Chapter 12
Smart Tourism and Local Heritage:
Phygital Experiences and the Development of Geotourism Routes

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ABSTRACT

Contemporary society is sustained by a growing digitalization of social processes, with exponential growth in the uses of ICT, which opened up new interaction possibilities with objects and places. In the field of tourism, these technological developments have given rise to the emergence of new concepts: smart tourism, smart destinations, smart experiences, and smart heritage. These concepts and their implications for the success of tourist activities are discussed first, and then the focus of analysis is shifted to the local tourism resources and characteristics. The case study focuses on the municipality of São Pedro do Sul, an area located in the Viseu Dão Lafões subregion, within the Central Region of Portugal. Several low-cost digital strategies are proposed to enrich tourism activities based on endogenous cultural and natural resources and empower route tourism as a relevant strategy for diversifying tourism and support the sustainable development of local communities based on a digital application that aims to integrate storytelling in the territorial context under study.

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INTRODUCTION

The rapid development of information and communication technology in recent decades has opened up new possibilities for humans to interact with objects and places. In the field of tourism, these technological developments have given rise to the emergence of several new concepts: smart tourism, smart destinations, smart experiences, and smart heritage. Information technology increasingly mediates interactions between visitors or tourists and the places they choose to visit. Mobile information services can enrich the tourism experience with a digital memory of the region and its heritage, enabling the delivery of innovative services and making touristic offerings more creative, accessible, and intuitive.

In most tourist destinations, the ubiquity of information, interconnectivity, and the ability to customize services to user preferences are revolutionizing the way people explore territories and heritage sites. In recent years, several examples of tourism services have been identified that are supported by multi-sensory interactive platforms enabling varying degrees of immersive experience, while delivering increasingly personalized relations with physical places and cultures.

After discussing the concepts of smart tourism, smart destinations, smart experiences, and their implications for the success of tourism activities, the focus of attention is changed to deal with resources and current characteristics of tourism at the local level. The case study focuses on the municipality of São Pedro do Sul, an area located in the Viseu Dão Lafões subregion, within the Central Region of Portugal. This is a municipality characterized by very contrasted landscapes, with vast mountain rural areas very sparsely populated and riverside sectors where the main population clusters are concentrated. The tourism activity is key to the local economy of São Pedro do Sul, especially considering that other alternatives are currently less viable. For example, the largest local enterprise is Termalistur – Termas de São Pedro do Sul, E.M., S.A., the management company for the city's thermal spas and all related activity.

Methodologically, the option fell on the description of the most relevant characteristics of the territory of São Pedro do Sul, as well as on the graphic representation of some data to characterize the tourist demand in this municipality. The present reality reflects a high spatial concentration of tourism activity, so the main objective of this work is to highlight the importance of digital technology in reconfiguring cultural and natural tourism experiences, particularly in relation to the promotion of touristic routes, which are of paramount importance in attracting visitors and tourists to those less accessible, rural areas. Based on the local cultural and natural resources, several low-cost digital strategies are proposed to enrich this type of tourism and, simultaneously, empower route tourism as a relevant means to diversify tourism and support the sustainable development of local communities. Starting by analyzing the communication tools currently available, it is particularly important to highlight the importance of social networks as platforms for information exchange and up-to-date contracts between tourist agents operating in the territory of São Pedro do Sul and the various customer segments potentially interested in the offer available. These types of platforms may also be an important source of information to feed the proposed digital application prototype, which aims to integrate stories and digital storytelling in the territorial context under study – the *phygital* experience.

SMART TOURISM AND SMART DESTINATIONS

The *smart* expression has been increasingly common in recent years. In very simple terms, it denotes the integration of advanced information and communication technologies into products and services.

Often mistaken for the mere incorporation of the latest and most advanced technology (Höjer & Wangel, 2015), the concept of *smartness* (Figure 1) is really about taking advantage of networks, expanding the interoperability and interconnectivity of agents, and engaging different technologies in order to maximize the value of the information that is being produced (Boes, Buhalis, & Inversini, 2015). The distinction lies in the integration of several advanced technological domains – e.g. Internet of Things (IoT), Open Data, Big Data, Artificial Intelligence – to provide a more efficient and personalized response, optimize resource consumption, increase sustainability, and generally improve quality of life. Smartness is expressed in more efficient services, best personal responses and optimization of resources consumption, or in one word, quality and sustainability. Smartness requires the reengineering of the tourism system, as it brings together new synergies that enable the real-time co-creation of tourism experiences as illustrated in the bottom half of Figure 1 (World Travel Market London, 2017).

