

Visit to vineyards in “Quintas” of Douro: the immersive media as possible exponential support of the wine tourism experience

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Ana Moreno

ORCID ID 0000-0003-0831-5456
anamoreno.ipca@gmail.com
FBAUP - PhD Design e ID+

Nelson Zagalo

ORCID ID 0000-0002-5478-0650
nzagalo@ua.pt
Universidade de Aveiro _ Digimedia

Heitor Alvelos

ORCID ID 0000-0003-0119-4583
halvelos@fba.up.pt
Universidade do Porto_ ID+

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The aim of this article is to understand how immersive media, namely Augmented Reality (AR), can improve the visit to vineyards in “Quintas” of Douro. This region has experienced a tourism increase in the last decade, feeling the need to enhance and diversify the offer. Information and Communication Technologies can play an important role in improving the visitor experience and increasing the sector’s competitiveness. In wine tourism, there are still few studies about the use/implementation of immersive media, especially AR. For this article, thirty “Quintas” of Douro were surveyed about the availability of visits to vineyards and what supports/media are used. Six mobile phone touristic applications for the Douro region were analysed, as well as six national projects of AR application in a cultural tourism context. The visit to the vineyard has increased in recent years as a tourist offer, and the majority is done with a guide, a smaller percentage is provided with a map and/or audio guide. The tourist applications analysed do not use immersive media or have a narrative component. AR has demonstrated benefits in enhancing learning and entertainment, being able to contribute to a better autonomous visit to cultural heritage, in outdoor spaces. Challenges were mentioned with regard to reconciling historical accuracy and entertainment, risks in the implementation, digital access, and potential lack of engagement. The development of an AR application for visits to vineyards in “Quintas” of Douro should include the visitor in the development process, incorporate the narrative and gamification component, taking into consideration the adult audience, potentially use historical sound and animated dramatization, consider the implementation in several points, the organization of different routes and the personalization of the experience.

Keywords

Immersive Media;
Augmented Reality;
Cultural Tourism;
Wine Tourism;
“Quintas” of Douro.

Introduction

In this year, 2022, Douro was selected as the European City of Wine for 2023. According to the promoters, it is intended that this region will be “a European reference in wine, vineyards, culture and the harmonious celebration of nature and secular work performed by Douro generations” [1]. This application approval strengthens the region as a tourism destination.

For its part, “Turismo do Porto e Norte de Portugal” (TPNP) [2], in the plan of activities and budget 2021-2025, integrates the action - Wine Tourism Routes, indicating the dynamics of wine tours as one of the greatest opportunity vectors in boosting the tourism offer of Oporto and north of Portugal, particularly in wine regions, and mentioned the Information and Communication Technologies (ICT) as central to this project. In this background, the present study aims to explore to what extent ICT, namely Immersive Media (IM) and specifically Augmented Reality (AR), can enhance

the experience of visiting a vineyard in “Quintas” of Douro and thus contribute to a more competitive and differentiated offer, being in line with the tourism investment agenda for the region.

Alto Douro Wine Region: Continuing Cultural Landscape

The Alto Douro Wine Region (ADWR) is inscribed on the UNESCO World Heritage list, since 2001, as Cultural Landscape - Continuing [7]. The classified area (24,600 ha) is representative of the three Douro Demarcated Region (DDR) sub-regions - Lower Corgo, Upper Corgo and Upper Douro (250,000 ha) - includes the majority of the most significant assets, and is well preserved overall [8].

Rössler defines cultural landscapes as “the interface between nature and culture, tangible and intangible heritage, biological and cultural diversity - they represent a closely woven net of relationships, the essence of culture and people’s identity” [9, pg 334]. Regarding the continuing cultural landscapes, we can add that they are the product of permanent change, a constant adaptation to keep active their social role, seeking a balance between the traditional way of life and the evolving process of contemporary society [10].

ADWR, representative of DDR, is a rural, mountain landscape, where different types of terraces, shaped by human activity, have been producing wine for around two thousand years [8]. “Agriculture is thus a generator of heritage, material, and immaterial, which is preserved in the landscape in a cumulative way” [11, pg 37]. Douro wine landscape is the “testimony of an ancient cultural tradition, and, simultaneously, of a living civilization, focused on quality viticulture”. [12, pg 143].

Thus, if, as Taylor [13] states, cultural landscapes are an imprint of human history, then the ADWR landscape is the territory’s fingerprint. A unique, non-transferable, and indelible mark, which accompanies the region’s development, and which should be conserved due to its exceptional and unique character.

This author also considers cultural landscapes as records of past and present actions, that once read and interpreted, may be the basis for the understanding of past generations [13]. In this way we can enunciate cultural landscape literacy as a useful means of communication for the territory understanding and appropriation, actively contributing to the conservation of the cultural asset [14], which is the responsibility of the international community as a whole. [15].

