BREAKING BARRIERS: UNVEILING CHALLENGES OF INTRODUCING VIRTUAL REALITY FOR MANAGERS IN THE TOURISM INDUSTRY

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Abstract

Purpose – This study investigates the barriers to the adoption of Virtual Reality (VR) in the tourism industry. Although VR has great potential to enhance the tourist experience, the adoption of this technology is still limited in the tourism sector. Building on the fundamental principles of the Technology-Organization-Environment (TOE) theory and its contribution to perceptions of technology adoption, this study aims to fill the knowledge gap regarding the specific barriers to VR adoption by tourism enterprises.
Methodology – To achieve this objective, interviews were conducted with managers of tourism companies, and the data was analysed using qualitative methodology through MAXQDA 20 software.
Conclusions – The results reveal that the main barriers identified by managers mainly include lack of knowledge about VR, particularly in the tourism sector. The perceived lack of usefulness, limited experience with the technology, and reluctance to invest in technological equipment also emerge as barriers to VR adoption.
Originality of research – This study can help companies in the tourism sector to develop more effective strategies to overcome these barriers, thereby improving the tourist experience and increasing their competitiveness in the market using VR equipment.
Keywords Tourism; Virtual Reality; Tourist companies; Tourism Management; QDA; TOE

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INTRODUCTION

VR has emerged as a technology with tremendous potential to enhance the tourist experience and differentiate tourism ventures (Sousa et al., 2024). In fact, some authors highlight VR ability to provide unique immersive experiences, such as destination preview, simulation of thrilling experiences, employee training, and promotion of tourism ventures (Losada et al., 2022). These inherent capabilities of VR have had a significant impact on the tourism sector, attracting tourists seeking new experiences or alternatives to conventional travel (Sarkady et al., 2021). Despite its growing popularity among tourists, the adoption of VR by tourism companies has been slower, primarily due to challenges faced by companies during their operations (Moro et al., 2019). While tourists' demand for VR experiences has shown a remarkable upward trajectory in recent years, with a growing number of travelers seeking immersive and innovative tourism experiences (Losada et al., 2022), paradoxically, many companies in the tourism sector have not fully embraced these new technologies (Sousa et al., 2024).

According to Statista's Research Department (2020), nearly 50% of tourists would use VR as a tool to choose their holiday destination, although only 13% of the respondents would be willing to pay for VR experiences. From a business perspective, as per the same source, only 20% of travel companies worldwide intend to invest in VR equipment. Editor's Choice (2021) also refer that 50% of internet users turn to virtual tours in their research and decision-making process, and 67% want more companies to offer virtual tours. This fact is particularly noteworthy given the increasing competition in the market (Collado-Agudo et al., 2023), as rival companies relentlessly seek ways to stand out and attract tourists craving authentic and engaging experiences. The acquisition of new technologies, such as VR, emerges as a strategic opportunity that some companies have not fully explored (Oncioiu & Priescu, 2022). This disconnects between tourists' increasing demand for technological innovations and companies' hesitation to adopt these technologies presents an intriguing background that this research aims to explore in detail.

Laurell et al., (2019) recognizes the benefits that VR can offer in the tourism sector but also identifies barriers that hinder widespread adoption of this technology by tourism companies. Some studies suggest that these barriers may be related to the costs associated with VR (Badamasi et al., 2022), companies' lack of experience and technical requirements (Neuhofer et al., 2015), lack of knowledge about VR capabilities and acceptance by tourists (Yung & Khoo-Lattimore, 2019), and uncertainty about the return on investment associated with this technology (Koohang et al., 2023).

Although VR has the potential to enhance the tourist experience, existing literature has not provided a clear understanding of the barriers and opportunities that VR presents to tourism companies (Yung & Khoo-Lattimore, 2019). Laurell et al., (2019) highlights the advantages of using VR in tourism, but there is still a significant lack of research focusing on the potential barriers to VR adoption and understanding them. Thus, there is an urgent need for more research to better understand how VR can be

utilized by tourism companies and help overcome the barriers hindering its adoption (Stankov & Gretzel, 2020). According to Sousa et al., (2022), previous studies tend to focus solely on technology-related factors to explain possible limitations in adoption, sometimes neglecting environmental, organizational, and behavioural factors that also influence the adoption of VR by tourism companies (Shen et al., 2022). Bernardo et al., (2023) further suggests that more research is needed to explore new tourist services or management attributes with VR.

Given this understanding, it is crucial to thoroughly explore the barriers that exist and may contribute to inhibiting the adoption of VR by tourism companies. Therefore, this study aims to fill this gap in the literature by providing valuable insights for managers of tourism companies seeking to adopt VR in their ventures. It also seeks to understand the barriers to VR adoption, which are essential for ensuring the efficient implementation of this technology in the tourism sector, increasing customer satisfaction, and profitability of ventures. Taking this, the objective of this study is to specifically explore the barriers that managers of tourism companies face in adopting VR from their perspectives. Thus, the study of barriers to VR adoption is conducted to help identify the most relevant obstacles and provide insights on how to overcome them.

1. LITERATURE REVIEW

1.1. Adoption of VR by Tourism Companies

The adoption of VR by tourism companies is still considerably limited, despite the known potential to enhance the tourist experience (Buhalis et al., 2023). It is important to highlight that the adoption of VR by tourism companies presents a unique opportunity to provide tourists with a more immersive and personalized experience, creating added value and competitive advantage for the companies (Subawa et al., 2021). The literature also emphasizes that VR adoption can help tourism companies address challenges such as seasonality and aggressive competition (Yung & Khoo-Lattimore, 2019). With VR, it is possible to attract tourists during low season periods by offering immersive and differentiated experiences, allowing them to choose their own adventures and activities within a tourist destination (Sousa et al., 2024). Furthermore, VR can be an effective marketing tool to promote tourist destinations, helping companies stand out in an increasingly competitive market (Pencarelli, 2020).