Digital technologies are increasingly present in a range of socioeconomic activities. This is an irreversible fact to which tourism, as an open socioeconomic system, has not been indifferent. Tourism comprises, by its very nature, an array of diverse economic activities (including transport, accommodation, catering, tourist entertainment, car and recreational rental activities, travel agencies and tour operator activities, museums, sites and historic monuments, theme parks and amusement parks, among others) with a common denominator: they are based on the provision of consumer services.

Nowadays, information is key to support these services, and innovations in data collection and processing are a major asset to service providers. This, however, is a new trend. As Moreira noted (2013), systematic studies on innovation have multiplied since the 1960s, although they initially focused mostly on industrial production. Prior to the 1980s, little research dealt with the innovation of consumer services. Starting in the 1990s, and particularly in the first decade of the 21st century, awareness of the potential for expansion into the service sector began to be the focus of attention. In tourism, product, process and management innovation is almost entirely supported by the evolution in digital information technology (Hjalager, 2010). The digital world and instantaneous communication have brought efficiency to the tourism system, enabling performance optimization in each of the components and improving the relationships between them, as well as promoting new forms of organization and management, service provision, promotion, distribution and marketing. In a word, they have made the tourism system *smarter* (Figure 1).

Thus, *eTourism* can be seen as a precursor to smart tourism. Indeed, the former was mostly supported by the Internet expansion of the late 20th century and focuses on content rather than the user and is oriented to enabling information exchange *pre-* and *post*-travel. This is a vital pillar for a concept of tourism which increases the efficiency, quality and flexibility of travel services by generating new services and promoting good practices (Poon, 1993, 2003).

In more recent years, however, "the Internet and Web 2.0. platforms have become a catalyst of change that has not only impacted the way businesses and consumers interact but has fundamentally transformed the way how and by whom tourism products, services and experiences are designed, created and consumed" (Neuhofer, 2016, p. 17). The technological revolution is underway and is gaining momentum. Santos (2018) presents an illustrative scheme for the evolution of web services that provides us with an idea of the major advances and allows us to infer the range of application possibilities in the near future (Figure 2). Although the temporal thresholds may be slightly optimistic and may fail to coincide with the actual situation in each country, the succession of paradigms seems to fit the dynamics of contemporary cybersociety.

The first phase, the Web 1.0, was a limited *medium* focused on static content and data collection. Web 2.0, a social web, emerged as soon as users were able to easily generate, distribute, and share content

