	<0.001	***	0.317	1.174	H5a (strongly supported)	
	Subjective Norm	0.264	2.339	0.020	*	0.077	2.369	H1b (weakly supported)	
	Stone–Geisser Q <sup>2</sup> = 0.414	R <sup>2</sup> = 0.551	R <sup>2</sup> adjusted = 0.544						
Usage attitude	Coefficient	Path Coefficient	T-Statistics	p-Values	f <sup>2</sup>	VIF	Hypothesis		
	Curiosity	0.131	2.379	0.018	*	0.036	1.067	H10a (weakly supported)	
	Output Quality	0.489	8.090	<0.001	***	0.414	1.285	H3 strongly supported)	
	Perceived Ease of Use	0.142	2.096	0.037	*	0.028	1.622	H5b (weakly supported)	
	Perceived Usefulness	0.155	2.415	0.016	*	0.034	1.578	H6 (weakly supported)	
	Price Value	0.174	2.827	0.005	**	0.051	1.320	H9 (supported)	

**Note:** \*\*\*  $p < 0.001$  strongly supported; \*\*  $p < 0.01$  supported; \*  $p < 0.05$  weakly supported;  $p > 0.05$  not supported burdens and skepticism toward using VR devices, and, notably, such spectators are more likely to believe that they need the technology.

Attitude toward using the technology positively influences the intention to use a VR device to watch the next Olympics (H7) to the same extent that curiosity (H10b) influences this intention to use. The results indicate that spectators are twice as likely to use VR when they perceive that VR is viewed favorably in their group and that using it will improve their position in the group (H1c) and when spectators perceive that the technology is close to them, not something far from their lives (H11).

## 6. Conclusions and Discussion

### 6.1. Scholarly Contributions

Digital spectating of sport events has been propelled by the COVID-19 pandemic due to real world restrictions. Previous research in other domains of digitalization [17] indicated that the technology by itself could be a value proposition. Therefore, this study challenges the drivers of spectators' intention to use VR technologies for leveraging their experiences of mega sport events and quantifies the relevance of barriers.

This study clearly answers the research question of whether curiosity or the fulfilment of an expectation is the main driver for adopting VR technology to spectate mega sports events. Consolidating the results, we conclude that spectators' curiosity is a relevant and substantial driver of the usage intention, but subjective norm and self-construal turned out to have a stronger impact. Curiosity, perceived enjoyment together with experience explain substantial parts of the variance in intention to use. The users' intention to use increases when spectators take advantage of VR technology. The self is a dynamic cultural creation, with individuals' self-views, emotions, and motivations taking shape and forming within a framework provided by cultural values, ideals, structures, and practices [91]. As conceptualized, the level of construal as a mental representation is invoked by distance rather than representing a distance [73], and VR is thought to bridge the athlete-spectator distance.

Spectators tend to adopt VR technologies because of extrinsic motivations: they meet their presumed social norms and use the technology for self-construal to impress others. This result aligns with previous research emphasizing the relevance of social norms for the adaptation of disruptive technologies [62]. An important contribution is the relevance of the self-construal that has been rarely considered in previous technology adaptation studies. Mapping of the results to the EPI Cube taxonomy [8] indicates the importance of self-construal for the adoption of immersive technologies. This study contributes the first empirical result in the medium-high spectrum of the taxonomy and aligns well with the scarce empirical research obtained in the medium-low spectrum [32].

Intrinsically motivated antecedents of using VR technologies turned out to have a substantial and statistically significant impact. However, the curiosity of spectators and the usage attitude are inferior compared to the extrinsic motivators. Putting this finding in the context of previous research [65,109], it becomes obvious that positive emotions, such as enjoyment or emotional gratification, are antecedents for explaining the intention to use in the context of digital services (either streaming or, as here, the usage of VR technology to spectate mega sports events).

The surprising dominance of the extrinsic motivators calls for further research in a later point in the technology cycle when the VR immersion is adopted by broader segments and, therefore, is less significant for self-construal purposes. Particularly of interest will be a possible change in the relevance of the subjective norm as a driver of the intention to use VR for spectating mega sports events when relevant peers have (or are assumed to have) a favorable opinion of the technology so that using it elevates the spectator's position within the peer group.

Recent research prompts maintaining a sound fit between theory and the real-world setting when going from theory to phenomenon [110]. This study contributes to closing two gaps in the research: first by discovering the importance of curiosity's relationship to the acceptance of VR [31] and second by finding the importance of self-construal in relation to the acceptance of new technology [32].

### 6.2. Practical Contributions

The implementation of this innovative technology enhances the whole experience of spectating mega sports events, allowing a more realistic and involving view of sports for the audience. This study indicates that it is essential for marketers to ensure that sport spectators can perceive value for using the VR technology according to their self-construal. Self-construal and social value turned out to be more important than intrinsic motivators were. Concretely, marketers could facilitate extrinsic assets by implementing engagement campaigns by uploading screenshots, videos or other materials in social media. Using VR technology provides a unique spectatorship experience; allowing the audience to attend mega sports events as members of the public or as athletes competing in the Olympic Games are practical means for adding value. VR devices heighten spectators' experiences by showing extra material, such as the athletes' training, their warm-up, and the Olympic Village experience, feeling like an athlete and presenting a "behind the scenes" view of the event to the public. Allowing the audience to live the mega sports event from the inside could attract more people and increase awareness of the efforts of both the athletes and the organization.