According to Wu et al. (2020), VR can indeed foster tourists' loyalty to a tourist destination and encourage their visit. The study by Gao et al. (2022) also points out that this ability of VR is primarily due to the potential of these devices to virtually recreate tourist locations and activities with a high level of authenticity and realism, thereby helping to build a sense of immersion and presence in the virtual world. Such sensations achieved through VR experiences have generated user satisfaction and increased their intention to use VR for tourism purposes (Beck et al., 2019; Wei et al., 2023). Even though the recognized benefits of VR in the tourism sector, the adoption of this type of equipment by industry companies seems to be progressing at a slow pace (Grundner & Neuhofer, 2021). Despite the apparent resurgence in demand for more technological solutions by companies to cope with future social restrictions due to COVID-19 (Rodrigues et al., 2021; Kusumah et al., 2022), the adoption of VR in the tourism sector has not been as exponential as expected (Schiopu et al., 2021). In this regard, some studies have pointed out possible difficulties in VR adoption, such as costs, knowledge, and value, but these need to be confirmed by studies exploring the perceptions of tourism companies (Yang & Han, 2021). Additionally, the adoption of VR by tourism companies can also be influenced by contextual factors such as organizational culture, management structure, and resource availability (Koo et al., 2018).

The high costs of implementing and maintaining VR are often cited as one of the main obstacles to technology adoption by tourism companies (Li et al., 2019). The costs associated with VR implementation can indeed be prohibitively high for tourism companies to bear. According to the study by Zhao et al. (2019), these high implementation costs are primarily attributed to technical limitations of companies and the inherent complexity in developing VR activities. The research by Guttentag (2020) further adds that these costs are essentially tied to their implementation, procurement of electronic equipment, and hiring of skilled professionals to develop tourism-related content in VR. Lack of knowledge about the technology is another barrier that has been identified in previous studies (Koo et al., 2018). Many tourism business managers still lack a solid understanding of VR, and this lack of knowledge can affect their willingness to invest in the technology (Laurell et al., 2019). Finally, the lack of consensus on the added value of VR for the tourist experience is another barrier that has been identified, primarily stemming from a lack of understanding about VR true contribution to the tourism sector (Beck et al., 2019).

In terms of its application in tourism, VR has been primarily used to enable both remote and on-site experiences. (Yung & Khoo-Lattimore, 2019). In the former case, the Covid-19 pandemic has further propelled decentralized tourism experiences. Tourists have seen the opportunity to explore locations in VR through devices like smartphones or headsets without leaving their homes (Akpan et al., 2022). For tourism companies, this solution has maintained tourists' interest in their tourism products (Sarkady et al., 2021). Through their websites, they have offered VR activities and experiences that tourists could enjoy from home (Schiopu et al., 2021). This growing approach by companies has aided in promoting their products and attracting new customers (Sousa et al., 2022). Given the success companies achieved with offering remote VR experiences, the industry began creating virtual activities on-site, that is, during tourists' physical visits (Kim et al., 2021). Following the resumption of travel, companies started investing in VR experiences as a complement to on-site visits to tourist locations (Jorge et al., 2023). Acknowledging tourists' demonstrated interest in virtual activities, companies started investing in VR programmers and equipment to provide immersive experiences at their tourism establishments (Kim et al., 2021). According to the study by

Sousa et al. (2024), the way VR is implemented in tourism largely depends on the purpose companies have for its application. That is, whether they intend to use VR as a promotional tool, offering virtual content through their digital platforms to tourists, or alternatively, as a supplementary activity during physical visits to enhance the tourism experience.

1.2. The Importance of the Technology-Organization-Environment (TOE) Theory in VR Adoption

The TOE has played a crucial role in reviewing the literature related to the adoption of new technologies by organizations (Moorhouse, 2019). This conceptual framework provides a valuable theoretical lens for understanding the inherent challenges and facilitators in the assimilation of technological innovations by companies (Seshadrinathan & Chandra, 2021). The essence of TOE lies in the premise that the adoption of new technologies does not occur in isolation but is influenced by three interconnected sets of organizational factors, suggesting that this process is influenced by three main pillars: technological, organizational, and environmental (Al Hadwer et al., 2021). By considering TOE, researchers can identify the complex interactions among these factors and how they influence decisions and outcomes in technological adoption (Sugandini et al., 2019).

The study by Al Hadwer et al. (2021) exemplifies the utility of TOE when investigating the implementation of innovative management systems. The results of this study highlight how technological factors, such as the usefulness and complexity of these systems, interact with organizational characteristics, including financial availability, to influence adoption decisions. On the other hand, the study by Ghobakhloo et al. (2022) reveals how environmental factors, such as industry competition, impact companies' perceptions of technology value and investment. These findings help validate TOE as a robust and effective theoretical framework for understanding the complex interactions among technological, organizational, and environmental factors in technology adoption by companies (Dehghani et al., 2022).

Regarding the adoption of VR by tourism companies, the TOE approach can be useful in understanding the perceived barriers faced by industry companies (Moorhouse, 2019). The technological characteristics of VR, such as implementation costs, the need for specific equipment, and technological complexity, can be considered barriers to VR adoption (Ghobakhloo et al., 2022). Organizational characteristics, such as organizational culture and management structure, can influence how the company perceives VR and its willingness to adopt it (Badamasi et al., 2022). Finally, environmental characteristics, such as competition in the tourism industry and tourist expectations, can affect how the company perceives the added value of VR to the tourist experience and its willingness to invest in the technology (Ghobakhloo & Ching, 2019).