Figure 1. The concept of smartness in the context of the tourism system

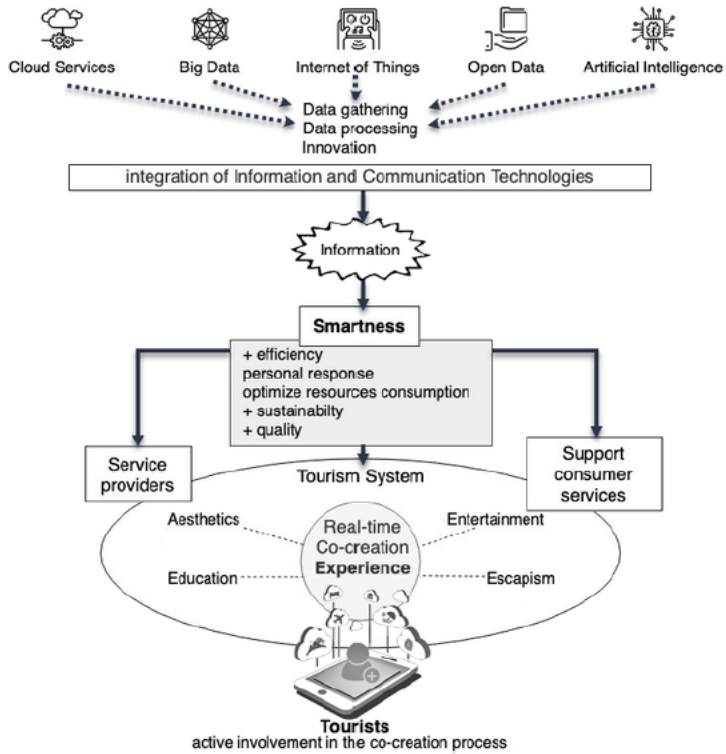
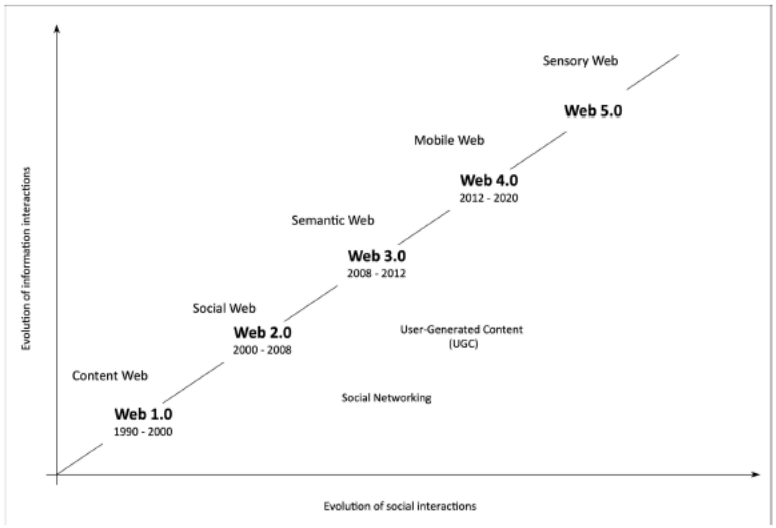


Figure 2. The evolution of the web
Source: Santos (2018, p. 15, adapted from Benito-Osorio et al., 2013)



and information with others in real time. It represents a more dynamic level than the previous phase. Web 2.0 is characterized by a fundamental change in the way content and its value were socially and collaboratively co-created by users. Web 3.0 is the semantic web – the web of things. It integrates the internet and connected devices and is associated with the emergence of augmented reality (AR), virtual reality (VR) and artificial intelligence (AI). Web 3.0 is data-driven and focuses on semantic content. The available services allow the merging of microformats, artificial intelligence, data mining, natural language searches and machine learning technologies. Web 3.0 does not refer to a new platform or technology, but to the use of semantic networks in order to enhance and make the search and sharing of information more efficient. Semantic references to Web 3.0 describe the transformation of the Web into a database as a way to make its content more accessible through the use of applications, artificial intelligence technologies, three-dimensional and geospatial elements. Web 4.0 – the mobile web – is based on a differentiating feature: ubiquity. The main distinguishing features of Web 4.0 will be ubiquity, identity and connectivity, enabling a "(...) growing real-time integration between individuals, virtual worlds, and the objects that interact with them." (Santos, 2018, p. 17). This means that the clear-cut distinction between human action and machine action will be diluted, and the interconnection points of the cybersociety network will grow exponentially. The Internet of Things (IoT) is the most concrete example of this projected reality. Web 5.0 is the latest stage predicted, and it entails the possibility of incorporating sensory stimulation in cyberinteractions.

These technological advances, expressed in the several steps of Web development in Figure 2, were responsible for introducing radical changes in the functioning, management and strategic positioning of tourism organizations, both at the operational and at the distribution level. This led to improvements in efficiency, differentiation capacity, operational cost and response times, allowing for very significant improvements in terms of customer service.

Taking advantage of this technological context, smart tourism is geared towards information-intensive management, real-time updates, service delivery facilitation and the enrichment of tourist experience, which means both an *in situ* and *ad interim* travel orientation. Although smart tourism is still in its infancy (Zhang, Li, & Liu, 2012), it is quickly becoming one of "the hottest topics currently, and also the most cutting edge research topic, catching much attention in society" (Huang, Yuan, & Shi, 2012, p. 444). Despite this interest, "in the context of tourism, *smart* is used to describe a complex amalgam (...)" and it should be noted that "there is also a lack of definitional clarity: suddenly everything is smart" (Gretzel, Sigala, Xiang, & Koo 2015, p. 179-180).

