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The Development of Virtual Tourism in the Island of Crete, Greece: A PESTEL Analysis

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Abstract

The island of Crete, Greece is a well-known global tourism destination hosting few millions of tourists every year. Although mass tourism dominates in the local tourism product several types of thematic tourism have been also developed in the island. Virtual tourism allows the exploration of Crete without the physical presence of the visitor. The current technological advances of virtual reality and augmented reality allow the exploration of several historical, and cultural monuments as well as other beauties in Crete without the physical presence of visitors in the island. Virtual tourism is particularly useful to those who are disabled or do not have the financial resources to travel to Crete while it can be used as a marketing tool in several

cases. Additionally, virtual tourism can mitigate the impacts of overtourism and climate crisis on the local tourism industry. PESTEL methodology is a strategic tool that is useful in the analysis of the impacts of the external environment on an organization. The development of virtual tourism in Crete has been analyzed with the PESTEL framework examining the impacts of political, economic, social, technological, environmental and legal factors on it. Our results could be useful to policy makers and to stakeholders of the local tourism industry who should develop appropriate policies for the promotion of virtual tourism in Crete.

Keywords: Crete-Greece, External Factors, PESTEL Analysis, Tourism Industry, Virtual Tourism

1. Introduction

The island of Crete, Greece is a popular global tourism destination hosting a growing number of tourists every year. However, its prosperous tourism industry is facing various problems related to climate crisis and overtourism [1, 2, 3, 4]. The advances of virtual reality (VR) and in augment reality (AR) have resulted in the development of virtual tourism (VT) [5, 6, 7]. Virtual tourism is a novel type of tourism which allows the exploration of destinations without physical travelling [8, 9]. PESTEL analysis is a methodological tool which allows organizations to identify and assess the external factors which affect their operations. It is broadly used nowadays when organizations want to create their development strategies taking into account the factors which might affect them [10, 11, 12].

The aim of the current work is to study the development of virtual tourism in the island of Crete, Greece using PESTEL analysis.

The text is structured as follows: After the literature review the tourism industry in Crete and the concept of virtual tourism are analyzed. In the next section the PESTEL framework is stated followed by an analysis of the external factors that affect the development of virtual tourism in Crete. The text ends with discussion of the findings, the conclusions drawn and the citation of the references used.

The current work is innovative since there are not many studies so far related with the development of virtual tourism in Crete. It fills the gap related with limited existing studies which use PESTEL methodology in the development of virtual tourism. It could be useful to policy makers and to stakeholders of the tourism industry in Crete which should create appropriate policies for the future development of virtual tourism in the island.

2. Literature survey

The literature survey is separated in three sections including a) the tourism industry in Crete, b) the virtual tourism, and c) PESTEL analysis.

2.1 The tourism industry in Crete

The opportunities and challenges of sustainable tourism in Greece have been explored ^[4]. Twenty-one recommendations have been proposed in several areas including the diversification of the tourism product and the sharing of good practices through increased collaboration. The impacts of overtourism and climate crisis on tourism industry in Crete, Greece have been studied ^[1]. The author stated that overtourism and climate crisis have adverse and harmful impacts on the tourism industry in Crete. He also mentioned that the stakeholders of the local tourism industry should collaborate to mitigate and reduce their undesired impacts on the prosperous tourism industry. The tourism-related carrying capacity and the environment in the island of Crete, Greece have been explored ^[2]. The authors stated that the environment in Crete can sustain a polymorphic tourism product. They also mentioned that the environment plays a vital role for the sustainable development of tourism and offers a unique tourist product in Crete. The carbon emissions due to the tourism in the island of Crete, Greece have been evaluated ^[13]. The author estimated the carbon emissions at 488.77 kgCO₂ per visitor. He mentioned that the international and domestic flights combined with the arrival and departure of tourists had a high share at 80.69% in the total tourism-related carbon emissions. The tourism potential of the island of Crete has been studied ^[3]. The authors assessed and analyzed the climatological parameters and the thermal comfort of Crete for the period 1955-2001. They stated that their analysis has shown that the natural tourism potential is high and an extension of the tourism period is possible. The development of virtual tourism in the island of Crete has been examined ^[14]. The author stated that the current technological progress in VR allows the development of VT complementing the traditional physical tourism. He also mentioned that VT can mitigate the challenges of climate crisis and overtourism in the island.