By applying the TOE theory to the study of VR adoption by tourism companies, it is possible to gain a comprehensive understanding of the factors that influence this adoption and how these factors interact with each other (Al Hadwer et al., 2021). This can help identify barriers and facilitators of VR adoption, as well as provide insights into how companies can overcome these barriers and leverage the potential benefits of the technology (Seshadrinathan & Chandra, 2021). Thus, considering the TOE theory in the analysis of barriers to VR adoption can provide a more comprehensive understanding of the factors influencing technology adoption by tourism companies (Sugandini et al., 2019).

2. METHODOLOGY

The methodology used in this study follows the principles of qualitative data analysis, collected through interviews with managers of tourism companies. The interview guide was developed based on the key assumptions of the TOE, adapted to the tourism context (Table 1 - appendix). In this section, we will provide a detailed description of the study participants, the instrument used for data collection, the procedures followed for conducting the interviews, and the content analysis of the data. The data analysis was conducted systematically, using a well-established theoretical framework from the literature. The obtained results contribute to a better understanding of the challenges faced by managers in VR adoption and can help develop more effective strategies to overcome these barriers and leverage the advantages offered by this technology.

2.1. Participants

The sample for this study consisted of 15 managers from tourism companies located in different regions of Portugal, including urban and rural areas. The managers were selected through purposive sampling, which involved identifying tourism companies that offer tourism experiences to their visitors and would be willing to participate in the study. To be eligible for participation, the selected tourism companies had to offer tourism experiences such as guided tours, outdoor activities, tourist accommodations, among others. The selected managers represented companies of different sizes and sectors within the tourism industry. The sample included managers with varying levels of experience and knowledge regarding technology and virtual reality, ranging from those with advanced knowledge and prior experience with the technology to those with less experience and knowledge in this area. All participating managers were informed about the study's objectives and provided informed consent the interview. Anonymity and confidentiality of their responses were ensured throughout the data collection process.

To ensure the validity of the study, we follow the principle of saturation, commonly used in qualitative studies such as in-

depth interviews (Rowlands et al., 2016). According to Hennink & Kaiser (2022), data saturation is reached when the analysis does not reveal new information or emerging themes. In this study, data saturation was achieved after analyzing data from 15 participants, suggesting that the sample size is adequate for the study's objectives. As Francis et al. (2010) noted, the number of participants required to achieve saturation may vary depending on the complexity of the phenomenon under study and the depth of analysis conducted. Therefore, the sample of 15 participants is considered valid for this study, allowing for the creation of a solid and reliable foundation for obtaining scientifically relevant results.

2.2. Instruments

The instrument used for data collection was a semi-structured questionnaire constructed based on the key factors highlighted by the TOE theory. The questionnaire consisted of open-ended questions that explored various aspects related to the adoption of VR by managers of tourism companies from an individual perspective regarding potential barriers to VR adoption. The questions were formulated based on the conducted literature review and were grouped into four main categories: individual factors, technological factors, organizational factors, and environmental factors.

2.3. Procedures

The managers were contacted by email or phone and invited to participate in the study. Those who agreed to participate were individually interviewed at their companies, with an average duration of 45 minutes. All interviews were recorded and later transcribed for content analysis. Data collection took place during the months of lower tourist demand, between January and February 2023.

2.4. Data Analysis

The interviews were analyzed using MAXQDA 20 software (Kuckartz & Rädiker, 2019), which allowed for the organization and coding of data according to the TOE theory. Content analysis was conducted by two independent researchers who identified categories and subcategories based on the managers' responses. Any divergences were discussed and resolved through consensus.

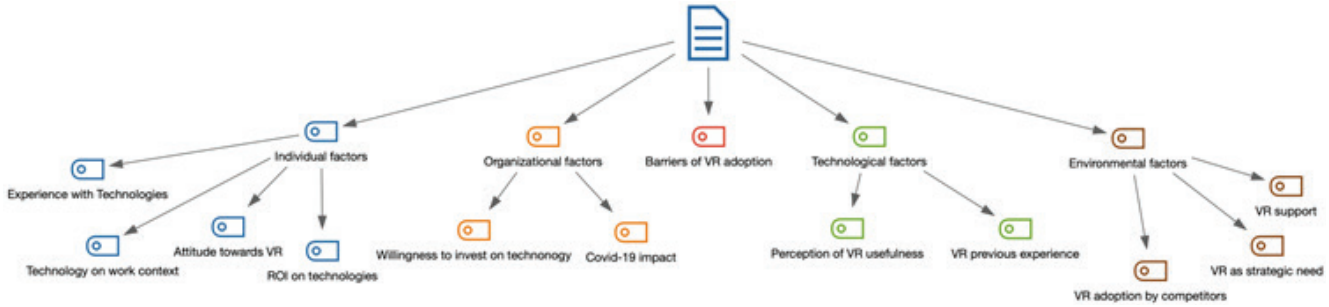
2.5. Research Questions

In this section, we outline the research questions that guided our investigation into the adoption of VR technology by companies in the tourism sector. Research questions are essential in establishing the research objectives and focus. Therefore, we pose the following: (1) What are the main barriers to its adoption?; (2) Does the impact of Covid-19 on tourism influence the intention to adopt VR?; (3) Do managers intend to adopt VR?;

3. RESULTS AND DISCUSSION

In this section, we present and discuss the results of the research on the barriers to the VR adoption by tourism companies. The presented results are based on the coding of the interviews, generating a structure of meaningful units that give purpose and coherence to the study (Table 2 - appendix). All the coded content derived from the participants' narratives was considered valid (Figure 1 - appendix). From this process of interpretation and analysis of the interview content, five themes and eleven sub-themes emerged, which contribute to the understanding of the perceptions of the managers of tourism companies regarding the barriers they believe hinder the adoption of VR (Figure 2).