Thus, it is essential to clarify the boundaries of the smart tourism concept. Zhang and Yang's definition (2016, p. 862) focuses on the technological dimension, but they clearly specify the main fields of intervention, stating that "smart tourism technology consists of three main components: cloud services, the internet of things, and information communication technology including mobile communication technology and artificial intelligence. It is an integrated application and innovation of technology and is mainly used in positioning, guiding, touring, and booking". Gretzel et al. (2015, p. 182) propose a more robust conceptualization, and divide smart tourism into three layers: the "smart experience", the "smart business ecosystem" and the "smart destination". These are interlinked by the collection, exchange and processing of data. Each layer can be analysed as an ecosystem, composed of a range of actors which collaborate to create value for themselves and for their communities.

In this work, it is particularly interesting to explore the concept of "smart destinations" and to look particularly at this concept in the context of rural or semi-rural spaces (the rural ecosystem). Indeed, most smart tourism projects build upon the more general smart city concept and, perhaps because of

this, tend to focus on urban spaces (the urban ecosystem) (e.g. Zacarias, Cuapa, De Ita, & Torres, 2015; Jasrotia & Gangotia, 2018; Khatami, Fiandrino, Presti, & Zerbetto, 2018). At a recent seminar entitled "Smart Cities in Smart Tourism" (Ambitur, 2019), held in the European Parliament, promoters considered "smart destinations" to be an "urban space that leverages information, communication technologies and data science to meet today's challenges". Smart destinations are, however, "(...) special cases of smart cities: they apply smart city principles to urban *or rural* areas and not only consider residents but also tourists in their efforts to support mobility, resource availability and allocation, sustainability and quality of life/visits" (Gretzel et al., 2015, p. 180, emphasis added).

The urban ecosystem has several advantages when it comes to investments in cutting-edge technology projects whose success is not guaranteed: higher demographic density; greater demand; greater spatial concentration of supply; and increased infrastructure support (infrastructure building blocks). However, considering the digital ubiquity predicted for Web 4.0, the playing field should soon be level and these advantages, associated with the centrality of places, will no longer matter or, at least, will have a much lesser impact on determining the individual success of smart destination projects developed in urban and rural areas.

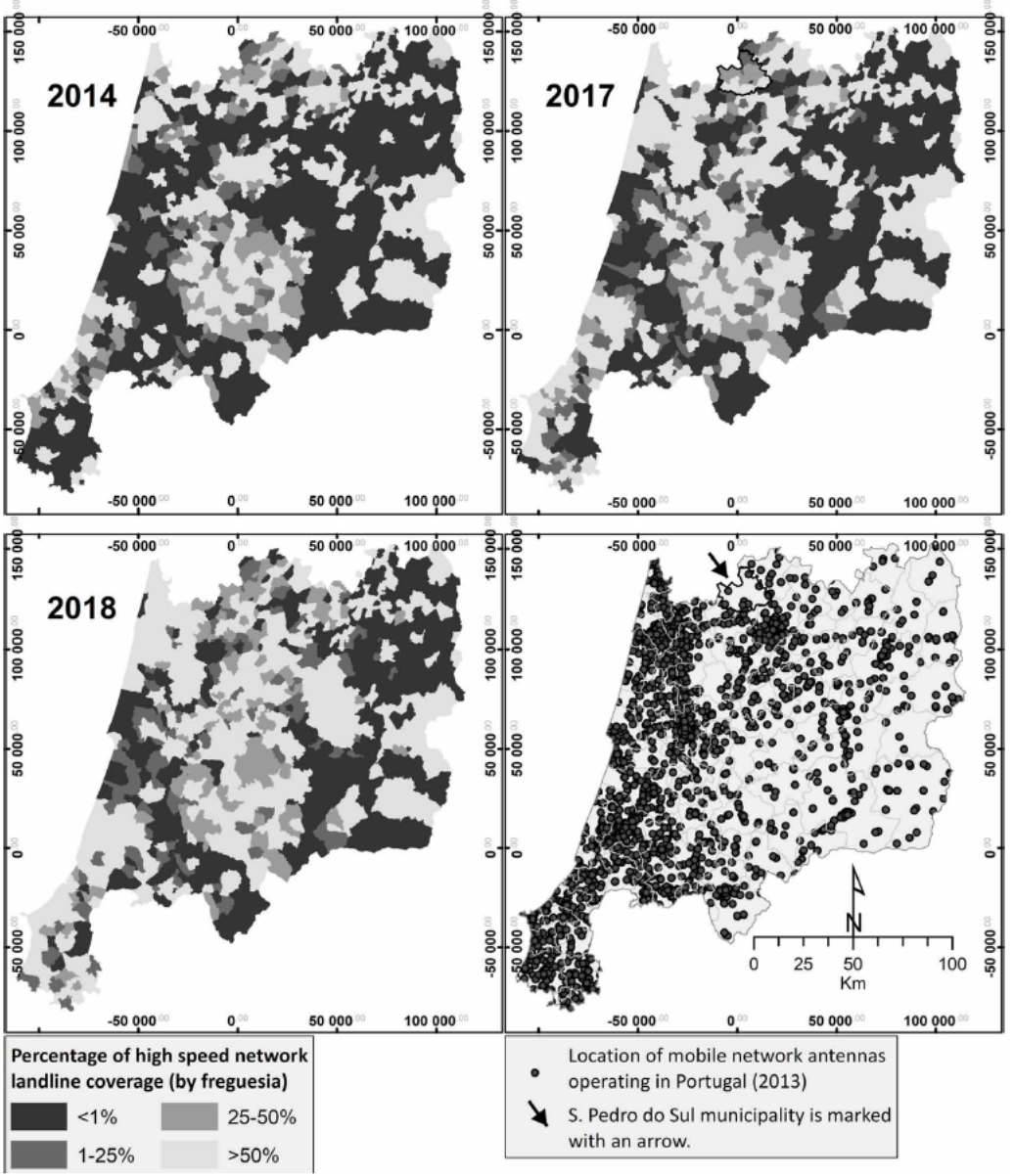
Therefore, one of the major challenges for the sustainable development of tourism in the coming years will be the expansion of the technological infrastructure in less central regions, particularly, rural areas which are typically less densely populated and subject to demographic aging and depopulation. Bolstering the technological infrastructure is essential for enhancing tourism based on endogenous natural, constructed and cultural resources, while simultaneously boosting the socio-economic development of these places and the spatial and sectoral diversification of the tourism supply, thus contributing to greater balance in territorial development.