2.2 The virtual tourism

The virtual tourism experiences have been studied using the data collected from 660 participants ^[5]. The authors stated that while free VT experiences are popular, when the users were asked to pay the participation rate was low. A systematic review of virtual reality has been made ^[6]. The authors reviewing 54 papers stated that VR technologies are continuously improving bringing new challenges to tourism. They examined several themes including a) the applications of VR to tourism, b) the motives of the consumers to adopt the VR technology, and c) their satisfaction to reuse and recommend VT. The impact of VR technology on tourists' experience has been analyzed ^[15]. The authors studied 119 online comments regarding the experience of tourists who visited Barcelona and Seville in Spain. Their results indicated that VR technologies influence the quality of experience of tourists. The new way of travelling using virtual tourism has been studied ^[7]. The authors stated that the evolution of VR technologies made possible the discovering of new destinations without travelling. They also stated that young people and people with prior knowledge of online video games and VR are more willing to be engaged in VT activities. A literature review related

with the application of virtual reality in tourism industry has been made ^[16]. The author stated that the use of VR in tourism has created a novel type of travel the virtual tourism. However, she mentioned VT is mainly used nowadays as a marketing tool. The impact of virtual experiences and destination image on the travel intention has been explored ^[17]. The authors analyzed questionnaires from 400 participants. They stated that virtual experiences and destination images significantly enhance the travel intention indicating the importance of virtual reality as a marketing tool. The past the present and the future of virtual tourism have been reviewed ^[8]. The authors stated that several elements of VT such as smartphones, VR, AR and artificial intelligence interact among them. They also mentioned that technology and sustainability are the main pillars for the development of VT. A review of virtual reality in tourism has been realized ^[9]. The authors stated that the emerging technology of VR has influenced both the supply and the demand side of tourism. They also mentioned that VR is currently used as a marketing tool for promotion and communication purposes during the pre-travel phase. The technologies and applications of VR and AR have been explored ^[18]. The authors stated that various studies have indicated the positive impacts of virtual tourism using VR and AR. They provided a literature review of the latest technologies that can potentially benefit the remote tourism and the digital heritage industry.

2.3 PESTEL analysis

A PESTEL analysis in two tourism destinations has been realized ^[10]. The author analyzed the business tourism in Croatia and Qatar, two countries with different attractions to visitors. She stated that both countries try to develop business tourism as the main type of tourism. The tourism evaluation in Braila County, Romania using PESTEL analysis has been implemented ^[11]. The authors stated that tourism in Braila County acts as a stimulator of the local economic system while tourism development engages several local stakeholders. The implications of external factors on Indonesia's tourism industry using PESTEL analysis has been explored ^[12]. The authors stated that tourism has become a leading sector in Indonesia's economy. They suggested the use of quantitative analysis distributing questionnaires to several stakeholders and analyze the results afterwards. The role of virtual tourism in promoting sustainable travel has been examined using PESTEL analysis ^[19]. The authors stated that by reducing the carbon footprint associated with mass tourism and providing alternative experiences to physical travel, virtual tourism holds the potential to transform the industry. They also mentioned that the hybrid approach, combining virtual experiences with traditional travel, can foster more environmental conscious tourism practices. The use of PESTEL analysis in the management of tourism in Moldova has been studied ^[20]. The author analyzed the use of PESTEL methodology in the local tourism industry. He stated that it is very sensitive to armed conflicts and terrorists' attacks. The application of virtual reality technology has been studied using PESTEL analysis ^[21]. The author stated that the emergence of VR technology has transformed the practice and experience of cultural design. He mentioned that VR technologies can provide more engaging and interactive environment for cultural design. The digitalization of *Subak* cultural heritage, located in Bali,

Indonesia, using SWOT-PESTEL analysis has been studied [22]. The authors tried to develop a strategic planning model for the digitalization and preservation of *Subak*. They stated that their research emphasized the importance of innovation and technological adaptation in preserving cultural heritage.