Figure 1: **Hierarchical Structure of Meaningful Units**



Source: adapted from MAXQDA20

The similarity matrix is a table that displays the similarity between different text units on a scale ranging from 0 to 1. It

measures the similarity between text units using text comparison algorithms, which can identify similar words or phrases across different units. The importance of this matrix lies in its ability to analyse large amounts of textual data efficiently and systematically. This process helps identify patterns, trends, and emerging themes in the data, enabling researchers to conduct a more in-depth analysis of the textual content. Additionally, the similarity matrix can help reduce data complexity, making it easier to identify patterns that may be difficult to detect otherwise. In this case, our results indicate a similarity approaching 1 among participants (Figure 3). This suggests that participants provided very similar contributions and, to some extent, their contributions to addressing the research objective are equivalent. When this is the case, we can conclude that the participants' involvement is homogeneous.

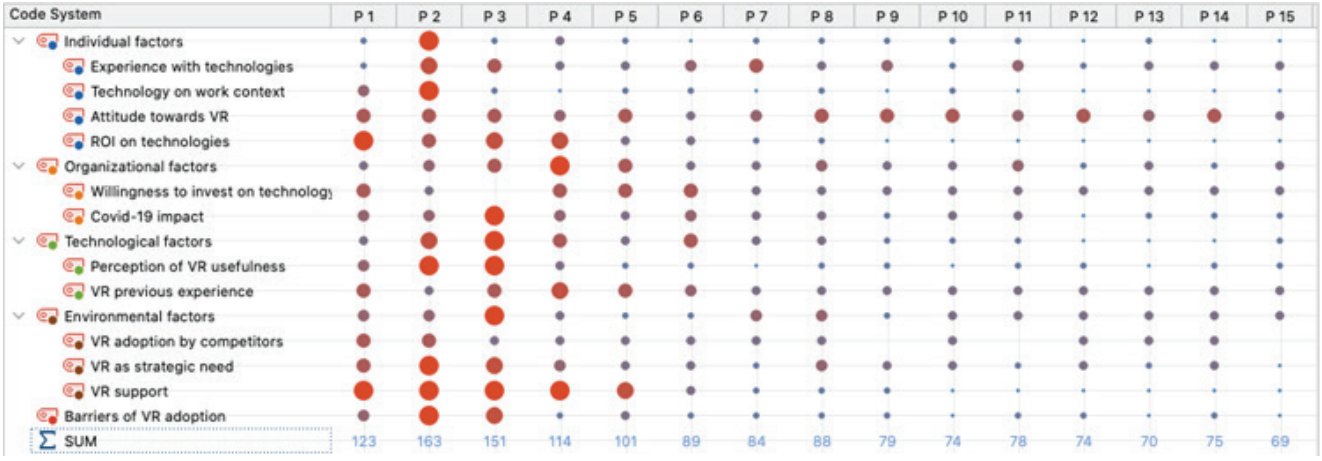
Figure 2: **Similarity Matrix**

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	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 2	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 3	0,94	0,94	1,00	0,94	0,94	0,94	0,94	0,94	0,88	0,94	0,88	0,94	0,94	0,94	0,88
P 4	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 5	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 6	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 7	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 8	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 9	0,94	0,94	0,88	0,94	0,94	0,94	0,94	0,94	1,00	0,94	1,00	0,94	0,94	0,94	1,00
P 10	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 11	0,94	0,94	0,88	0,94	0,94	0,94	0,94	0,94	1,00	0,94	1,00	0,94	0,94	0,94	1,00
P 12	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 13	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 14	1,00	1,00	0,94	1,00	1,00	1,00	1,00	1,00	0,94	1,00	0,94	1,00	1,00	1,00	0,94
P 15	0,94	0,94	0,88	0,94	0,94	0,94	0,94	0,94	1,00	0,94	1,00	0,94	0,94	0,94	1,00

Source: adapted from MAXQDA20

The Code Matrix Viewer (Figure 4) allows for a clear and intuitive visualization of the relationships between codes and participants, facilitating the analysis and interpretation of the results. By using the Code Matrix Viewer, it is possible to create a graphical representation of the distribution of participants across different categories and subcategories, aiding in the identification of patterns and trends in the data. Furthermore, the tool enables filtering and selecting codes and categories of interest, making it easier to compare different groups or segments of the data. This process is crucial for a comprehensive and rigorous analysis of qualitative data, allowing for the identification and interpretation of complex patterns and relationships between categories. Based on our results, we highlight the following themes with the highest occurrence in this study: "Barriers of VR adoption" (226), "Perception of VR usefulness" (146), "Experience with Technologies" (112), "VR as an enterprise strategic" (81), "Covid-19 impact" (63), and "Technology on work context" (60). Our data reveal that participants primarily associate barriers to VR adoption with factors related to their individual experience with the technology (177) and the perceived usefulness of technological equipment (162).

