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An Exploratory Study about the Effect of COVID-19 on the Intention to Adopt Virtual Reality in the Tourism Sector

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Abstract: During the health crisis caused by COVID-19, virtual reality (VR) proved to be useful for the tourism industry, allowing this industry to continue working despite the restrictions imposed. However, it remains to be seen if the impact of this sanitary crisis in the tourism industry influenced managers' intention to adopt this technology in the post-pandemic period. To fill this gap, a qualitative methodological approach was adopted, using the MAXQDA20 software and interviews with managers of tourism enterprises. The results show that the willingness to invest in technology, the perception of VR as a business strategy, and the perception of the impact of the pandemic are factors that regulate the intention of companies to adopt VR. In addition, prior experience with VR and the perception of technical support are also important for its adoption. Thus, it was concluded that VR can be a valuable sustainable strategy for tourism companies to address the challenges imposed by the pandemic. However, adopting the technology depends on factors such as financial availability, business strategy, and previous experience with VR. Furthermore, tourism companies must also receive adequate technical support to ensure its correct implementation.

Keywords: virtual tourism; COVID-19; technology adoption; business models; TOE

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1. Introduction

People infected with COVID-19 started to get sick in Wuhan, China, and this virus spread worldwide in early 2020 [1]. In March 2020, the World Health Organization (WHO) declared that this virus should be considered a pandemic, which means a global public health emergency. This virus has had a significant impact on public health worldwide, and the consequent measures to contain the virus have resulted in adverse effects on countries' economies [2]. In the tourism industry, the losses were also very significant [3]. In 2020, this sector's GDP dropped by 50.4% compared to the previous year. This result can be explained by the complete shutdown of 72% of worldwide destinations [1], the result of some measures to combat the pandemic, such as confinements, travel restrictions, the closing of borders, and the decrease in flights, particularly international flights.

In the period before the appearance of this virus, the consumption journey of tourism services already increasingly included the use of the internet, whether in the pre-trip, during the trip, or post-trip [4]. However, to respond to all the changes that COVID-19 caused, the use of information technology allowed the tourism industry to adapt to the

new constraints to continue working [5]. Aiming to maintain the tourists' interest, virtual tours were one of the main strategies that organizations used in this industry [1]. The advantage of virtual tours is that they allow tourists to visit tourist attractions, participate in events, and take virtual walks without having to leave home [6]. Singapore developed an example of a virtual tour titled "Experience Singapore now. Visit later". VR is one of the technologies that can be used to provide virtual visits in a more immersive way [7]. This technology allows users to simulate, in a virtual environment, the attractions and points of interest of a tourist destination or even simulate some tourist activities [8]. Additionally, previous studies confirm the relevance of VR as an emerging technology in tourism that has already been shown to influence tourists' consumption behaviour [9]. However, despite all the advantages VR can provide, an exploratory study demonstrated that VR does not seem to substitute the real tourist experience [10].

VR can potentially mitigate many aspects that COVID-19 has altered, i.e., this crisis may trigger its adoption on a broader scale [11]. As the tourism industry is going through the post-pandemic period, it is necessary to study the social, environmental, and economic impacts left by the pandemic [7], in particular, to try to find new resources, such as the use of VR for tourism purposes, which can contribute to solving future crises in the sector, whether they are health-related or not. Ref. [12] suggests that, in the post-pandemic period, VR can increase tourists' confidence. However, for tourists to have VR content at their disposal, organizations in the tourism sector must be interested in adopting this technology. Considering this, it is crucial to question how VR can be introduced into the tourism business models to make them more innovative and, simultaneously, more sustainable. Ball et al. [11] refer to the need for studies that more deeply examine effect of COVID-19 in this scope and suggest using qualitative studies to explore the link between the pandemic and the use of VR.