Alto Douro Wine Region and tourism activity

The Douro region combines its winemaking vocation with tourism, being ADWR its main tourism product [16]. The region’s tourism activity has experienced, in the

last decade, a gradual increase on both sides, supply, and demand [16] [17] [18]. ADWR is characterized by wine growing and production, combining tangible and intangible heritage [19].

Cultural tourism is related to wine tourism, in the specific case of the DDR/ADWR, to the extent that this territory evokes the visitor to learn, discover and experience the cultural legacy of the region, [20] as well as to participate and enjoy tourism activities and resources related to the wine culture, both material and immaterial. [21] Ali-Knight & Pitt [22] relate the wine tourism experience with the experience economy [23], given the richness of the wine and its interactive nature. Also, they highlight the need to create memorable experiences, that surprise by their novelty, involve the visitor, and emphasize the senses, enhancing the tourism offer. Santos, et al. [24] reinforce the need to develop authentic, genuine, personalised, and differentiated wine tourism experiences within the current competitive context.

Immersive media and wine tourism

ICT presented in the reality-virtuality continuum: Augmented Reality (AR), Pure Mixed Reality (PMR), Augmented Virtuality (AV) and Virtual Reality (VR) can significantly impact the consumer's tourism experience before, during, and after the visit [25]. These concepts are often referred to as Immersive Media as they encourage psychological immersion [26].

AR combines and aligns real and virtual objects in a real environment, performs interactively in real-time, and enables a multisensory dimension [27]. It can be understood as media and technology simultaneously [28]. It can be used in indoor or outdoor environments [20], *in situ*, [30], or *ex situ* [31], be static, mobile-based, or wearable [32]. It allows storytelling, gamification, and customization [33]. Operates with different formats of media: text, image, video, sound, and computing, and can be complemented with analogic supports [28] [34]. In the tourism context, the mobile phone has been identified as the preferred platform to run AR applications [35] given its massive use by visitors [36] and for keeping the user in the real environment. Several studies have pointed out the benefits of using AR in a cultural tourism context, namely increasing empathy, entertainment [37], learning, and the creation of place memories [30]. AR can contribute to preserving history, generating positive word-of-mouth, and attracting new markets [38].

AR has shown potential benefits in enhancing autonomous visits. Chang, et al [30], in their study comparing visit groups: no media, with audio guide, and AR guide, concluded that different modes of guidance produce different learning outcomes, with learning effects being higher in groups using AR guide than in groups using audio guide. In the same context, risks have also been reported, namely the availability of internet access, the timeliness of devices, user skills, possible cognitive overload,

[28] potential individualism of the experience, and neglection of the surrounding environment, [30] as well as the high initial investment [38].

In wine tourism, in the specific case of wineries, it is recommended the digitalization of the three phases: pre, during, and, after the visit. During the visit, *in situ*, the consumer should have access to information about the wine, its culture, and surrounding environment, as well as feeling involved by the experience and surprised by the novelty, generating a feeling of post-visit nostalgia, contributing to the assimilation of positive sensations [39].

With regard to research on immersive experience and wine tourism, it is still scarce. Most studies focus on VR, often presenting examples of projects carried out in wineries, international fairs, or wine museums [39] [40]. AR has a much smaller expression in the overall computation of published articles [39] relating mostly to wine labels [41] [42].

Methodology

In the first phase of the paper, we tried to understand, from a literature review, the relation between basilar concepts of this research, such as Continuing Cultural Landscape, Landscape Literacy, Cultural Tourism, and Wine Tourism, with the Douro Region, as well as the relation of IM, namely AR, with cultural tourism and wine tourism. In a second phase, we identified the communication media in visits to vineyards in “Quintas” of Douro, based on mobile or personal interviews and website analysis. The thirty selected vineyards cover the three DDR sub-regions, have a presence in journalistic pieces about the sector [3] [4] [5] [6], indicating the touristic relevance, and/or high scores on websites for booking overnight stays, demonstrating the quality of the provided offer.

Also, in the second phase, six mobile tourism applications and six projects of AR application in a tourism context were analysed. Regarding the mobile tourist applications, a search was performed in the Android application with the word “Douro”. Of the twenty applications found, those which were functional, with tourism objectives, and whose territory covers the DDR, were selected, in a total of six applications. Three of them are for regional information, one for a museum tour and two for walking trails, one of which was developed for a “Quinta” of Douro. Concerning the application of AR in the context of tourist visits to cultural heritage, six national research projects were selected. All were published, or presented at a conference, by their authors, less than five years ago, covering different types of cultural heritage: movable, immovable, archaeological, and intangible, indoors or outdoors. Five projects have been tested; one is at the conceptual stage.