Figure 3: **Code Matrix Viewer**



Source: adapted from MAXQDA20

3.1. Main barriers to adopt VR

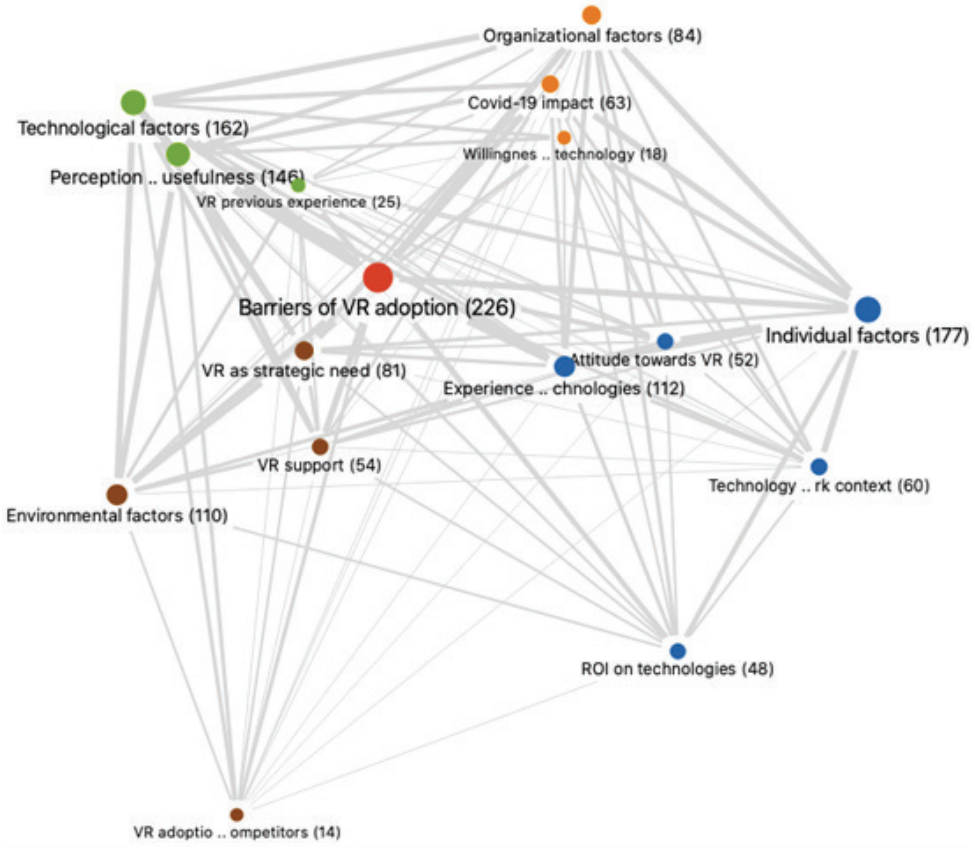
The code map (Figure 5) allows us to visualize and analyse the origins of managers' perceptions regarding the barriers to VR adoption. This tool is particularly useful in identifying complex relationships between codes and their associated documents, in this case, the participants. Through this approach, we were able to explore how codes relate to each other and how they connect to the content of the interviews. Additionally, the Code Map helped us identify patterns that explain the formation of individual perceptions among our participants. Identifying relationships and connections within the data was crucial for understanding our results.

Through this analytical process, we observed that managers perceive VR as a barrier to technology adoption within their companies. They seem to be not fully convinced of the necessity to adopt this technology in their operations. This could be reflective of a lack of understanding regarding the value that VR can bring to the tourism industry. According to Li et al., (2019), many companies struggle to find the commercial value of VR for their business and, as a result, do not adopt it. Furthermore, experience with technology is also an important factor, as managers who are not familiar with VR technology may have difficulty grasping how it can be used in their companies. This finding aligns with the literature highlighting a lack of skills and technical knowledge as a factor inhibiting the adoption of emerging technologies such as VR (Venkatesh et al., 2012).

Another barrier to VR adoption highlighted was the lack of attitude towards the technology. Managers still seem to have a skeptical view of VR technology, mainly due to believing it is too expensive or too complex to implement in their companies. Several studies suggest that an individual's attitude is an important factor in technology adoption (Davis, 1989; Venkatesh et al., 2003), and a lack of attitude can discourage the adoption of VR by tourism companies. The perception of VR usefulness emerged as a crucial theme in this study regarding its adoption. Literature suggests that perceived usefulness is a key factor in the adoption of emerging technologies, including VR (Li & Chen, 2019). Additionally, the willingness to invest in VR was identified as a barrier in managers perspective. This result may be due to many tourism companies being unaware of the gains that can be obtained with VR. This lack of awareness may be related to the lack of evidence of return on investment (ROI) for VR, as mentioned by tom Dieck and Jung (2018).

The COVID-19 pandemic also has a significant impact on VR adoption, as many companies are currently focused on surviving the crisis and do not have resources to invest in new technologies (Silva et al., 2023). The pandemic may be delaying the adoption of VR by tourism companies. This is consistent with previous studies that have shown the pandemic's significant impact on tourism companies and technology adoption (Gössling, 2021; Sigala, 2020). Another barrier identified by the study's managers was the lack of previous experience with VR. This finding aligns with the literature that highlights the importance of prior experience in technology adoption (Venkatesh et al., 2003). Additionally, the lack of support for VR was also considered a barrier by the managers. This may be related to the lack of training and technical support available for technology adoption (Venkatesh et al., 2003). Regarding the use of technology in the work context, it is important to highlight that the adoption of new technologies can require significant changes in work processes and how employees perform their tasks. As mentioned by Lee et al., (2019), the implementation of VR in tourism companies may require work reorganization and employee training, which can be seen as a challenge by managers. Concerning the adoption of VR by competitor companies, managers may feel pressured to adopt the technology to avoid falling behind their competitors. However, they may also have concerns that late adoption of the technology could harm the company's image in the eyes of the public (Masood & Egger, 2019).