Ballina Ballina (2019, p. 43) pointed out the notable absence of research into smart tourism tools in rural and nature destinations. In the Central Region of Portugal, despite progress in recent years, several low-density rural areas do not yet have network coverage of sufficient quality to support the development of smart tourism projects without significant constraints (Figure 3). Large expanses of the northeast and southeast, as well as a strip ranging from Figueira da Foz to Abrantes, continue to lack high-speed landline network coverage. While in the latter area the denser mobile coverage seems to minimize the negative effects, there is no equivalent compensation in the former regions. Another striking disadvantage is the spatial discontinuity of coverage throughout the region, which is related to the differences between the more and less urbanized areas.

The territorial asymmetries in the development of digital technology infrastructure have a huge negative impact on the image and competitiveness of tourist destinations, imposing obvious constraints on access to services, which stifles innovation and inhibits the autonomy of visitors and tourists. Additionally, several obstacles arise when monitoring tourist demand, managing and forecasting tourist flows, gauging preferences and satisfaction levels in real time, and making intelligent use of big data in the context of smart tourist destination management.

These limitations pose serious risks to the widening gap between the most popular tourist destinations and lesser known ones because, as stated by Buhalis and Amaranggana (2015, p. 378), "Smart Tourism Destinations should make an optimal use of Big Data by offering right services that suit users' preference at the right time". Moreover, to achieve this goal, the development of technological infrastructure and the integration of information and communication technologies is not sufficient. Challenges also include leadership, entrepreneurship and innovation, conveyed by the social and human capital of each destination. In this context, the role of stakeholders is paramount.

Figure 3. High speed network landline coverage and mobile network coverage (2G, 3G and 4G) in Central Portugal
Source: Data from ANACOM



Finally, reference should also be made to the integration of technology with tourist attractions. In the context of tourist destinations, smart technologies have also been integrated into the natural and cultural heritage, both material and intangible, giving rise to the concept of *smart heritage*. Buonincontri and Marasco (2017) conclude that tourist attractions (archaeological, religious sites, monuments, museums, theatres, art galleries, events) can benefit greatly from the application of smart technology. These initiatives enhance the relationship between tourists and local heritage, while also contributing to the increased urgency of preservation, conservation, and monitoring.