This study aims to understand whether the perception of managers of tourism sector organizations about the impact of the COVID-19 pandemic is related to their intention to adopt VR in their organization in the future. Through a qualitative methodology, we intend to develop an exploratory study to elucidate the connection between these two concepts and which other constructs may influence this relation. The results of this research will allow us to raise awareness among managers in the tourism sector about what influences the decision to adopt VR in their business, especially as a strategy in the face of future crises and social restrictions. Additionally, it will also be relevant for the design of public policies to support the digital transformation of this sector since it will be able to design them more effectively by knowing what influences the managers' decision-making process. The article is structured in five parts. After the introduction, in which the research problem is described, the second part of this study presents the literature review on technology adoption. The third part describes the methodology used for the execution of this study. The fourth part presents and discusses the results obtained. The fifth and last part contains the main conclusions, limitations, and suggestions for future research.

2. Theoretical Framework

2.1. Adoption of Information Technologies

Information technology has changed economies worldwide, particularly the tourism sector [4]. Nowadays, the tourist's journey is increasingly digital, impelling the organizations of this sector to perform a digital transformation. VR is becoming an experience increasingly closer to the real-world context, demonstrating the potential of this technology which allows tourists to see and enjoy various tourist experiences as if they were in the place represented in the virtual environment [13]. For that reason, VR has been used in the tourism industry for recreational and promotional purposes [14].

Concerning tourists' point of view, several previous studies reported that VR experiences can influence a person's intention to visit a tourist local or destination [1,15]. Considering the relevance of this technology in tourists' decision-making process, several authors focus their research on the acceptance of this technology [16,17]. Empirical studies

on VR acceptance by tourists indicate that they intend to use this technology for tourism purposes and that this intention can be influenced by the quality of systems and contents and by the perceived presence in the virtual environment [18]; furthermore, positive emotions, emotional involvement, and perceived usefulness are other influencing factors identified in the study of [19].

The tourism industry is becoming increasingly competitive, and its organizations seek a competitive advantage [20]. Adopting VR allows organizations to become more competitive by offering their customers more immersive digital experiences [8]. However, adopting this technology also brings high costs for these organizations, particularly for SMEs, so managers must consider the costs and benefits in advance [8]. The scientific literature on the topic of the adoption of innovative technologies, in which virtual reality is included, has very specific particularities associated with the context in which they are found and the characteristics of each technology under study [21]. Previous studies seem to indicate that the increasing improvement in VR equipment may be one of the most relevant factors for adopting this technology [11]. Regarding extended-reality technologies, AR, and VR, the environmental factors are particularly relevant for adopting these technologies [22].

Martins et al. [8], through a systematic literature review, provided a list of possible determinants of VR adoption by organizations in the tourism sector, each being framed as determinants related to the organization, the technology, or environmental factors. This study also mentions that the literature on the adoption of this technology in the tourism sector is still scarce, and reinforces the need for further in-depth future studies on the topic since the experts interviewed could not reach the identification of the possible determinants of the adoption of this technology in the tourism sector. The present study is intended to analyse the effect of an environmental factor, the perceived effect of COVID-19, on the adoption of VR by organizations in the tourism sector.

2.2. Technology–Organization–Environment (TOE)

The TOE framework identifies three aspects of a company's context that influence the process by which it adopts and implements technological innovations. These aspects are the technological context, the organizational context, and the environmental context [23]. The technological context describes the internal and external technologies that are relevant to the company. The organizational context refers to descriptive measures about the organization, such as size and management structure. Lastly, the environmental context is the arena in which the company operates and develops its activities [24]. According to Raj and Jeyaraj (2011) [25], the TOE framework is important in technology adoption studies as it considers organizational and environmental factors that influence adoption, in addition to the technical factors of the technology itself. As Oliveira and Martins (2011) [24] claimed, the TOE framework is more comprehensive in explaining technology adoption because it includes technological, organizational, and environmental factors. This study aims to analyse the impact of the crisis caused by COVID-19 on the intention to adopt VR. As this is an environmental factor, TOE was considered the most appropriate theoretical framework for this study. This means that the study is not limited to understanding the perception of the technical characteristics of VR but also how managers perceive its interaction with the environment of their organizations.

2.3. COVID-19 and Virtual Tourism

When tourists faced restrictions preventing them from travelling, they chose to travel in cyberspace. Consequently, the use of technology has started to be perceived as a valid way to travel [6]. Additionally, during the pandemic, VR was a technology that allowed the existence of a safe alternative for tourist activities since it restricts direct human contact and allows the user to enjoy, in a virtual environment, a tourist destination or service [1].