3. The Tourism Industry in Crete

Crete, the largest of the Greek islands, is a major tourist destination known for its breathtaking landscapes, rich history, and vibrant culture. The island attracts millions of visitors annually, contributing significantly to Greece's economy. With its diverse attractions, ranging from stunning beaches and ancient archaeological sites to picturesque villages and delicious cuisine, Crete has solidified its reputation as a premier travel destination. One of the primary reasons for Crete's popularity is its remarkable natural beauty. The island boasts a variety of landscapes, including pristine beaches, rugged mountains, and lush valleys. Famous beaches such as Elafonissi, Balos, and Vai offer crystal-clear waters and golden sands, making them popular among tourists seeking relaxation. Moreover, the Samaria Gorge, one of Europe's longest gorges, attracts adventure enthusiasts interested in hiking and exploring the island's diverse flora and fauna. Crete's historical and cultural significance further enhances its appeal. The island was home to the Minoan civilization, one of Europe's earliest advanced societies. The archaeological site of Knossos, near the capital city of Heraklion, is a major

attraction, showcasing the grandeur of Minoan architecture and art. Other historical landmarks, such as the ancient city of Phaistos and the Venetian-era Fortezza of Rethymno, provide visitors with a glimpse into Crete's storied past. In addition to its historical sites, Crete is renowned for its charming villages and vibrant traditions. Towns like Chania, with its picturesque Venetian harbor, and Agios Nikolaos, known for its stunning lake, captivate visitors with their unique charm. Traditional Cretan music, dance, and festivals play an essential role in local culture, offering tourists an authentic experience of island life. The local cuisine is another vital aspect of Crete's tourism industry. The island's Mediterranean diet, rich in olive oil, fresh vegetables, and local cheeses, is considered one of the healthiest in the world. Tourists often indulge in traditional dishes such as dakos, moussaka, and fresh seafood while enjoying the warm hospitality of the locals. Despite its success, Crete's tourism industry faces challenges, including the need for sustainable development to preserve its natural and cultural heritage. Over-tourism, environmental degradation, and infrastructure improvements remain critical areas of focus for local authorities. Overall, Crete remains a top travel destination, offering a perfect blend of history, culture, and natural beauty. By promoting sustainable tourism practices, the island can continue to thrive while preserving its unique identity for future generations. Several characteristics of Crete and its tourism industry are presented in Table 1.

Table 1: Several characteristics of Crete and its tourism industry

Surface of Crete	8,336 Km ²
Length of coastline	1,040 km
Residents in Crete (Census 2021)	617,360 residents
Average annual air temperature (Heraklion city)	18.9°C
Annual hours with sunshine (Heraklion city)	2,780 hours
Average annual precipitation (Heraklion city)	460 mm
Average annual sea temperature (Heraklion city)	20.1°C
Tourist's beds (2021)	193,928
Arrivals in Crete in 2023	6,327,366 tourists
Number of airports for tourists' arrivals	3
Number of seaports for tourists' arrivals	6
%, arrivals in Crete to arrivals in Greece in 2023	17.7 %
Overnight staying of tourists in Crete in 2023	34,342,891 bed-nights
%, overnight staying in Crete to overnight staying in Greece in 2023	23.3 %
Average days of staying in Crete in 2023	5.43 days

4. Virtual Tourism: Exploring the World from Anywhere

Virtual tourism is an emerging concept that allows individuals to explore destinations through digital technology without physically traveling. This innovative approach has gained popularity, especially in recent years, due to advancements in virtual reality, augmented reality, and high-definition multimedia content. Virtual tourism provides an immersive experience, enabling users to visit cultural sites, natural landscapes, and famous landmarks from the comfort of their homes. The rise of virtual tourism can be attributed to several factors, including technological advancements and the increasing accessibility of digital platforms. With the advent of VR headsets, 360-degree videos, and interactive online tours, travelers can experience destinations in a highly realistic manner. Museums, historical sites, and tourist attractions have embraced virtual tours to provide educational and entertaining experiences to a global audience. One of the key advantages of virtual

tourism is its accessibility. It enables people with physical disabilities, financial constraints, or travel restrictions to explore destinations they may not have been able to visit otherwise. Virtual tourism also promotes environmental sustainability by reducing the carbon footprint associated with traditional travel. Additionally, it allows users to preview destinations before planning an actual visit, helping them make informed travel decisions. Despite its many advantages, virtual tourism has certain limitations. The experience, while immersive, cannot fully replicate the sensory and cultural aspects of physical travel. The lack of direct interaction with local people, cuisine, and real-world environments means that virtual tourism serves more as a complementary experience rather than a complete substitute for traditional travel. Furthermore, the cost of VR equipment and high-quality digital experiences can be a barrier for some users. As technology continues to advance, virtual tourism is expected to evolve further. Improved VR and AR capabilities, coupled with artificial intelligence, could