Analysis of the current communication media of visits to vineyards in “Quintas” of Douro

“Quintas” of Douro are the largest agricultural units in the region. Between the 17th and 18th centuries, Douro experienced an expansion of wine growing and the establishment of new “Quintas”. Since then, “Quintas” of Douro have assumed a strategic position in the wine growing and regional development, as well as a central role in the territory occupation, with a strong impact on shaping the cultural landscape. They often combine wine production with tourism, enhancing various forms of income [43] [44] [11]. Generally, they integrate cultivation, production, and housing structures, being the guardians of Douro material, immaterial, and natural heritage. They present themselves as identity structures of the region and, consequently, as tourism assets in the regional articulation between viticulture, cultural tourism, and wine tourism. [43] [44] [45]. Regarding the tourist visit to the vineyard in “Quintas” of Douro, Guedes & Marques, in 2017, report the low expressiveness of this activity in general. Among the nineteen “Quintas” observed, only two made available walking trails within the vineyard (11%), and only one provided an audio guide in different languages (5%) [46].

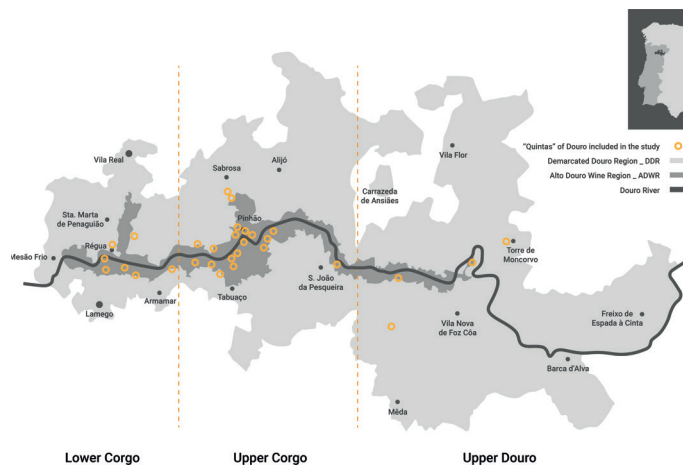


Fig 1.

Map of the DDR/ADWR with the location of the “Quintas” of Douro included in the current study.

The current study encompasses thirty “Quintas” of Douro, mostly situated in the ADWR, covering the three DDR sub-regions, as illustrated in the following image. Among the thirty “Quintas” surveyed, we’ve identified that the vineyard visit is made available by 73% of the “Quintas”, which means a substantial increase compared to the 11% in 2017. Regarding the communication media for the vineyard visits, we found that 50% have a face-to-face guide, 11% provide a map and an audio guide, 6% have a face-to-face guide and map, and 6% provide only a map. One

“Quinta” specifically mentioned the lack of time and logistical resources to maintain guided tours to the vineyards, and a second one noted that the visit to the vineyards could benefit from digital media.

Analysis of tourism mobile applications for the Douro region

According to the mentioned criteria, in the methodology section, six applications were selected: i) “Passaporte Douro” - information about each municipality of CIM Douro; ii) “Eno & Taste” - information about the Douro region; iii) “I Love Douro” - information about the Douro region; iv) “Museu do Douro” - information about the Douro Museum assets; v) “Ventozelo” - information about the walking trails of “Quinta de Ventozelo”; vi) “Magnifico Douro - Passeios em Terra” - information about walking trails in Douro. From the analysis of the six mobile tourist applications for the Douro region, it is concluded that none of them uses immersive media. Most of them, four, were developed by the private sector. Only one application provides access to information through QR codes. The information is descriptive and informative and, generally organised by categories. The information categories address mainly points of interest, activities, accommodation, restaurants, and routes. The availability of routes is scarce in general information applications, and in the case of walking tours, different routes are provided with both descriptive and geographical information. In three applications it is possible to select favourites and in three it is possible to share information. Creating an account is not a priority. The visualisation of information, in three applications, is available both in a list and map. The most used types of media are text, image, and audio guide, with one case incorporating videos with an external link. Most applications are available in Portuguese and English. In one application it is possible to access the same information on the website, in another, it is possible to access external links and in a third one, external emails are available. Finally, one of the applications provides a “quiz” at each stage, and a second one is reinforced by physical support, a “passport” which the user should stamp.