Most consumers have purchased VR equipment since the pandemic caused by COVID-19, and this moment is considered a turning point in using this technology [11]. The study by [11] provides empirical evidence that, from the consumer's point of view, perceptions

about the effects of COVID-19 affected the intention to purchase VR equipment. In the tourism sector, consumers are able to enjoy experiences with less risk through VR systems, and consequently, they may perceive this technology as a substitute for conventional travel. As a result, tourists' intention of tourism increased due to the influence of COVID-19 [26]. In this sector, the crisis caused by COVID-19 and the impact left on organizations in this sector can be seen as an opportunity for this sector to change its business models, incorporating more technology to become more sustainable [1]. Based on this argument, it is proposed to study if the perception of the impact of COVID-19 is related to the intention to adopt VR from the perspectives of managers of organizations in this sector.

3. Methodology

This study adopted a qualitative methodological approach to understand the adoption of virtual reality technology in the tourism context. In addition, the methodology also included the construction of a semi-structured questionnaire to collect data from the study participants (Appendix A). The questionnaire was designed to explore participants' perceptions of adopting VR technology in the tourism industry based on the TOE [27].

3.1. Participants

For this study, 15 participants who work in the tourism industry and have experience or knowledge about technology adoption in a work context were selected. The participants are also managers of tourism enterprises, with responsibilities in acquiring technological equipment in their company for tourism purposes. For this reason, these participants are the ideal target to explore tourism managers' intention to adopt VR equipment. The interviews were conducted face-to-face with participants' companies between January and March 2023. According to the demographic data, the participants fall within the age range of 30 to 60 years. The majority being under 40 years of age suggests that these individuals have advanced rapidly in the hierarchy of tourism management. Most have between 10 and 20 years of experience in the field and hold higher-education degrees. In organizational terms, the sample predominantly comprises small- and medium-sized companies with an average annual turnover of EUR 2 million.

3.2. Instruments

A semi-structured questionnaire is important in qualitative studies, as it allows the interviewer to explore the respondents' answers in depth [28]. In addition to the questionnaire referred to above, an audio recorder was used to document the interviews. To analyse the data collected, the MAXQDA Analytics Pro 2020 software was used. This software is a powerful tool for qualitative data analysis, allowing the researcher to organize, categorize, and analyse data more systematically and efficiently [29]. In addition, the software also allows the identification of patterns and trends in the data that can be useful to understand the results of the study better, ensuring the validity and reliability of the results, even when used to understand the dynamics of tourism sector stakeholders [30].

3.3. Procedure

Before starting data collection, participants were contacted via email and informed about the purpose of the study. After giving their consent to participate in this study, individual interviews were scheduled with each participant to proceed with data collection. The interviews were conducted face-to-face, according to the participants' preferences. All interviews were audio recorded and later transcribed for analysis. In this analytical process, the MAXQDA20 software allowed for the organization and categorization of the data systematically and the identification of patterns and trends in the collected data. Figure 1 summarizes the various phases of the data analysis and treatment process. In step 1, all interviews were transcribed for use with MAXQDA20. In step 2, the interviews were loaded into the software. In step 3, all interviews were read and validated for processing. In the next step (step 4), the relevant interview excerpts were searched and highlighted. In

step 5, the excerpts highlighted in the previous step were coded and categorized according to their theme. Finally, step 6 refers to analysing and interpreting the outputs generated through MAXQDA20.

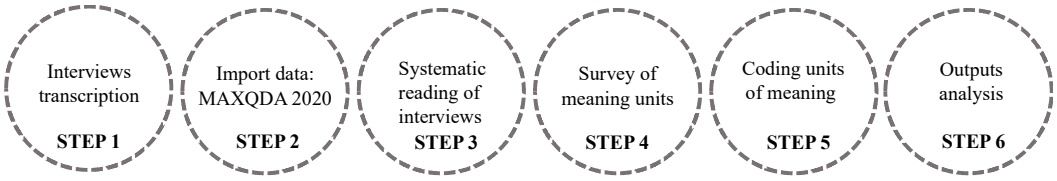

Figure 1. Description of the analytical process. Source: adapted from MAXQDA20.