enhance the realism and interactivity of virtual travel experiences. More destinations and cultural institutions are likely to invest in digital tourism to reach wider audiences. Hybrid tourism, where travelers combine virtual experiences with physical visits, may also become a trend in the future. Virtual tourism is revolutionizing the way people explore the world. While it may not replace traditional travel, it serves as a valuable tool for education, accessibility, and sustainable tourism. As technology advances, virtual tourism will continue to offer new opportunities for individuals to discover and appreciate global destinations from anywhere in the world.

5. PESTEL Analysis: A Comprehensive Business Tool

PESTEL analysis is a strategic framework used by organizations to assess the external factors that can impact their operations. The acronym PESTEL stands for Political, Economic, Social, Technological, Environmental, and Legal factors. This tool helps companies understand the macro-environment in which they operate, allowing them to make informed strategic decisions. Political factors refer to the influence of government policies, regulations, and stability on organizations. Elements such as taxation policies, trade regulations, government stability, and international trade agreements can impact an organization's ability to operate efficiently. For example, organizations operating in politically unstable regions may face higher risks, while those in countries with favorable trade policies may experience growth opportunities. Economic factors involve the overall economic environment in which an organization functions. Elements such as inflation rates, exchange rates, economic growth, interest rates, and employment levels affect consumer purchasing power and organizations' profitability. For instance, during economic downturns, consumer spending decreases, negatively impacting sales, whereas in times of economic growth, organizations can thrive due to increased consumer demand. Social factors pertain to cultural and demographic influences on organizations. Population growth, age distribution, lifestyle changes, consumer behaviors, and education levels are key social factors that impact demand for products and services. Organizations must adapt to changing social trends to remain competitive. For example, the growing awareness of health and wellness has led to increased demand for organic and plant-based food products. Technological factors involve the impact of technological advancements on organizations' operations and industry trends. Innovations, automation, digital transformation, and research and development can create new opportunities and competitive advantages. Organizations that fail to keep up with technological changes risk becoming obsolete. For example, the rise of e-commerce has forced traditional retailers to adopt digital platforms to remain relevant. Environmental factors consider the ecological and environmental aspects that affect organizations. Issues such as climate change, sustainability regulations, carbon footprints, and resource scarcity have become increasingly significant. Many organizations are adopting environmentally friendly practices to comply with regulations and meet consumer expectations. For example, organizations in the automotive industry are investing in electric vehicles to reduce environmental impact. Legal factors encompass laws and regulations that influence organizations' operations. Labor laws, consumer protection laws, health and safety

regulations, and intellectual property rights are crucial considerations for organizations. Non-compliance with legal requirements can result in penalties, legal disputes, or reputational damage. PESTEL analysis is a valuable tool for organizations to understand external factors that can impact their operations. By systematically analyzing political, economic, social, technological, environmental, and legal factors, organizations can develop strategic plans that mitigate risks and capitalize on opportunities. Organizations that proactively adapt to changes in the macro-environment are more likely to achieve long-term success.

6. The virtual tourism in Crete and the external factors affecting it

6.1 Political Factors Affecting the Development of Virtual Tourism in Crete, Greece

Political factors play a crucial role in shaping the development and expansion of virtual tourism on the island. Key political considerations include government policies, funding and investment, regulatory frameworks, international collaborations, and digital infrastructure. The Greek government has recognized tourism as a vital economic sector and has increasingly embraced digital transformation to enhance its global competitiveness. National and regional policies promoting digital tourism significantly impact the development of virtual tourism in Crete. The Greek Ministry of Tourism has initiated programs aimed at digitizing cultural heritage, which provides a framework for virtual tourism expansion. Additionally, the Greek National Tourism Organization has undertaken efforts to promote Greece, including Crete, as a technologically advanced tourism destination. However, bureaucratic inefficiencies and slow implementation of digital strategies may hinder progress. Financial support from both the public and private sectors is essential for the growth of virtual tourism. The European Union has provided funding through programs such as the European Regional Development Fund and the Horizon Europe initiative, which support technological advancements in tourism. The Greek government also allocates national funds to cultural and digital projects, but financial constraints and competing priorities often limit the scale and speed of implementation. Private sector involvement, including partnerships with tech companies and startups, can significantly boost investment in virtual tourism infrastructure. The legal environment in Greece, including intellectual property rights, data protection laws, and content licensing, affects the development of virtual tourism. Virtual experiences require access to digital content from archaeological sites and museums, necessitating clear regulations on ownership and usage rights. Global partnerships with international organizations, universities, and tech firms play a pivotal role in advancing virtual tourism. The Greek government's collaborations with UNESCO, Google Arts & Culture, and other international bodies have facilitated the digitization of Crete's cultural heritage. A well-developed digital infrastructure is fundamental to the success of virtual tourism. The Greek government's commitment to expanding broadband connectivity, 5G networks, and digital literacy programs directly affects the feasibility of virtual tourism initiatives. EU funding has supported Greece's digital transformation, but disparities in infrastructure development between urban and rural areas remain a challenge.