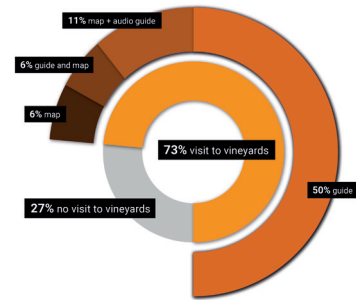


Fig 2.
Infographic of the current communication media of visits to vineyards in “Quintas” of Douro

Analysis of projects using AR in the context of cultural tourism in Portugal

For the present study, based on the mentioned criteria in the methodology section, six research projects using AR in the tourism cultural context in Portugal, were selected: i) DinoFelis - archaeological site [47]; ii) Turning Point - museum collection [33]; iii) Pasev - historical sound [48]; iv) SensiMar - archaeological site [49]; v) Quinta da Regaleira - touristic site [34] and vi) Remind/Marinade - intangible heritage [50]. From the analysis of the six projects, it is concluded that the majority, five, were developed academically. The target audience is adult or non-discriminated.

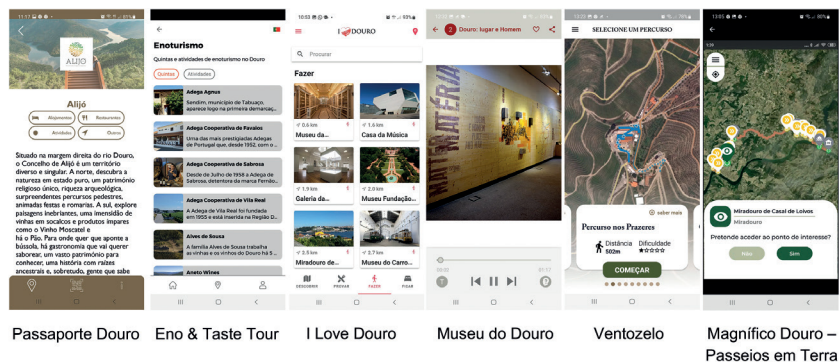


Fig 3.
Images of tourism mobile applications for the Douro region.

	DOURO IMPERÍVEL	PASSAPORTE DOURO	ENO & TASTE TOUR	MUSEU DO DOURO	VENTOZELO	MAGNÍFICO DOURO - pedestrian
GENERAL OBJECTIVE						
Regional Tourism	●	●	●	●	●	●
Museum Tour				●		
Walking Tour					●	●
PROMOTER ORGANISATION	●	●	●	●	●	●
Private		●	●		●	●
Public	●			●		
ACCESSIBILITY OF INFORMATION , OR CODE	●					
INFORMATION ORGANISATION	●	●	●	●	●	●
Geographical area - Counties	●	●	●	●	●	●
Category of information	●	●	●	●	●	●
CATEGORY OF INFORMATION	●	●	●	●	●	●
Quintas / Winetourism	●	●	●	●	●	●
Points of Interest: Natural / Built	●	●	●	●	●	●
Experiences / Activities	●	●	●	●	●	●
Catering / Gastronomy	●	●	●	●	●	●
Accommodation	●	●	●	●	●	●
Tours	●	●	●	●	●	●
News / Highlights	●	●	●	●	●	●
Specific tour or space				●	●	●
TOURS		●	●		●	●
Recommended - Curator's Tour		●	●		●	●
Customisable by the user		●	●		●	●
CONTENT TYPOLOGY	●	●	●	●	●	●
Descriptive	●	●	●	●	●	●
Informative / Directions	●	●	●	●	●	●
Narrative						
EVALUATION / INFORMATION SHARING		●	●	●	●	
Favourites		●	●	●	●	
Evaluations		●	●	●	●	
Sharing		●	●	●	●	
Account creation		●	●	●	●	
INFORMATION VISUALISATION	●	●	●	●	●	●
List	●	●	●	●	●	●
Map	●	●	●	●	●	●
MEDIA TYPOLOGY	●	●	●	●	●	●
Text	●	●	●	●	●	●
Image	●	●	●	●	●	●
Audio	●	●	●	●	●	●
Video				●		
GAMES / QUIZZ				●		
LANGUAGES	●	●	●	●	●	●
Portuguese	●	●	●	●	●	●
English		●				●
WEBSITES + LINKS	●	●	●			
Website app						
Websites of external entities	●					
External Email		●				
External - Youtube	●					
DIRECT BOOKING		●				
PHYSICAL MEDIA SUPPORT	●					

Fig 4.
Analysis table of tourism mobile applications for the Douro region.

Three applications give special attention to the juvenile audience. The media typology includes text, image, descriptive audio or historical sound, video, role-play animation, and 3D reconstruction. The content typology is mostly descriptive. Three cases present informative content, two visual and/or sound content, and two narrative content.