4. Results and Discussion

This section presents and discusses the results found on the issues that influence the adoption of virtual reality by tourism companies. All the presented results were obtained from the proposed analytical process, and all the units of meaning coded in this study have been validated. Table 1 presents the structure of the meaning units used in this study and how their categorization was conducted. This structure made it possible to organize the collected content so that it could be evaluated in the light of the TOE. Through this process, it was possible to identify four themes and six subthemes related to VR adoption that help answer the study objective. These subthemes correspond to the emerging themes that result in the coding process of the interviews.

Table 1. Units of meaning.

Themes	Subthemes	Units of Meaning
Organizational factors	Willingness to invest on technology	(...) we are willing and looking for ways to have more technological equipment soon (...)
	VR as a business strategy	(...) VR would make perfect sense in a company's strategy in this sector (...)
Technological factors	Previous VR experience	(...) it is fundamental to always try the product or service first, in the case of VR the same. If we don't like it, it doesn't matter to the tourists (...)
Environmental factors	COVID-19 impact	(...) we were completely closed to tourism, we stopped having visits, we lost a lot of financial capacity, we stopped selling our products and tourism services (...)
	VR support	(...) would need to understand what exists in terms of technical support for the creation of tourist experiences in VR (...)
VR adoption	Intention to adopt VR	(...) In fact I intend to adopt VR equipment, it would be a good tourist complement to our company, our visitors would like it very much (...)

Source: adapted from MAXQDA20.

In addition to categorizing meaning units, it is important to understand each participant's contribution to understanding the theme under study. This textual analysis tool allows for assessing the relations between codes (themes) and units of analysis (parts of text) in a qualitative study, and is particularly useful for identifying patterns and relations between themes that emerge during data analysis. The similarity matrix displays the frequency with which codes occur together in the same piece of text, presenting a similarity score for each pair of codes, ranging from 0 to 1. The higher the score, the more frequent the occurrence of the codes simultaneously [29]. According to Figure 2, most participants have a value of 1 or close to it, which means that they contribute in a very equivalent way to the understanding of the topic under study.

Document name	P 1	P 2	P 3	P 4	P 5	P 6	P 7	P 8	P 9	P 10	P 11	P 12	P 13	P 14	P 15
P 1	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 2	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 3	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 4	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 5	0.96	0.96	0.96	0.96	1.00	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.92	0.96	0.96
P 6	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 7	0.92	0.92	0.92	0.92	0.96	0.92	1.00	0.92	0.92	0.92	0.92	0.92	0.96	0.92	0.92
P 8	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 9	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 10	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 11	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 12	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 13	0.96	0.96	0.96	0.96	0.92	0.96	0.96	0.96	0.96	0.96	0.96	0.96	1.00	0.96	0.96
P 14	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00
P 15	1.00	1.00	1.00	1.00	0.96	1.00	0.92	1.00	1.00	1.00	1.00	1.00	0.96	1.00	1.00

Figure 2. Similarity matrix. Source: adapted from MAXQDA20. Note: Above 0.95 is considered an optimum contribution form the participant (colour green).

Considering the themes under study (Figure 3), the results suggest that the willingness to invest in technology (134), the intention to adopt VR (70), the impact of COVID-19 (58), and VR as a business strategy (54) are the themes that the participants mention and discuss the most. This process shows that their intention to adopt VR mechanisms in their companies depends essentially on these four emerging themes. For the managers, considering VR makes sense if it is analysed from a more organizational point of view, meaning that VR can aid the company in structural terms.

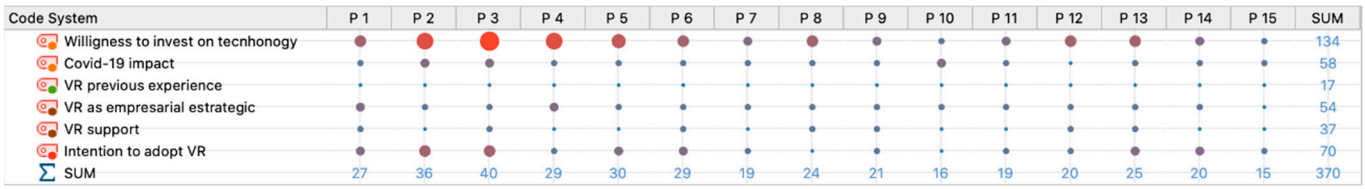

Figure 3. Emerging themes. Source: adapted from MAXQDA20.