Figure 4: **Correlation among emerging themes**



Source: adapted from MAXQDA20

3.2. Impact of Covid-19 on tourism influence the intention to adopt VR

The code occurrence model (Figure 6) allows for the analysis of the frequency and significance of specific codes within the data corpus. Through this tool, it is possible to gain a deeper understanding of the relationship between specific themes or topics and their occurrence, enabling a more systematic analysis of the data and a more precise identification of patterns. Based on this analysis, we can have a clearer idea of the concerns and issues that are most relevant to the study participants. According to our model, it is evident that there is a set of themes that influence the willingness to pay for technologies, which in turn can impact the adoption of VR by tourism companies. It was observed that the willingness to invest in technology plays a crucial role in the adoption of VR in the sector. According to the study by Chirisa et al. (2020), the perception of return on investment in technology is one of the factors influencing the adoption of digital technologies, including VR, in the tourism industry. Furthermore, the perception of the impact of Covid-19 is also an important factor to consider, as many companies have faced financial difficulties due to the pandemic, which can affect their willingness to make new investments. According to the study by Gretzel and Stankov (2021), the Covid-19 pandemic has had a significant impact on the adoption of digital technologies in the tourism sector, with many companies having to reconsider their business strategies and investment priorities.

Another factor that can affect companies' willingness to invest in technology is the lack of support for acquiring VR mechanisms, which can be attributed to the complexity and high cost of these technologies. According to the study by Sigala (2020), cost and complexity are key factors that limit the adoption of VR in the tourism sector. The lack of previous experience with VR and the non-use of VR equipment as a business strategy also appear to be important barriers. According to the studies by Akpan et al., (2022) and Kim et al., (2020), the lack of knowledge and prior experience with digital technologies can negatively affect companies' willingness to invest in innovative technologies like VR.

Individual attitudes and experiences with technology can also affect companies' willingness to invest in technology in the workplace context. According to the study by Talwar et al., (2022), a positive attitude towards digital technologies is a key factor for the adoption of VR in the tourism sector. Additionally, the perception of usefulness of VR is also an important factor that can influence companies' willingness to invest in technologies, as discussed in the study by Sigala (2020). The limited use of technology in the workplace is another factor that can affect companies' willingness to invest in technology overall. According to the study by Steffen et al., (2019), the lack of experience or understanding of VR can limit its adoption, and companies with lower levels of digitalization tend to not value technological mechanisms as much, thereby limiting their willingness to invest in innovative technologies like VR (Yen et al., 2010).

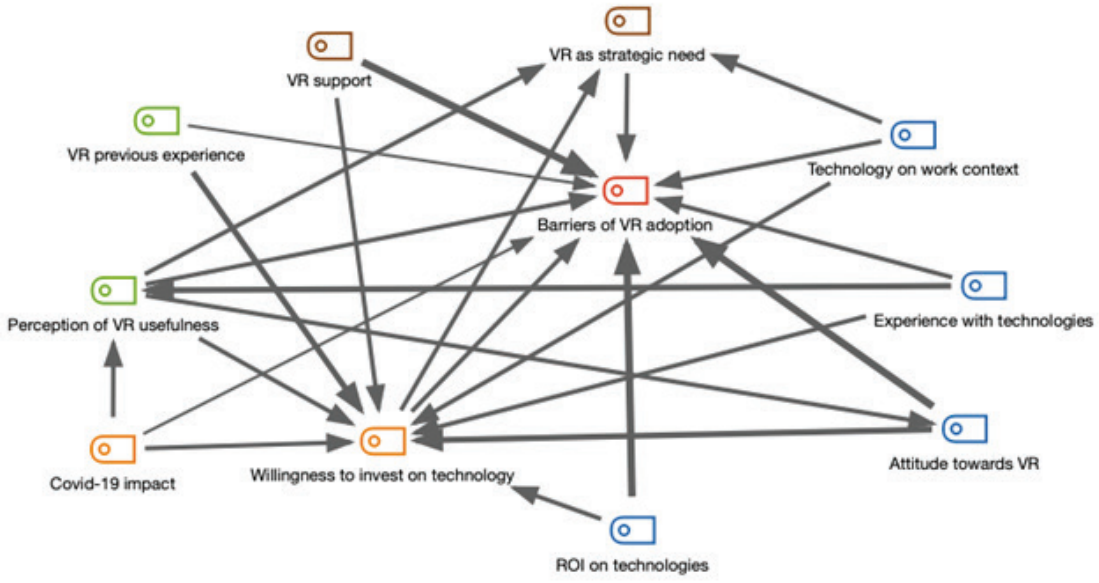
Regarding the influence of the perceived usefulness of VR on its adoption by tourism companies (see Figure 6), our findings are consistent with previous studies, such as Li and Chen (2019), which highlight the importance of perceived usefulness in users' intention to adopt technology. However, individual technology experience and the impact of Covid-19 appear to be the main determinants of managers' perceived usefulness of VR, which corroborates the conclusions of studies like Yousaf et al., (2021), emphasizing the importance of the social and organizational context for the perceived usefulness of technology. Regarding the barriers to VR adoption by tourism companies, our results align with previous studies, such as Buhalis and Amaranggana (2015), which highlight the lack of support and prior experience with technology as the main barriers to technology adoption by tourism companies. Additionally, we found that the perception of return on investment in technology and the non-use of VR equipment as a strategy need also seem to inhibit VR adoption. These findings support the study by Chathoth et al., (2016), which emphasized the importance of perceiving economic and strategic benefits in technology adoption by tourism companies.

3.3. Managers' intention to adopt VR

The results of our research highlight the importance of the perception of return on technology investment and the perceived utility of VR in the adoption decision. These technological factors align with the emphasis of the TOE Theory on "technological fit" and "competitive advantage." In terms of the TOE Theory, technological fit reflects the perception that VR meets the technological needs of the organization, while competitive advantage suggests that VR can provide a strategic advantage.