Digital Technology and Tourism Experience: The Smart Experience

In today's tourism, *experience* is a key consideration when making decisions about a given trip, e.g., which places to visit. Although the concept of experience is somewhat elusive and difficult to evaluate, several attempts have been made to evaluate this notion on a progressive scale (Pine & Gilmore, 1998, 1999, 2019; Oh, Fiore, & Jeoung, 2007; Maslova, 2017; Björk, 2018; Jensen, 2018). When interacting with impressive sites, tourists often express a "sense of place", something that goes beyond the physical properties of the location but reflects a high degree of satisfaction and is often attributed to the engaging arrangement of physical settings, activities and meanings associated with the surrounding objects (Berleant, 2003).

Two types of experience are typically discussed in relation to tourism and sense of place: *memorable experiences* result from extraordinary sensory stimulation associated with real/extravagant, seussian/fanciful or mixed interactions (e.g. climbing a mountain, visiting Disneyland); and *authentic experiences* arise from interactions with pristine sociocultural or natural environments. In each case, the associated narrative is one of a process that allows the tourist to extract meaning from the lived experience (Mathisen, 2018).

Information and communication technologies can have a transformative impact on the tourist's experience (Gretzel, Fesenmaier, & O'Leary, 2006). Sharing tourism experiences it's an increasingly evident social trend, indeed, a real-time co-creation between service providers and tourists; tourists and tourists; tourists and service providers (Wang, Li, & Li, 2013; Prebensen, Chen, & Uysal, 2018; Yüksel & Yanik, 2018). Passive consumption has been surpassed: tourists are actively involved in the co-creation of their own experiences, which are enriched by using ever more sophisticated technologies (Neuhofer, Buhalis, & Ladkin, 2012). This enables not only the improvement but also the intensification of the four dimensions of the tourism experience identified by Pine and Gilmore (1998): entertainment, aesthetics, education and escapism (Buonincontri & Marasco, 2017) (see Figure 1).

By definition, the tourist experience always involves the active participation of the tourist. In Pine and Gilmore's vocabulary, experiences are based on the active participation of consumers, their involvement in the action, and the *absorption* or *immersion* in the experience. Pine and Gilmore (1999, p. 31) define absorption as the process of "occupying customers' attention by bringing the experience into the mind" and immersion as the process of "becoming physically or virtually part of the experience itself". Tourists, as consumers, often absorb entertainment and educational happenings and are immersed in aesthetic and escapism experiences. Although the relevance of each of the four domains varies, depending on the concrete action, "research (...) reveals that different cultural heritage experiences can be related to different dimensions: visiting a cultural site may be more related to aesthetic and education dimensions, acting on emotions and sensory stimuli of visitors, while visiting a museum mainly affects education and entertainment dimensions" (Buonincontri & Marasco, 2017, p. 88).

The digital revolution is changing the relationship of visitors and tourists to the physical world. Meanwhile, the tourist experience is by nature idiosyncratic, and the new information and communication technologies reinforce this character by enabling its increasing customization. The gathering of information about individual preferences helps the customization process and results in the configuration of products and services that will meet the needs and interests of transient tourists.

The term *prosumer* was coined by futurist Alvin Toffler in 1980, meaning one who is both producer and consumer (Ritzer, Dean, & Jurgenson, 2012, p. 379). In the technological era of Tourism 2.0, the focus has turned to the *prosumer society*, materialized by the social web (Facebook, Instagram, Twitter, YouTube, Flickr, etc.). As Neuhofer (2016, p. 20) explains, "consumers have become prosumers, protagonists, post-consumers or consumer-actors actively involved in the entire value chain". Philip Kotler (1986) identifies a *prosumer movement*. Toffler and Toffler (2006) refer to the *coming prosumer explosion*, while others allude to *the age of the digital prosumer* (Ritzer & Jurgenson, 2010; Ritzer et al., 2012).

Contemporary modern societies are experiencing an intermediate stage between Tourism 2.0 and Tourism 3.0. The latter is defined by the *adprosumer* characteristic (Ballina Ballina, 2019; Ramos-Soler, Martínez-Sala, & Campillo-Alhama, 2019). In addition to the creation of his own consumption and product, the traveller 3.0 advertises the experience on the fly. Indeed, the prefix "ad" is an abbreviation of *advertising*, because the tourist has a prime role in defining the place's brand image and its promotion as a destination, by being permanently connected. Integrating online communities that help them to contextualize and define the places they visit, the tourist makes constant use of the smartphone and benefits from supportive digital apps that place a plethora of geolocated information at their fingertips (Túñez-López & Costa-Sánchez, 2018).