The AR is mostly activated by markers. One application activates the AR by “instant tracking”, GPS, and beacon technology, given the external natural environment. The routes can be limited to a single AR activation point, as in the examples of archaeological sites, present different thematic routes to choose from, or encompass different AR activation points, whose activation order is selected by the user. The narrative in one application presents a legendary plot, a fictional narrator, and the possibility of linearity or not. In a second one, the narrative is linear, the plot is historical and the narrators are historical characters. Gamification is identified in two applications. One application also presents an onboarding and a progress bar, and two allow the capture and sharing of “selfies”. Sight and hearing are the most frequently requested senses. One app explores smell. Most of the applications are available in Portuguese, with only one application also providing versions in English and Spanish. The evaluation of the user experience is carried out by a questionnaire in two applications, a third one uses non-participant observation. Potential benefits of using AR in the cultural tourism context were identified such as minimal spatial reorganisation, improvement of the visit without a guide (autonomous), promotion of learning, entertainment, and social interaction, add-value in brand awareness and reputation, more active, dynamic, pleasant, and involving visits, cultural enrichment, easy to use, interest/desire to use, increased knowledge and enjoyment of the place, potential experience personalization, and user engagement, as well as attracting more visitors.



Fig 5.
Images of projects using AR in the context of cultural tourism in Portugal

	DINOFELIS Conimbriga - 2018	TURNING POINT HFM - Madeira - 2020	SENSMAR Conimbriga - 2020	REGALEIRA 4.0 Quinta da Regaleira - 2019	REMIND / MARINADE Tavira - 2022	PASEV Évora - 2022
PROMOTER ORGANISATION						
Private	●	●	●	●	●	●
Public / Academic	●	●	●	●	●	●
CULTURAL HERITAGE						
Archaeological Site	●	●	●	●	●	●
Immovable Heritage			●	●		
Immaterial Heritage					●	
Immaterial Heritage - Historical Soundscape						●
Movable Heritage		●		●		●
Natural Heritage				●		
AUDIENCE						
Adult / non-discriminated	●	●	●	●	●	●
Juvenile	●	●	●	●	●	●
MEDIA TYPOLOGY						
Text	●	●	●	●	●	●
Image		●		●	●	●
Audio		●	●	●	●	●
Video					●	
Role-play animation			●	●		
3D - 3D 360°	●		●			●
CONTENT TYPOLOGY						
Visual / Sonorous	●	●	●	●	●	●
Descriptive	●	●	●	●	●	●
Informative		●		●	●	●
Narrative		●		●		
AUGMENTED REALITY ACTIVATION						
QR - Codes	●	●	●	●	●	
AR - Markers	●	●	●			
AR - Instant tracking				●		
AR - GPS + Beacon Tecnology					●	
Undefined						●
ROUTE						
Single point	●	●	●	●	●	●
Defined / themed route	●	●		●	●	
Personalised route (the user chooses the points order)		●				●
STORYTELLING						
Narrator - historical character		●		●		
Narrator - fictional character		●		●		
History-based plot				●		
Legend-based plot		●				
Linear narrative		●		●		
Non-linear narrative		●				
GAMIFICATION / REWARDS		●				●
ONBOARDING		●				
TIMELINE / PROGRESS BAR		●				
EXPERIENCE SHARING / SELFIES		●		●		
SENSES						
Sight	●	●	●	●	●	●
Hearing	●	●	●	●	●	●
Smell			●			
LANGUAGES						
Portuguese		●		●	●	●
English		●		●		
Spanish				●		
USER EXPERIENCE EVALUATION						
Questionnaire	●		●	●		
Non participation observation	●		●	●		
POTENTIAL BENEFITS						
Minimal space reorganization	●	●	●	●		
Improve the visit without guide		●		●		
Promote learning		●		●		
Promote entertainment				●		
Promote social interaction				●		
Add value in brand awareness and reputation				●		
Potential to attract more visitors	●			●		
Personalize experience		●				
More active, dynamic and pleasant visit	●					
More involved	●					
Culture enrichment	●					
Easy to use	●					
Desire / interest to use	●					
Potential to engage	●					
Can increase knowledge			●			
Can increase enjoyment			●			
POTENTIAL RISKS						
Privacy and digital footprint					●	
The tourism sector doesn't entice knowledge workers					●	
Digital access limitations					●	
Proliferation of tourism apps					●	
Lack of integration of information related to tourism					●	
Lack of effective engagement					●	
CHALLENGES						
Obtain already developed content				●	●	
Choose interesting narratives					●	
Conciling learning and entertainment						
NEGATIVE ASPECTS POINTED BY VISITORS						
Quality of 3D				●		
Texts too long and boring				●		
Lack of personalization				●		

Fig 6.
Analysis table of projects using AR in the context of cultural tourism in Portugal.

Potential risks mentioned were visitor privacy and digital footprint, knowledge workers' lack of enthusiasm for the tourism sector, digital access limitations, proliferation of tourism apps, integration absence of tourism information, and lack of engagement. The main challenges identified were the retrieval of previously developed content, the choice of narrative, and the conciliation of learning with entertainment. The negative aspects pointed out by visitors were the quality of 3D images, long and boring texts, and lack of personalisation.