For a more comprehensive and precise analysis of the constructs of the intention to adopt VR, it is important to understand how these themes relate to each other. Figure 4 visually presents the connections between the emerging themes and their relevance for understanding the research objective. The software lists the emerging themes according to their occurrence, suggesting relationships between them. According to [29], this process allows us to perceive the proximity between the themes and their importance in understanding the main theme under analysis.

The literature on technology adoption suggests that the willingness to invest in technology is one of the main determinants of adoption intention [31]. The study confirms this same relation, as the willingness to invest in technology in the work context is the issue that most influences managers' intention to adopt virtual reality (VR) in their companies. These results further corroborate the study of [32], which also found that the willingness to invest in technology is an important factor in adopting innovative technologies, such as VR, in tourism companies.

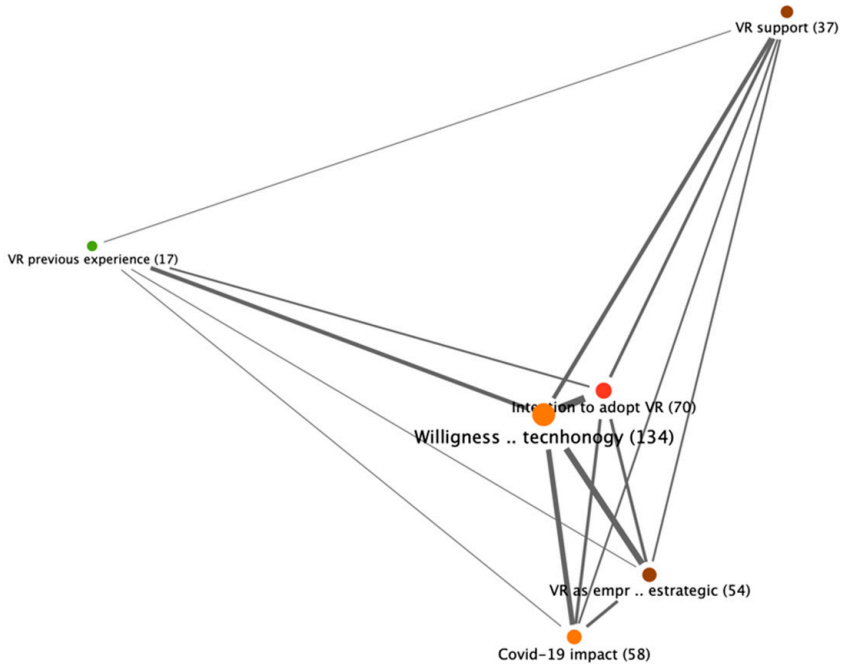

Figure 4. Relations between emerging themes (Willigness to invest on tecnhonogy; COVID-19 impact; VR previous experience; VR as empresarial strategic; VR support; Intention to adopt VR). Source: adapted from MAXQDA20.

Another significant result of the study is that the intention to adopt VR is also strongly influenced by managers who consider VR a business strategy. In this sense, the literature highlights the importance of the perception of the technology's value to the company and how it can contribute to the organization's competitive advantage [33]. The study [34] also aligns with this perception, their results stating that managers' perception of VR as a business strategy positively influences their intention to adopt the technology.

In addition, the present study highlights the importance of managers' perceptions of the impact of COVID-19 on the adoption of VR. The results suggest that the managers' perception of the impact of the pandemic on the adoption of VR is an important factor to be considered. In this regard, the literature has highlighted that the pandemic has accelerated the adoption of technologies in different sectors, including tourism [35]. According to the study of [36], the pandemic had a significant effect on managers' intention to adopt VR technology. This result can be explained by the fact that, due to the pandemic, many companies had to find alternative ways to promote their products and services. VR can be a valuable tool to offer immersive experiences to customers without needing to be physically present [37].