Tourism 4.0 will be arriving in the foreseeable future. In this stage, the concepts of online and offline will give way to the concept of ONlife. The ubiquity of the Internet of Things (IoT), Big Data, Cloud Computing, and Artificial Intelligence (AI) will enable greater resource optimization, with gains in efficiency and effectiveness by all components of the tourism system. However, although this future has not been reached, several features of the trend can already be observed.

The modern tourism experience is increasingly georeferenced, hedonistic, multisensory and increasingly mediated by technology (Neuhofer et al., 2012). Huang and Chen (2015) demonstrate the importance of images and image search systems for tourists to quickly obtain basic information about local history and the cultural landscape through the design and implementation of interactive mobile applications. Based on this experience, it can be concluded that "using an interactive application increases the enjoyment of a tour" (Huang & Chen, 2015, p. 1265).

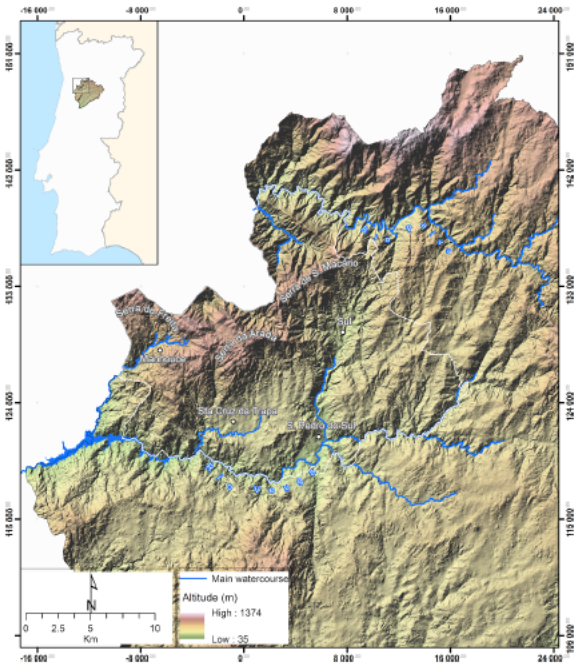
In a different context, Neuburger, Beck and Egger (2018, p. 196) acknowledge that "the former tourist experience with paper brochures, drawn maps and information signs is now supplemented by information and inspiring content retrieved from smartphones and Google cardboards. Traveling to real places is now enriched by virtuality that blurs the lines between these two worlds". Although these authors are unsure whether the future trend will be towards the enhancement of virtualization or the highlighting of physical objects, it seems to us that new digital technologies can be of great value in building up a *phygital* tourist experience. As a result of the fusion between virtual and physical worlds, with their overlapping digital information and real landscapes (made up of actual objects with colours, textures, sounds, smells, and flavours), it is possible to build a constant flow of sensations and reflections.

Tourism Activity in São Pedro do Sul as a Factor for Sustainable Development

São Pedro do Sul is a municipality located in the Viseu Dão Lafões subregion, within the Central Region of Portugal. The territory corresponds to the southern edge of a mountainous region recently branded as the "Magic Mountains®" and most of its terrain is marked by highly rugged topography (Figure 4 and Figure 5). In the northern sector, three mountains stretch from east to west: Serra de S. Macário (1 052 m), Serra da Arada (1 071 m), and Serra da Freita (1 119 m). In marked contrast, narrow valleys follow the banks of the principal watercourses with altitudes that do not exceed 400 m. The largest villages are in this area (Figure 5).

Figure 4. View to the South from S. Macário Mountain

Figure 5. Localization map and main topographic features



Apart from the urban area of São Pedro do Sul — Termas de São Pedro do Sul, the territory is predominantly rural, with a low density, aging population that has been growing more sparse in recent years. The valorisation of endogenous natural and cultural heritage through tourism seems to be a viable mechanism for mitigating the negative effects of depopulation and abandonment.