Table 2: Political factors affecting the development of virtual tourism in Crete

1	The Greek Ministry of Tourism has initiated programs aimed at digitizing the cultural heritage
2	European Union policies promote virtual tourism while it has provided funding aimed at digitizing cultural heritage
3	The Greek government’s collaboration with UNESCO facilitates the digitization of Crete’s cultural heritage
4	The Greek government’s commitment to digital transformation favors the development of digital tourism
5	Virtual experiences require access to digital content from archaeological sites and museums, necessitating clear regulations on ownership and usage rights

6.2 Economic Factors Affecting the Development of Virtual Tourism in Crete, Greece

Economic factors play a crucial role in shaping the development and expansion of virtual tourism on the island. Key economic considerations include financial investment, market demand, technological costs, employment opportunities, and economic sustainability. Investment from both public and private sectors is essential for the growth of virtual tourism in Crete. The Greek government has also allocated national funds to cultural and digital projects, but economic constraints and competing priorities often limit the extent of investment. Additionally, private sector involvement, including partnerships with technology firms and startups, can significantly boost the financial resources available for developing virtual tourism infrastructure. The success of virtual tourism in Crete depends on market demand and the potential for revenue generation. The increasing popularity of digital experiences, especially after the Covid-19 pandemic, has created new opportunities for virtual tourism. Tourists who cannot travel due to financial, health, or logistical reasons may find virtual tourism an appealing alternative. However, the challenge lies in monetizing these experiences effectively through subscription models, digital ticketing, and partnerships with educational institutions and travel agencies. Without a sustainable revenue model, virtual tourism initiatives may struggle to maintain long-term viability. Developing and maintaining virtual tourism platforms require substantial investment in digital infrastructure, software development, and high-quality content creation. The cost of 3D mapping, virtual reality equipment, and artificial intelligence integration can be high, making it crucial to secure funding for such projects. Virtual tourism can create new employment opportunities by requiring skilled professionals in digital content creation, software development, marketing, and customer service. The growth of this sector can provide alternative job opportunities for locals, reducing economic dependence on traditional tourism, which is highly seasonal. However, workforce training and upskilling are necessary to ensure that the local population can participate in and benefit from the digital transformation of the tourism industry. For virtual tourism in Crete to be economically sustainable, it must integrate into the broader tourism economy. This involves collaboration with traditional tourism businesses, such as hotels, travel agencies, and cultural institutions, to offer hybrid tourism experiences. Additionally, ongoing innovation and

adaptability to technological advancements will be essential in maintaining the competitiveness of Crete’s virtual tourism sector. Economic stability, both at the national and EU levels, will also play a role in determining the availability of funding and support for these initiatives.

Table 3: Economic factors affecting the development of virtual tourism in Crete

1	The Greek government has allocated national funds to cultural and digital projects
2	The private sector’s involvement boosts the financial resources available for developing virtual tourism infrastructure
3	Developing and maintaining virtual tourism platforms requires substantial investment
4	Virtual tourism development creates new employment opportunities for skilled professionals
5	The economic sustainability of virtual tourism in Crete requires its integration into the broader tourism economy
6	The high costs of virtual reality equipment and software development may limit accessibility