Finally, it is important to highlight that, despite the participants' perception of technical support about VR and previous experience with VR, they did not reveal the themes that most influenced their intention to adopt VR in this study. However, although their distance from their intention can be seen, as in Figure 4, they present significant connections with their intention. This allows us to refer that they exert an important effect in the formation of the intention to adopt VR on the part of the managers. Regardless, they are not as determinant as the other themes under analysis. It is important to note that these results do not deny the importance of these two factors but rather indicate that, in the specific context of this study, other factors had a stronger influence on the intention to adopt VR. However, regarding the importance of previous experience with VR and technical support, the results are in line with the study of [38], which suggests that previous experience with VR has a significant effect on users' intention to adopt the technology. Regarding the perception of technical support on VR adoption intention, Oncioiu and Priescu [34] showed that technical support significantly impacts the intention to adopt virtual reality

technology, with participants who perceived stronger technical support being more likely to have a positive intention to adopt VR. Thus, we conclude that providing adequate technical support can be an effective strategy to promote virtual reality adoption.

Analysing the relations between emerging themes in depth can help understand which direction managers will take and their effects on each other [29]. Figure 5 presents a more accurate view of the relations between themes, which enables a more detailed understanding of the themes that explain the VR adoption process by tourism companies' managers. From this exercise, it is important to understand what other indirect relations may influence the managers' intention to adopt VR mechanisms. For example, regarding the availability to invest in technology, it is clearly perceived that this is a significant determinant of the intention to adopt VR, which agrees with some recent research, such as the study of [39] that found that the availability to invest in technology is one of the main factors that influence the intention to adopt new technologies, including VR, as well as the study of [40], which also highlighted the importance of willingness to invest in technology as a key determinant of VR adoption.

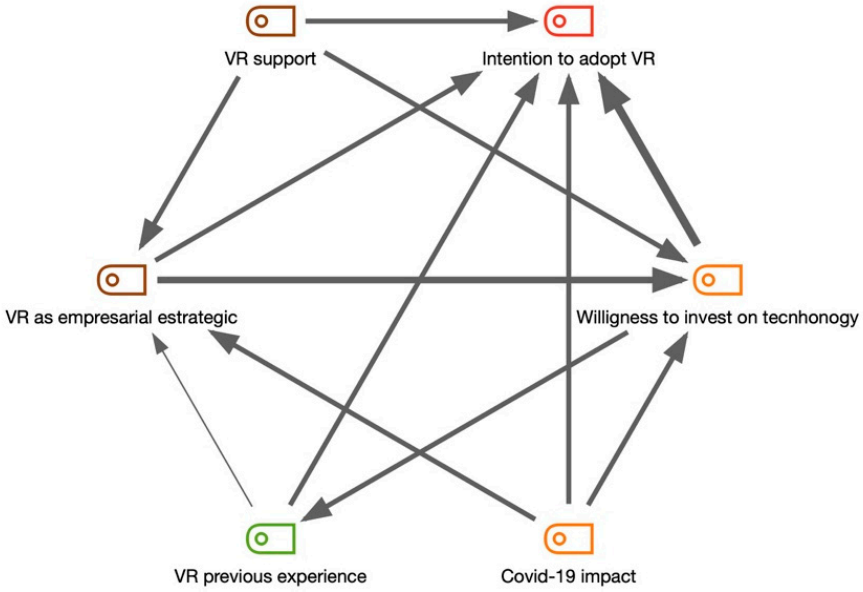

Figure 5. Global interpretation of the results. Source: adapted from MAXQDA20.

The fact that VR as a business strategy exerts a significant influence on the willingness to invest in technology also seems to be in line with the study of [41]. According to their results, the perception of VR as a business strategy is an important determinant of the intention to adopt VR. The influence of perception about the impact of COVID-19 on VR adoption is a current research topic. According to the study, there is a direct relation of experience with the pandemic on the purchase of VR equipment. The study of [42] reinforces this; according to it, the COVID-19 pandemic accelerated the adoption of VR technology as companies sought ways to maintain communication and collaboration at a distance. Therefore, the findings that the perception of the impact of COVID-19 has a significant effect on VR as a business strategy and willingness to invest are in line with previous findings.