The results also indicate that the willingness to invest in technology, a positive attitude towards digital technologies, and individual technology experience are crucial in VR adoption. In the TOE Theory, these factors align with organizational elements where the organization's ability to allocate resources, foster an innovation culture, and possess digital competencies play a fundamental role in the successful adoption of technologies. The impact of Covid-19 on the decisions of tourism companies is also a relevant outcome. This environmental influence fits within the TOE Theory, which considers external environmental conditions as a key factor in the adoption decision. The pandemic has reshaped the business overview, affecting resource availability and the urgency of technological innovations. In this context, managers seem to be pondering how they can apply VR to their organization's specific scenario. Understanding the organization's technological needs and the search for a strategic advantage can apparently guide the decision to adopt VR. Ultimately, the possible successful integration of VR into organizational strategies may depend on the ability to adapt to technological changes, promote a culture of innovation and remain agile in the face of environmental transformations.

Figure 5: **Factors affecting VR adoption in the tourism industry**



Source: adapted from MAXQDA20

4. IMPLICATIONS OF THE STUDY AND FINAL CONSIDERATIONS

This study has significant theoretical and practical implications. In terms of theory, the results contribute to the understanding of barriers to the adoption of VR by tourism companies, specifically in relation to perception (Chathoth et al., 2014). It was identified that the adoption of VR by tourism companies is primarily affected by the lack of willingness to invest in the technology, attitude towards VR, perception of its usefulness, failure to incorporate new technologies as part of their strategy need, the impact of Covid-19, and inexperience with the use of technology in their daily operations. These results are consistent with existing literature on technology adoption (Moorhouse, 2019) and provide a broader understanding of this topic in tourism, highlighting the importance of considering individual experience with technology and the perception of the impact of Covid-19 in studying barriers to VR adoption in the tourism sector (Shen et al., 2022).

From a practical perspective, the implications of this study are related to the development of more effective VR adoption strategies for tourism companies. Furthermore, it is important for managers to understand the utility of VR and how it can be applied to enhance the customer experience. Companies also need to be aware of the costs associated with VR adoption and the need for significant financial investment to successfully implement it. This may include costs for support, training to help employees become familiar with the technology, which companies may be reluctant to provide.

The theoretical and practical implications of this study are important for tourism companies that wish to adopt VR as a strategy need. These results can assist companies in identifying and overcoming barriers to VR adoption and implementing the technology more effectively. Additionally, this study may be useful for researchers and academics studying technology adoption in companies and seeking to further explore this topic. In addition to the theoretical and practical implications mentioned, there are other important considerations that may be relevant for tourism companies wishing to adopt VR. One such consideration is the importance of collaboration and partnerships with reliable and experienced VR technology suppliers. Tourism companies looking to adopt VR need to find vendors that can offer customized solutions to meet the specific needs of their business. Additionally, VR technology vendors should be able to provide adequate technical support to ensure proper deployment and maintenance of the technology.

Another important consideration is the need for a strategic approach to VR adoption. Tourism companies need to carefully consider how VR fits into their overall strategy need and how it can be used to enhance the customer experience and increase operational efficiency. This requires a careful analysis of the costs and benefits of VR technology compared to other available options. Furthermore, it is important to consider the potential impact of VR on the workforce. VR adoption may require new skills and knowledge from employees, as well as a proper training period to ensure that employees can effectively use the technology. Therefore, tourism companies need to ensure that their employees can adapt to the changes brought about by VR technology. It is evident that there is a significant absence of Destination Marketing Organizations (DMO) in promoting and raising awareness about the usefulness of VR devices in the local tourism sector. It would be crucial for these organizations responsible for territorial tourism management to develop actions for tourism managers regarding the new technological trends in the industry, ensuring that they can make decisions with a higher level of knowledge.

Lastly, tourism companies should be aware of the legal and regulatory challenges associated with VR adoption. For example,

companies need to ensure they comply with privacy and data security regulations when collecting and storing customer information. Therefore, it is important for tourism companies to work towards ensuring compliance with all relevant laws and regulations. In summary, this study provides a comprehensive insight into the barriers to VR adoption by tourism companies and suggests practical strategies to overcome these barriers. However, it is important to remember that VR adoption is an ongoing process and companies need to be willing to continuously adapt their strategies according to the ever-evolving needs of the market and customers.

CONCLUSION

The barriers to VR adoption in the tourism sector are a complex and multifaceted topic, and this study sought to understand them from the perspective of tourism company managers. Based on the results, we can conclude that the lack of knowledge about VR, limited experience with technology, and a lack of understanding of how to turn VR into a business are the main factors inhibiting its adoption by tourism companies. The managers who participated in the study also highlighted the importance of attitude and financial availability to invest in this technology as factors limiting their intention to acquire such equipment. Apparently, the lack of awareness about technical support for VR and its use by competitors makes managers quite hesitant about using this type of equipment in tourism. Additionally, it was identified that the return on investment and the use of technology in the work context can also affect the adoption of VR by tourism companies.

Finally, the Covid-19 pandemic has left managers with concerns about the future. The fear of going through something similar again fuels barriers when it comes to acquiring any type of equipment that is not essential for the normal development of the company. Their perception that they may face new social restrictions overnight greatly limits their decisions, especially regarding financial investment. To overcome these barriers, it is important for tourism companies to take a strategic approach to VR adoption, investing in employee training and partnerships with technology vendors and other companies in the industry to share knowledge and experiences with this type of technology.