6.3 Social Factors Affecting the Development of Virtual Tourism in Crete, Greece

Social factors play a vital role in shaping the adoption and development of virtual tourism on the island. Key considerations include cultural acceptance, digital literacy, accessibility, generational differences, and the role of community engagement in promoting virtual tourism. Crete is known for its deep-rooted traditions and strong cultural identity, which can influence the acceptance of virtual tourism. Many residents and stakeholders in the tourism industry may prefer traditional, in-person experiences over digital alternatives. Ensuring that virtual tourism complements rather than replaces conventional tourism is essential for gaining public support. The level of digital literacy among the local population and potential users of virtual tourism platforms significantly impacts their development. While younger generations and tech-savvy individuals may readily engage with virtual tourism, older demographics and those unfamiliar with digital tools may face challenges. One of the main social advantages of virtual tourism is its ability to make cultural experiences more accessible. People with mobility impairments, financial limitations, or other barriers to travel can explore Crete’s heritage sites through digital platforms. However, ensuring inclusivity requires designing user-friendly interfaces, offering multilingual support, and providing adaptive technologies for individuals with disabilities. The success of virtual tourism will depend on how well it accommodates diverse audiences. Different age groups exhibit varying levels of interest in virtual tourism. While younger individuals who are accustomed to digital entertainment and gaming may find virtual tourism engaging, older generations may prefer traditional travel experiences. The involvement of local communities in virtual tourism initiatives is crucial for their success. Encouraging local artisans, tour guides, and historians to contribute content can provide authentic and enriching experiences. Additionally, ensuring that revenue generated from virtual tourism supports local businesses and cultural preservation efforts will help maintain public interest and support.

Table 4: Social factors affecting the development of virtual tourism in Crete

1	The fact that virtual tourism complements rather than replaces conventional tourism is essential for gaining public support
2	The level of digital literacy among the local population and potential users of virtual tourism platforms significantly impacts their development
3	People with mobility impairments, financial limitations, or other barriers to travel can explore Crete’s heritage sites through digital platforms
4	Younger individuals who are accustomed to digital entertainment and gaming may find virtual tourism engaging, older generations may prefer traditional travel experiences
5	The involvement of local communities in virtual tourism initiatives is crucial for their success

6.4 Technological Factors Affecting the Development of Virtual Tourism in Crete, Greece

The advancement of virtual tourism is significantly influenced by various technological factors, including digital infrastructure, immersive technologies, cybersecurity, content quality, and internet accessibility. The development of virtual tourism in Crete heavily depends on robust digital infrastructure. High-speed internet, 5G networks, and cloud computing capabilities are crucial for ensuring seamless and immersive virtual experiences. While urban areas of Greece have seen considerable improvements in digital connectivity, some rural and remote regions, including parts of Crete, still face issues with internet access. Government and private sector investments in digital infrastructure are essential to bridge this gap and support virtual tourism initiatives. The integration of advanced technologies such as virtual reality, augmented reality, and 360-degree video tours has the potential to enhance virtual tourism experiences. Virtual reality headsets and augmented reality applications enable users to explore historical sites, museums, and landscapes interactively. However, the high costs of virtual reality equipment and software development may limit accessibility, making it necessary to develop affordable and user-friendly solutions for broader adoption. As virtual tourism platforms handle vast amounts of user

data, cybersecurity and data protection become critical concerns. Ensuring secure transactions, protecting user privacy, and safeguarding digital content from cyber threats are fundamental to maintaining consumer trust. Implementing strong cybersecurity measures, such as encrypted data storage and secure payment systems, is essential for the sustainable development of virtual tourism in Crete. The effectiveness of virtual tourism relies heavily on high-quality content creation. Realistic 3D renderings, high-resolution imagery, and accurate historical narrations contribute to an engaging user experience. Collaboration with historians, archaeologists, and local experts ensures authenticity and educational value. Additionally, the use of artificial intelligence and machine learning can further enhance personalization and interactivity, providing users with customized virtual tours based on their interests. Ensuring equal access to virtual tourism experiences requires widespread internet availability and affordable digital devices. Although many tourists and researchers can access Crete’s virtual sites from around the world, digital disparities may exclude certain demographics. Initiatives to provide free or low-cost access to digital tourism platforms, particularly in educational institutions and public spaces, can help promote inclusivity.