Conclusion

Tourism has been growing in the Douro. "Quintas" of Douro, as touristic assets with a strong impact in the region, have sought to diversify their offer, increasingly including the vineyard visit in the set of experiences available to the visitor. In most of the surveyed "Quintas", the visit is made with a guide, and a smaller percentage provides a map or a map and audio guide. The logistical difficulty of the vineyard visit was mentioned, as well as the potential of digital media to improve this specific activity. In none of the studies analysed the visitor was included at an early stage of the project. It may be relevant to include them along with the other stakeholders, beyond the evaluation phase, mitigating risks and adapting the system to the potential user. The customization of the experience is pointed out as a possible benefit and the lack of it as a negative aspect, so it is understood that it should be considered in the development of the experience. The juvenile audience is the focus of the analysed AR experiences with narrative and gamification, being necessary to understand the potential of these strategies with the adult audience.

Concerning the media typology, historical sound (sound reconstitution) could be an alternative, besides audio, as well as animated dramatization using non-3D images. The content typology should go beyond the descriptive and informative to include narrative, which may be linear or not. The historical narrative and the fictional one, the latter being legendary, should be taken into account in the development of the experience, trying to reconcile different perspectives: the accuracy of the events and the entertainment.

The activation of AR in outdoor spaces may be a sensitive point, being mentioned as solutions "instant tracking", GPS, and beacon technology. The route should have, due to spatial characteristics of "Quintas of Douro", more than one activation point. The availability of different thematic routes may be an option, along with the customization, where the user has the possibility to choose the order of points. Social interaction should be taken into account, given the possible individualism of the experience, likewise sharing information, in selfie format, for example, seeking to increase the recognition and reputation of the place. Accompanying physical support may benefit the understanding and engagement of the experience [28].

List of abbreviations and acronyms

CIMDOURO _ Comunidade Intermunicipal do Douro
ICOMOS _ International Council on Monuments and sites
TPNP _ Turismo do Porto e Norte de Portugal
UNESCO _ United Nations Educational, Scientific and Cultural Organization
UNWTO _ World Tourism Organization

References

1. **Observador (17, June, 2022).** Região do Douro escolhida para Cidade Europeia do Vinho 2023. <https://observador.pt/2022/06/15/regiao-do-douro-escolhida-para-cidade-europeia-do-vinho-2023/>
2. **Turismo do Porto e Norte de Portugal (2020).** Reerguer o Turismo da Região. Plano de Atividades e Orçamento 2021-2025. http://www.portoenorte.pt/fotos/gca/plano_atividades_e_orcamento_2021_2025_21418814425fe93e209a1a7.pdf
3. **Impulsiveaddiction (30, April, 2022).** Enoturismo: 19 melhores Quintas do Douro e Vinho do Porto. <https://www.impulsiveaddiction.com/melhores-quintas-do-douro/>
4. **Evasões (30, April, 2022).** Nove quintas do Douro que vale a pena conhecer. <https://www.evasoes.pt/ar-livre/9-quintas-do-douro-vale-pena-conhecer/505008/>
5. **TimeOut (30, April, 2022).** Cinco quintas para se instalar no Douro. <https://www.timeout.pt/porto/pt/viagens/quintas-no-douro>
6. **Wow (30, April, 2022).** Quintas mais bonitas para visitar no Douro. <https://wow.pt/pt/quintas-mais-bonitas-para-visitar-no-douro/>
7. **UNESCO (2002).** WHC-01/CONF.208/24. World Heritage Committee, twenty-fifth session, Helsinki, Finland. <https://unesdoc.unesco.org/ark:/48223/pf0000125306>
8. **ICOMOS (2001).** Advisory Body Evaluation. Alto Douro Wine Region. <https://whc.unesco.org/en/list/1046/documents/>
9. **Rössler, M. (2006).** World heritage cultural landscapes: A UNESCO flagship programme 1992–2006. *Landscape Research*, 31 (4), 333–353. <https://doi.org/10.1080/01426390601004210>
10. **UNESCO (2021).** Operational Guidelines for the Implementation of the World Heritage Convention. <https://whc.unesco.org/en/guidelines/>
11. **Fauvreille, N. (2014).** As quintas vinhateiras na construção do património paisagístico do Douro. *Atas das II Conferências Museu de Lamego / CITCEM - 2014, Quintas do Douro: História, Património e Desenvolvimento*, 35-52.
12. **Aguilar, B.F. (2002).** “O Alto Douro Vinhateiro, uma paisagem cultural, evolutiva e viva”. *Douro Estudos & Documentos*, 7 (13), 143-152.
13. **Taylor, K. (2009).** Cultural Landscapes and Asia: Reconciling International and Southeast Asian Regional Values, *Landscape Research*, 34 (1), 7-31. <https://doi.org/10.1080/01426390802387513>
14. **Mitchell, N., Mechtilid R., Tricaud P. (2009)** World Heritage Cultural Landscapes: A Handbook for Conservation and Management. World Heritage Papers 26. Paris: UNESCO World Heritage Centre. https://whc.unesco.org/documents/publi_wh_papers_26_en.pdf
15. **UNESCO (1972).** Convention Concerning the Protection of the World Cultural and Natural Heritage. Adopted by the General Conference at its seventeenth session. Paris, 16 November 1972. <http://whc.unesco.org/en/conventiontext/>.
16. **Bernardo, E. (2018).** Para um enfoque territorial do turismo no Douro. PASOS, Revista de Turismo y Património Cultural. PASOSEDITA, 21, RTPC. ISBN: 978-84-88429-37-7