This study has contributed to filling a gap in the literature by providing a deeper understanding of the barriers to VR adoption in the tourism sector from the perspective of its managers. We believe that the results can be useful for tourism companies wishing to adopt VR, as well as for future research on this topic. However, there are some limitations that should be considered. Firstly, the study was conducted with managers of tourism companies in a single country, which may limit the generalization of the results. Secondly, the study sample was relatively small, which limits the representativeness of the findings. Additionally, the study relied on semi-structured interviews, which may have influenced the accuracy of the collected data.

Therefore, we suggest some recommendations that can be considered for future research in this area. Firstly, future research should address the barriers to VR adoption in different sectors beyond tourism. Secondly, it is important to expand the sample to include tourism companies in other regions to validate the results obtained in this study. Furthermore, future research can consider other research methodologies, such as focus groups or case studies, to deepen the understanding of the barriers to VR adoption. While there are many studies on the use of VR in tourism, further empirical work is needed on the barriers to VR adoption by tourism companies. Future research should focus on better understanding the perceptions of tourists and the concerns of companies regarding VR to help overcome the barriers that hinder the adoption of the technology by tourism companies. Lastly, future studies can also explore possible solutions or strategies to help tourism companies overcome the barriers identified in this study.

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APPENDIX

Table 1: **Interview Guide**

Interview Guide	
Socio-demographic data	
Age	
Gender	
Education	
Years in the profession	
Identification data	
No. of employees	
Main activity	
Annual financial return	
Use of technological equipment	
Individual factors	
Experience with Technologies	Can you share with me your experience in using technology?
	How frequently do you utilize technology in your daily life?
	How would you describe your relationship with new technologies?
Technology on work context	What is your stance on the integration of new technologies in the workplace? Are you interested in staying informed about technological advancements?
	Do you think that the work you do on a daily basis would be the same without the technology you currently use in the workplace?
Attitude towards VR	What are your thoughts on Virtual Reality technology?
ROI on technologies	In your opinion, do investments in new technologies generate returns that justify the costs?
Organizational factors	
Willingness to invest on technology	Is your company interested in investing in technological equipment?
Covid-19 impact	Has the investment capacity of your company changed as a result of COVID-19?
Technological factors	
Perception of the usefulness of VR	Do you believe that adopting a Virtual Reality application would be beneficial for your company? If so, how?
	Do you think Virtual Reality technology can be an important tool in the workplace?
VR previous experience	Would your previous experience with Virtual Reality influence your decision to adopt this technology in your company?
Environmental Factors	
VR adoption by competitors	Are you aware of any national or international competitors who use Virtual Reality technology? If so, how do they use it?
VR as strategic need	Do you believe that incorporating Virtual Reality technology in the tourism sector is a strategic need? If so, what would be its best application?
	Given the current situation of social distancing, do you think Virtual Reality technology could be integrated into the business models of tourist developments? If so, how?
VR support	Do you know of any companies or entities that provide technical support for the implementation of Virtual Reality systems? If so, do you think their support is sufficient?
Barriers of VR adoption	
	If you wanted to adopt Virtual Reality technology in your company, what potential barriers could prevent you from doing so?
	In your opinion, what are the main obstacles to adopting Virtual Reality technology in your company?

Table 2: **Structure of the units of meaning**

Themes	**Subthemes**	**Units of meaning**
Individual factors	Experience with Technologies	(...)My experience with technology is elementary, I use esseincial daily, I don't look much for new technologies(...)
	Technology on work context	(...)At work I use our computer systems on a daily basis to manage the main activities of the enterprise(...)
	Attitude towards VR	(...)I am quite positive about the capabilities of VR(...)
	ROI on technologies	(...)It would be crucial to know what return we could expect from the use of VR(...)
Organizational factors	Willingness to invest on technology	(...)My willingness to invest in technology is favorable if it adds something(...)
	Covid-19 impact	(...)COVID-19 made this business very difficult, we were very fragile, especially in financial terms(...)
Technological factors	Perception of VR usefulness	(...)I believe that VR can become a useful tool for tourism enterprises(...)
	VR previous experience	(...)Experimenting with VR to find out what it can concretely do could help you decide if it is worth buying such equipment(...)
Environmental factors	VR adoption by competitors	(...)I believe that companies that already have VR will motivate competitors to acquire it as well, especially if they realize that this is an added value(...)
	VR as strategic need	(...)If VR can generate value for the industry, it should be equated as a company strategy, no doubt(...)
	VR support	(...)Companies that provide support are fundamental to be able to acquire certain products or services, without specialized support the investment is not viable(...)
Barriers of VR adoption		(...)What inhibits me from moving forward with the acquisition of VR is that I do not have enough knowledge about its capabilities and especially about its contribution to the tourism sector(...)

Source: adapted from MAXQDA20

Figure 1: **Text Coding**

	Frequency	Percentage	Percentage (valid)
Barriers of VR adoption	226	15,8	15,8
Environmental factors	110	7,7	7,7
Environmental factors > VR adoption by competitors	14	1,0	1,0
Environmental factors > VR as strategic need	81	5,7	5,7
Environmental factors > VR support	54	3,8	3,8
Individual factors	177	12,4	12,4
Individual factors > Attitude towards VR	52	3,6	3,6
Individual factors > Experience with technologies	112	7,8	7,8
Individual factors > ROI on technologies	48	3,4	3,4
Individual factors > Technology on work context	60	4,2	4,2
Organizational factors	84	5,9	5,9
Organizational factors > Covid-19 impact	63	4,4	4,4
Organizational factors > Willingness to invest on technology	18	1,3	1,3
Technological factors	162	11,3	11,3
Technological factors > Perception of VR usefulness	146	10,2	10,2
Technological factors > VR previous experience	25	1,7	1,7
TOTAL (valid)	1432	100,0	100,0
Missing	0	0,0	
TOTAL	1432	100,0	

Source: adapted from MAXQDA20