Table 5: Technological factors affecting the development of virtual tourism in Crete

1	The development of virtual tourism in Crete heavily depends on robust digital infrastructure
2	The integration of advanced technologies such as virtual reality, augmented reality, and 360-degree video tours has the potential to enhance virtual tourism experiences
3	As virtual tourism platforms handle vast amounts of user data, cybersecurity and data protection become critical concerns
4	Realistic 3D renderings, high-resolution imagery, and accurate historical narrations contribute to an engaging user experience
5	Virtual tourism experiences require widespread internet availability and affordable digital devices.

6.5 Environmental Factors Affecting the Development of Virtual Tourism in Crete, Greece

In Crete, Greece, a region known for its rich natural and cultural heritage, environmental factors play a crucial role in shaping the development of virtual tourism. Key considerations include climate change, conservation efforts, carbon footprint reduction, sustainable tourism policies, and the digital preservation of natural and cultural sites. Climate change poses a significant challenge to the tourism industry in Crete. Rising temperatures, coastal erosion, and extreme weather events threaten the island’s ecosystems and historical landmarks. Virtual tourism can help mitigate these effects by reducing the need for physical visits to vulnerable sites, thereby minimizing human impact on delicate ecosystems and historical structures. Developing digital replicas of sites at risk due to climate change can help preserve their cultural significance for future generations. Crete is home to a diverse range of natural landscapes, including beaches, gorges, and ancient ruins. The influx of tourists can lead to environmental degradation, such as soil

erosion, pollution, and habitat destruction. Virtual tourism provides an opportunity to promote conservation by offering digital experiences that reduce foot traffic in ecologically sensitive areas. Government and environmental organizations can leverage virtual tourism as a tool for educating the public on sustainable practices and the importance of preserving Crete’s biodiversity. Traditional tourism contributes significantly to carbon emissions through air travel, accommodation energy consumption, and transportation. Virtual tourism offers an eco-friendly alternative by allowing individuals to explore Crete without the environmental costs associated with travel. This shift can contribute to global efforts in reducing carbon footprints while still enabling cultural and educational exchanges. The Greek government has been focusing on promoting sustainable tourism practices, aligning with the European Union’s green initiatives. Policies that encourage the integration of virtual tourism into Crete’s tourism strategy can support long-term environmental goals. Investments in digital infrastructure, along with incentives for businesses to

adopt virtual tourism technologies, can enhance Crete’s reputation as a leader in sustainable tourism development. Advancements in technology allow for the digital documentation and preservation of Crete’s historical and natural sites. High-resolution 3D models, virtual reality experiences, and augmented reality applications enable users to explore landmarks in detail without causing wear and tear to physical structures. Digital preservation not only protects these sites from human impact but also ensures their accessibility for future generations, even in the face of environmental challenges.

Table 6: Environmental factors affecting the development of virtual tourism in Crete

1	Virtual tourism minimizes the human impact on delicate ecosystems and historical structures in Crete
2	Virtual tourism minimizes environmental degradation, such as soil erosion, pollution, and habitat destruction in Crete
3	Virtual tourism offers an eco-friendly alternative by allowing individuals to explore Crete without the environmental costs associated with physical travel
4	Policies that encourage the integration of virtual tourism into Crete’s tourism strategy can support long-term environmental goals
5	High-resolution 3D models, virtual reality experiences, and augmented reality applications enable virtual visitors to explore landmarks in detail without causing wear and tear to physical structures

6.6 Legal Factors Affecting the Development of Virtual Tourism in Crete, Greece

In Crete, Greece, where tourism plays a vital role in the local economy, legal factors significantly impact the development of virtual tourism. These factors include intellectual property rights, data protection regulations, digital accessibility laws, licensing requirements, and compliance with tourism policies. The development of virtual tourism relies on high-quality digital content, including 3D models, virtual reality experiences, and interactive maps. Intellectual property laws regulate the ownership, distribution, and commercial use of such content. In Crete, digital replicas of archaeological sites, museums, and historical landmarks must comply with Greek and European copyright laws, ensuring that original creators, cultural institutions, and content developers receive proper recognition and compensation. Virtual tourism platforms collect and process user data to enhance digital experiences, personalize recommendations, and facilitate transactions. In Greece, the General Data Protection Regulation governs data privacy, requiring businesses to obtain user consent, protect personal information, and provide transparent data policies. Compliance with data protection regulations is crucial for virtual tourism platforms operating in Crete, as failure to adhere to these regulations can result in legal penalties and damage consumer trust. Additionally, secure digital payment systems must comply with financial regulations to ensure safe transactions for users purchasing virtual tours or digital souvenirs. Ensuring that virtual tourism experiences are accessible to all users, including individuals with disabilities, is a key legal consideration. European accessibility standards require digital platforms to provide features such as screen reader compatibility, subtitles for audio content, and adaptable navigation tools. In Crete, virtual tourism providers must comply with these regulations to promote inclusivity and