- 17. Bock, I. (1998).** Governança e desenvolvimento do Turismo – O caso do Douro. [Doctoral Dissertation Aveiro University]. Aveiro University Research Repository <https://ria.ua.pt/handle/10773/28394>
- 18. TPNP (2021).** Evolução da oferta turística de camas na CIM-Douro. Registo Nacional dos Empreendimentos Turísticos (RNET) do Turismo de Portugal, I.P. e trabalhados pelo GAE/TPNP, ER, Lamego.
- 19. UNESCO (2001).** WHC-01/CONF.208/INF.7. World Heritage Committee, twenty-fifth session, Helsinki, Finland. World Heritage Thematic Expert Meeting on Vineyard Cultural Landscapes.
- 20. UNWTO (2019).** UNWTO Tourism Definitions. <https://doi.org/10.18111/9789284420858>
- 21. Carta Europeia de Enoturismo (2022, June 9).** <https://silo.tips/download/cartaeuropeia-do-enoturismo-principios-gerais>
- 22. Ali-Knight, J. e Pitt, L. (2001).** Attract, engage and entertain: Wine as an Experience. Conference Proceedings, Australian and New Zealand Marketing Academy Conference, Massey University.
- 23. Pine II, B.J., J.H. Gilmore. (1998).** Welcome to the experience economy. Harvard Business Review, 76 (4), 97–105.
- 24. Santos, V., et al (2019).** Wine and wine tourism experience: a theoretical and conceptual review. Worldwide Hospitality and Tourism Themes 11 (6), 718-730. <https://doi.org/10.1108/WHATT-09-2019-0053>
- 25. Flavián, C., Ibáñez-Sánchez, S., & Orús, C. (2019).** The impact of virtual, augmented and mixed reality technologies on the customer experience. Journal of Business Research, 100, 547–560. <https://doi.org/10.1016/j.jbusres.2018.10.050>
- 26. Kaplan-Rakowski, R., Meseberg, K. (2019).** Immersive Media and Their Future. Branch, R., Lee, H., Tseng, S. (eds) Educational Media and Technology Yearbook. Educational Media and Technology Yearbook, 42. Springer, Cham. https://doi.org/10.1007/978-3-030-27986-8_13
- 27. Azuma, R., Baillot, Y., Behringer R., Feiner, S., Julier, S., MacIntyre B. (2001).** Recent advances in augmented reality. IEEE Computer Graphics and Applications, 21 (6), 34-47, Nov.-Dec. 2001, <https://doi.org/10.1109/38.963459>
- 28. Hawkinson, E. (2018).** Augmented Tourism: Definitions and Design Principles. Invention Journal of Research Technology in Engineering & Management (IJRTEM), 2 (9), pp. 33-39.
- 29. Jacob, J., Nóbrega, R. (2021).** Collaborative Augmented Reality for Cultural Heritage, Tourist Sites and Museums: Sharing Visitors' Experiences and Interactions. Augmented Reality in Tourism, Museums and Heritage. Springer Series on Cultural Computing. https://doi.org/10.1007/978-3-030-70198-7_2
- 30. Chang Y-L, Hou H-T, Pan C-Y, Sung Y-T, Chang K-E. (2015).** Apply an Augmented Reality in a Mobile Guidance to Increase Sense of Place for Heritage Places. Journal of Educational Technology & Society, 18(2), 166–178. <http://www.jstor.org/stable/jeductechsoci.18.2.166>
- 31. Cranmer, E. E., tom Dieck, M. C., and Fountoulaki, P. (2020).** Exploring the value of augmented reality for tourism. Tour. Manag. Perspect. 35:100672. <https://doi.org/10.1016/j.tmp.2020.100672>
- 32. Rauschnabel, PA, Felix R., Hinsch C. (2019).** Augmented reality marketing: How mobile AR-apps can improve brands through inspiration. Journal of Retailing and Consumer Services 49, 43–53. <https://doi.org/10.1016/j.jretconser.2019.03.004>
- 33. Cesário, V., Olim, S., Nisi, V. (2020).** A Natural History Museum Experience: Memories of Carvalhal's Palace – Turning Point. Interactive Storytelling, Springer Internacional Publishing, 339-343. https://doi.org/10.1007/978-3-030-62516-0_31
- 34. Andrade, J. G., & Dias, P. (2020).** A phygital approach to cultural heritage: augmented reality at Regaleira. Virtual Archaeology Review, 11 (22), 15–25. <https://doi.org/10.4995/var.2020.11663>
- 35. Bekele, M.K., Pierdicca, R., Frontoni, E., Malinverni, E.S., Gain, J. (2018).** A survey of augmented, virtual, and mixed reality for cultural heritage. Journal on Computing and Cultural Heritage, 11, 1–36. <https://doi.org/10.1145/3145534>
- 36. Wang, D.; Xiang, Z.; Fesenmaier, D.R. (2014).** Smartphone use in everyday life and travel. Journal of Travel Research, 5 (1), 52–63. <https://doi.org/10.1177/0047287514535847>