Studying the acceptance of VR helps managers to develop a communication strategy [84,85]. Recent research prompts scholars to connect to real-world examples and trends [110]. This is met by this study, as VR spectatorship is becoming increasingly relevant [12], so companies associated with the sports world, media, and entertainment need to follow this trend. This study suggests the bases for understanding the characteristics of spectators who follow this trend; the findings can be exploited in a company's existing practices or can be a starting point for market analysis that understands the most relevant aspects for VR users or potential users.

Furthermore, promotional campaigns related to the sports market or mega sports events benefit from these findings: focusing on entertainment and fun through VR will increase the attraction of sport enthusiasts. From the sponsors' perspective, it is an additional opportunity to display and highlight their brand, as the spectators have additional perspectives compared to on-site experience or watching on traditional displays. When companies understand the importance of specific VR characteristics, they can adapt their communication strategies and products accordingly. For instance, Nike focusing substantially on customers' experience can benefit from the findings of this study: their branding can take advantage of VR, knowing that it is perceived positively by its consumers, to communicate its messages and to attract new people facilitated by borrowed attention. A spot that can be seen only through VR will provide a more realistic feeling of what being an athlete means. Installing VR inside the company's stores provides a unique shopping experience. Among other factors, this study concretely shows the impact of the output quality on user attitude toward the use of VR; consequently, improving the image, video, and sound of VR will inspire an optimistic consumer attitude and a greater willingness to pay for and use VR.

### 6.3. Social Implications

Companies and organizational institutions are not the only parties benefitting from the use of VR in mega sports events. In fact, this research provides implications also for individuals: spectators, athletes, trainers and amateurs are some of them.

The mega sports event acquires a new value thanks to the implementation of VR: the event becomes a real-life experience in which the person can be immersed, living the competition from the athlete's perspective, and gaining insights that could not be found otherwise. Moreover, the COVID-19 pandemic has affected the spectatorship of the mega sports event, limiting the audience to attend and enjoy the different sports events—resulting in a loss in the interest toward the mega sports event itself and generally, toward the different disciplines, which have a limited attraction power due to this lack of audience. Therefore, implementing VR in the Olympic Games following the findings presented in this study may prevent the decrease in the attractiveness of the event and of the different

sports presented there since the audience could be able to attend the various competitions simply from home using a VR device.

Going further, using a VR device is less expensive than travelling to the events and spectating them on site. This contributes to a democratization of mega-sports events, providing a special experience to fans with a lower budget. Selling virtual tickets is a new opportunity to generate additional profits without investing in the physical stadium building. This might be equalizing the difference between affluent and emerging societies in organizing mega sports events.

#### 6.4. Limitations and Future Research

In light of our research design and findings, we wish to discuss some limitations and how future research may address them. One limitation of our study arises from the question of whether the results are valid for other entertainment applications. So far, it is unclear whether the results are transferable, so further research is merited to examine how to exploit the intrinsic curiosity, joyfulness, and playfulness of users' motivations. Furthermore, positive emotions, engagement, relationships, meaning, and accomplishment [56] should be evaluated with respect to their change due to the adoption of VR technologies in the spectating process. Perceived social norms are a relatively weak basis for advancing VR technology in the leisure sector, as they are relatively unstable and change over time.

As our findings highlight, variance for the intention to use is in substantial part explained by constructs (curiosity, experience, and perceived enjoyment), which can be related to hedonism. This relation could be validated and extended by future research. Considering the motivations of the target group by itself, potential limitations arise from the predominance of young respondents, mainly from Italy. This is due to the fact that the questionnaire was spread on social media, starting from an Italian account. However, group testing by countries did not result in significant differences.

Future research could consider three perspectives for implementing VR. On the one hand, users could feel like spectators in the stadium and participate as fans. On the other hand, they could participate from an athlete's perspective. Here, it is crucial to consider the viewpoints of the athletes as well. From a marketing perspective, both the content and positioning of advertising would differ according to the spectators' perspective. In the future, advertisers are more likely to customize advertisements to the spectator's profile.

Third, considering the importance of social interactions in the course of spectating sports events [55,111], a technical advancement of the VR technology enabled by the projection of avatars to the virtual space enriches the experience. This way, friends could also meet virtually to experience the sporting event.

Furthermore, media multitasking and multiscreening with its impact on willingness to use VR devices could be considered in future research.

In fact, virtual reality experiences frequently are limited to the senses of sight and hearing. Notably, recent research [112] addresses the inclusion of pleasant smells congruent with the experience, which turns out to have a positive effect on users' perceptions.

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