cater to a diverse audience. Adapting virtual experiences for users with different needs not only aligns with legal requirements but also enhances the reach and impact of digital tourism. Greek tourism laws regulate the operation of travel-related businesses, including those offering virtual experiences. Virtual tourism providers may be required to obtain specific licenses or permits, especially when using digital content derived from protected cultural sites. Collaboration with government agencies, cultural institutions, and local tourism boards ensures compliance with regulations and facilitates the promotion of virtual tourism as an officially recognized sector within Greece’s tourism industry. Virtual tourism must respect cultural heritage laws that protect Crete’s historical sites and artifacts. Greek and international regulations govern the digital representation of culturally significant locations to prevent the misrepresentation, exploitation, or unauthorized commercialization of heritage assets. Ethical considerations, such as accurately portraying historical events and respecting local traditions, must be integrated into virtual tourism experiences to maintain authenticity and credibility.

Table 7: Legal factors affecting the development of virtual tourism in Crete

1	Intellectual property laws regulate the ownership, distribution, and commercial use of digital tourism’s content
2	The General Data Protection Regulation in Greece governs data privacy, requiring businesses to obtain user consent, protect personal information, and provide transparent data policies
3	Ensuring that virtual tourism experiences are accessible to all users, including individuals with disabilities, is a key legal consideration. Virtual tourism providers must comply with the national and EU regulations
4	Greek tourism laws regulate the operation of travel-related businesses, including those offering virtual experiences
5	Greek and international regulations govern the digital representation of culturally significant locations to prevent the misrepresentation, exploitation, or unauthorized commercialization of heritage assets

7. Discussion

The political, economic, social, technological, environmental and legal factors which influence the development of virtual tourism in Crete, Greece have been examined and their impacts have been analyzed. The analysis of the abovementioned factors helps the tourism industry in the island to develop the appropriate policies for the promotion of VT in Crete. However, PESTEL analysis does not quantify the impacts of various external factors neither prioritize the activities that should be taken according to their importance and urgency. Our results are based on our view regarding the impact of several external factors on the development of virtual tourism in Crete without expressing the views of tourism-related stakeholders and therefore are subjective.

Future work should be focused in developing questionnaires regarding the impacts of the abovementioned factors on the development of VT in Crete which should be filled by the local stakeholders of the tourism industry. The analysis of these questionnaires should be compared with the results of our study to achieve a more objective view regarding the impact of various external factors on the development of VT in Crete.

8. Conclusions

The development of VT in the island of Crete, Greece has been analyzed using the PESTEL methodology. Several external parameters which influence the development of VT have been explored. Political factors play a significant role in shaping the growth of virtual tourism in Crete, Greece. Government policies, funding opportunities, regulatory frameworks, international collaborations, and digital infrastructure all influence the pace and scope of development. Economic factors play a critical role in shaping the growth of virtual tourism in Crete, Greece. Financial investment, market demand, technological costs, employment opportunities, and long-term economic sustainability all influence the development and success of virtual tourism initiatives. Social factors play a significant role in shaping the development of virtual tourism in Crete, Greece. Cultural acceptance, digital literacy, accessibility, generational preferences, and community involvement all influence the success and sustainability of virtual tourism initiatives. Technological factors play a crucial role in the development of virtual tourism in Crete, Greece. Advancements in digital infrastructure, immersive technologies, cybersecurity, content quality, and internet accessibility directly influence the growth and adoption of virtual tourism. Environmental factors play a significant role in the development of virtual tourism in Crete, Greece. Climate change, conservation efforts, carbon footprint reduction, sustainable tourism policies, and digital preservation all influence the growth and adoption of virtual tourism. Legal factors play a crucial role in shaping the development of virtual tourism in Crete, Greece. Intellectual property rights, data protection regulations, digital accessibility laws, licensing requirements, and cultural preservation laws all influence the way virtual tourism operates.

9. References

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