Finally, it is highlighted in this study that the perception of VR influencing willingness to invest and the perception of VR as a business strategy, which is in line with research that highlights the importance of technical support in adopting emerging technologies. For example, the study of [43] found that technical support can actually increase small and medium enterprises' intention to adopt VR. In turn, the study of [44] reports that the existence of technical support for emerging technologies contributes to improving

companies' strategy and progress. In addition, the study of [45] showed that technical assistance is a crucial factor for companies' adoption of virtual mechanisms.

5. Conclusions

Based on the results and discussion presented above, it is possible to reach relevant conclusions about the determinants that influence the intention to adopt virtual reality by tourism enterprises based on the TOE theoretical framework. The results of this study are in line with TOE since it was observed that the intention to use VR is affected by determinants related to VR itself (technological factor) and by determinants related to the strategic options of each organization (organizational factor), but also by determinants associated with the market or with other organizations operating in it (environmental factor).

The present research evidence that the perception of managers tourism sector organizations about the impact of the COVID-19 pandemic is related to their intention to adopt VR in their organization in the future. According to the reported findings, the greater the perception of the impact of the crisis caused by the pandemic, the greater the intention of tourism managers to adopt VR. The COVID-19 pandemic had a very significant drop in visitors in the tourism sector, and in this sense, VR may indeed be a way for companies to adapt to these changes and remain competitive. Companies must recognize the importance of technology in times of crisis and invest in innovative solutions to overcome these challenges.

This study also allowed us to identify the willingness to invest in technology and the perception of VR as a business strategy as factors that regulate the companies' intention to adopt VR mechanisms. Furthermore, previous experience with VR and the perception of technical support are also important in the study, to a lesser extent.

This study suggests, therefore, that the willingness to invest in technology is the primary determinant of the intention to adopt VR by tourism enterprises. This willingness to invest seems to be very dependent on the perception of VR as a strategic pillar in their business models, especially as a solution in situations of social restriction, such as the one originated by the COVID-19 pandemic. The fear of going through another similar crisis seems to help increase the willingness to look for new solutions to mitigate the impacts of the lack of visitors. According to the results, it can also be concluded that the managers' knowledge about VR and companies that provide specialized technical support brings some security when revealing their intention to adopt this type of mechanism. We observed that the managers' perception of using VR for tourism purposes is favourable if there is previous knowledge about its capacities.

The adoption of VR by companies can still be seen as a sustainable process in several points. In terms of investment, VR can reduce travel and face-to-face event costs, allowing companies to save financial resources and reduce their carbon footprint. In addition, VR can make business operations more efficient and reduce the time and cost required to perform complex tasks related to in-person visits. Regarding business, VR can provide immersive and personalized experiences for customers as an alternative to a face-to-face visit at the destination, especially when there is an impediment to travel, such as in the case experienced with COVID-19. These VR capabilities can contribute to the tourism sector becoming more and more sustainable.

6. Study Implications

In theoretical terms, the results corroborate the recent literature, highlighting the importance of the willingness to invest in technology as one of the main determinants of the intention to adopt innovative technologies. In addition, the study highlights the influence of VR as a business strategy and the perception of the impact of COVID-19 on VR adoption intention. These results contribute to increasing knowledge about technology adoption, especially in this context. Based on this study, it will be possible to consider the development of new research studies that seek to confirm and test new constructs or

latent variables that help consolidate the scientific knowledge about the adoption of VR by tourism enterprises.

In practical terms, the results may be useful for managers of tourism businesses who wish to adopt VR as a business strategy. This strategic vision of including VR in the tourism business model may be related to planning for the response to future crises, be they sanitary or of another type. However, this strategic vision can also be understood as part of the response to two major challenges of this sector: seasonality and sustainability. Seasonality is a factor because VR allows tourism managers to provide entertainment content that tourists can enjoy during the low season. Sustainability is a factor because this technology has the potential to be part of the instruments to reduce the ecological footprint of this sector while preserving the tangible and intangible heritage.

Understanding the determinants of VR adoption intention can assist managers in making more informed decisions and allocating resources appropriately to implement the technology effectively. Furthermore, managers should be aware of the importance of providing adequate technical support and previous experiences with VR to increase the perception of the technology as a business strategy.