37. Nechita, F., & Rezeanu, C.-I. (2019). Augmenting Museum Communication Services to Create Young Audiences. *Sustainability*, 11 (20), 5830. <http://dx.doi.org/10.3390/su11205830>

38. Tom Dieck, M.C.; Jung, T. (2016). Value of Augmented Reality to enhance the Visitor Experience: A Case study of Manchester Jewish Museum. *Review of Tourism Research*, 7, 1–6

39. Aramendia, G., Ruiz, E., Nieto, C. (2021). Digitalization of wine tourism experience: a literature review. *Doxa Comunicación*, 33, 257-283. <https://doi.org/10.31921/doxacom.n33a930>

40. Garibaldi, R., Sfodera F. (2020). Technologies for enhancing wine tourism experience. *The Routledge Handbook of Tourism Experience Management and Marketing*, 16, 409-417

41. Vrigkas, M., Lappas, G., Klefodimos, A., Triantafillidou, A. (2021). Augmented reality for wine industry: Past, Present, and Future. *SHS Web of Conferences*, 120, 04006. <https://doi.org/10.1051/shs-conf/202110204006>

42. Faddoul, G., Jin, L. (2020). From Augmented Reality to Augmented Product: Initial Study of AR Marketing in the Wine Industry. *AMCIS 2020 Proceedings*, 27. https://aisel.aisnet.org/amcis2020/adv_info_systems_research/adv_info_systems_research/27

43. Martins Pereira, G. (2014). Quintas do Douro: História, Património e Desenvolvimento. *Atas das II Conferências Museu de Lamego / CITCEM - 2014, Quintas do Douro: História, Património e Desenvolvimento*, 9-17.

44. Magalhães, N. (2014). O papel e importância das “quintas” na investigação e desenvolvimento da vitivinicultura duriense. *Atas das II Conferências Museu de Lamego / CITCEM - 2014, Quintas do Douro: História, Património e Desenvolvimento*, 105-113.

45. Martinho, A. (2014). A História e o património das quintas do Douro como valor de recurso para o Turismo. *Atas das II Conferências Museu de Lamego / CITCEM - 2014, Quintas do Douro: História, Património e Desenvolvimento*, 21-28.

46. Guedes, A., Marques, C. (2017). Enoturismo. Rumo Estratégico para o sector dos vinhos do Porto e Douro. Relatório Final. UTAD <https://www.ivdp.pt/pt/docs/RELATORIO%20FINAL.pdf>

47. Marto, A., Gonçalves, A., de Sousa, A.A. (2019). DinofelisAR: Users’ Perspective About a Mobile AR Application in Cultural Heritage. *VR Technologies in Cultural Heritage. Communications in Computer and Information Science*, 904, 79-92. https://doi.org/10.1007/978-3-030-05819-7_7

48. Rodrigues, A. (2022). “Narrativas geolocalizadas interativas estendidas em jogos para divulgar o património: Plataformas Interativas do Projeto PASEV”. *Encontros de Ciência*. <https://www.encontrociencia.pt/2022/?acao=sessoestematicas&dia=16>

49. Marto, A., Melo, A., Gonçalves, A., Bessa, M. (2020). “Multisensory Augmented Reality in Cultural Heritage: Impact of Different Stimuli on Presence, Enjoyment, Knowledge and Value of the Experience”. *IEEE Access*, (8) 193744 – 193756. doi.org 10.1109/ACCESS.2020.3032379

50. Gonçalves, A., Dorsch, L., Figueiredo, M. (2022). “Digital Tourism: An Alternative View on Cultural Intangible Heritage and Sustainability in Tavira, Portugal”. *Sustainability*, 14 (5). <https://doi.org/10.3390/su14052912>