7. Limitations and Future Research Lines

As possible limitations of the study, we highlight the fact that it was conducted with a specific sample of tourism business managers in a specific context, which may limit the generalization of results to other industries and contexts. The sample size does not allow for the generalization of the results. The study used only self-reported participant data, possibly leading to response biases. The study focused on VR adoption intention rather than actual adoption, which may limit the full understanding of VR adoption behaviour. In terms of suggestions for future research, we suggest conducting studies with more diverse samples in different sectors and contexts to increase the generalizability of the results. Use other data sources besides participants' self-reports to assess effective VR adoption behaviour. Conduct studies that investigate the factors that influence effective VR adoption after the intention is formed. It would be interesting to investigate the actual adoption behaviour of the technology to better understand the factors that affect users' decision to adopt or not adopt the technology. It is important to investigate the factors that influence the actual adoption of VR after adoption intention is formed since intention does not always translate into behaviour. It is necessary to consider other factors that may influence VR adoption, such as the availability of technology, the costs associated with adoption, and users' level of knowledge and experience. Finally, it is important to consider the role of education and training in VR adoption since many users may not be familiar with the technology.

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Appendix A. Interview Guide

1. Socio-demographic data of the participant	
1.1 age:	
1.2. gender:	
1.3. education:	
1.4. place of birth:	
1.5. years in the profession:	
1.6. previous occupation:	
2. Identification data	
2.1. number of employees:	
2.2. main activity:	
2.3. year founded:	
2.4. annual financial return (last year):	
2.5. use of VR devices:	
3. Organizational factors	
Dimensions	Items
Adoption of technologies	3.1. What type of information and communication technologies do you usually use in the management of the enterprise? (Software for enterprise management, devices for managing the enterprise's website and/or social networks, devices for augmented reality and/or virtual reality, etc.).
Organizational predisposition to technological investment	3.2. Of the resources that your company has, is any part allocated to the introduction/modernization of technological equipment?
Impact on business activity due to the pandemic crisis (COVID-19)	3.3. In your opinion, has your company's investment capacity changed with the effect of the pandemic?
	3.4. How has the company been affected by the restrictions arising from the current pandemic context (a drop in tourism activities: accommodation, entertainment, or a drop in wine sales)?
4. Technological factors	
Dimensions	Items
Perception of VR capacity	4.1. Do you think that Virtual Reality can be a determining factor in boosting your company? In what way? (Elaborate on the reasons for the positive or negative answer).
	4.2. In your opinion, can Virtual Reality be an alternative source of income? How do you see its return in financial terms?
Perception of the practical application of VR	4.3. In your opinion, is Virtual Reality easy to use? How do you see its use?
Perception of the usefulness of VR	4.4. Taking into account your knowledge of Virtual Reality, do you consider that it can be a complement to the tourist visit? or even a substitute?
	4.5. Do you think it would be useful to adopt a Virtual Reality application in your enterprise? If yes, for what purpose?
	4.6. Do you believe that Virtual Reality can allow a better promotion of the developments? What other benefits may be associated with its adoption?
	4.7. Thinking about Virtual Reality, do you believe it can be an important tool?
Influence of previous VR experience	4.8. In your opinion, would a previous experience in Virtual Reality influence your intention to adopt this technology in your company?

5. Environmental Factors	
Dimensions	Items
VR as empresarial strategic	5.1. Do you consider the use of Virtual Reality in the tourism sector to be a strategic need? If yes, what would be its best applicability?
	5.2. Thinking about a situation of social distancing, such as the one we are currently experiencing, do you believe that Virtual Reality could be introduced in the business models of tourism enterprises? If yes, in what way?
Knowledge about VR support	5.3. Do you know of any company or entity that develops or provides technical support in the implementation of Virtual Reality systems? If yes, do you consider that the support provided is or would be sufficient?
6. Intention to adopt the Virtual Reality	
Dimension	Items
Intention to adopt VR	6.1. Based on your knowledge of Virtual Reality, do you intend to adopt this technology in your company? (If yes, when? If no, why?) What factors might be influencing your decision? (If negative, how could they be overcome).

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