As noted by Carvalho (2011/2012, p. 11), "the abandonment of the rural landscape is one of the greatest risk factors for local heritage" and "it is important to identify (georeference), to describe, recognize value, safeguard, and let known the differentiating elements of landscape and rural life". In Portugal, since the 1990s, rural tourism has increasingly been contributing to the economic diversification of less densely populated areas (Moreira, 2018) and conferring value on the vernacular heritage.

In the study area, water and water related landscapes are natural resources of major importance in the local development strategy for both the surface waterways (Figure 6) and the hot springs. The latter are a millenary tourist attraction in this region.

Figure 6. Vouga valley near Termas de São Pedro do Sul

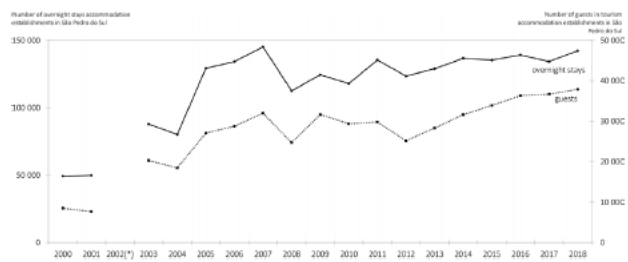
The local spring waters are slightly mineralized, sulfuric, with therapeutic characteristics, and reach the surface at 68.7 ºC. This thermal-mineral water is related to the contact between granitoids and ante-Ordovician schists, as well as the presence of the fracture alignment Verin-Penacova, which has a significant influence on the physical landscapes of this region. This influence is evidenced by a succession of parallel fracture valleys located mostly on the eastern and north-eastern side of São Pedro do Sul's territory.

The contemporary spa complex dates back to the 19th century, but there are many archaeological remnants of a Roman bath dating to the 1st century AD. In 1894, the Portuguese Queen Amélia was hosted at this resort, leading to a significant increase in its popularity (the central building known as "Queen Amelia Bathhouse" was named for her). Subject to renovation in the 1980's, the Bathhouse reopened to the public in 2001. Also, in the 1980s, another bathhouse, named "King Afonso Henriques Bathhouse", was built and today's São Pedro do Sul thermal baths stands out as the largest in Portugal.

In recent decades, tourism demand in São Pedro do Sul has been growing slowly but steadily, both in the number of guests in tourism accommodations and the number of overnight stays (Figure 7). This trend is likely to be related to limitations in the diversity of tourism supply, but also to the fact that the overwhelming majority of tourists come from the national market (Figure 8). Moreover, it shows a very expressive and persistent seasonality. There is a peak in the summer months, with a first spike in June, followed by a marked decrease in July and a sharp recovery in August when the maximum is reached. September and October, although with values close to those of June, mark the sharp decline into the fall and winter seasons (Figure 9).

The inauguration of the spa complex in 2001 seems to have had a positive effect on the increase of overnight stays in subsequent years (Figure 7 and Figure 9). Furthermore, as depicted in Figure 10, the average stay (number of nights) of guests in São Pedro do Sul tourist accommodation is consistently higher than the value of mainland Portugal. This can be a good incentive for developing complementary opportunities, specifically the tourist routes and phygital experiences, extending the positive effects of tourism activities to the whole municipal territory (Ferreira, 2008).

Figure 7. Number of overnight stays and number of guests in tourism accommodation establishments in São Pedro do Sul, 2000 – 2018
Source: Data from Instituto Nacional de Estatística, 2020, Lisbon



"Faced with a decline in clientele related to health spas over the last few years, the promotion of leisure spas emerges as a way of revitalizing underused equipment, recovery the old spas and rehabilitating edifications of great patrimonial value, appreciating and diversifying the services, and promoting the global image of thermal springs tourism" (Santos & Cunha, 2008, p. 212-213). Based on data from Direção-Geral de Energia e Geologia (2020), the governmental institution that oversees energy and geological concerns, São Pedro do Sul's thermal facilities received the greatest number of health related visits in the country in 2018 (11,797 visits) and came in fifth for wellness usage (4,505 visits). On average, the thermal facilities of São Pedro do Sul are the second most visited in Portugal, second only to the Caldas de Monchique thermal spa in the Algarve. In the last seven years, an annual average

Figure 8. Proportion of national guests and foreign guests in the municipality of São Pedro do Sul accommodation establishments, from 2000 to 2018
Source: Data from Instituto Nacional de Estatística, 2020, Lisbon

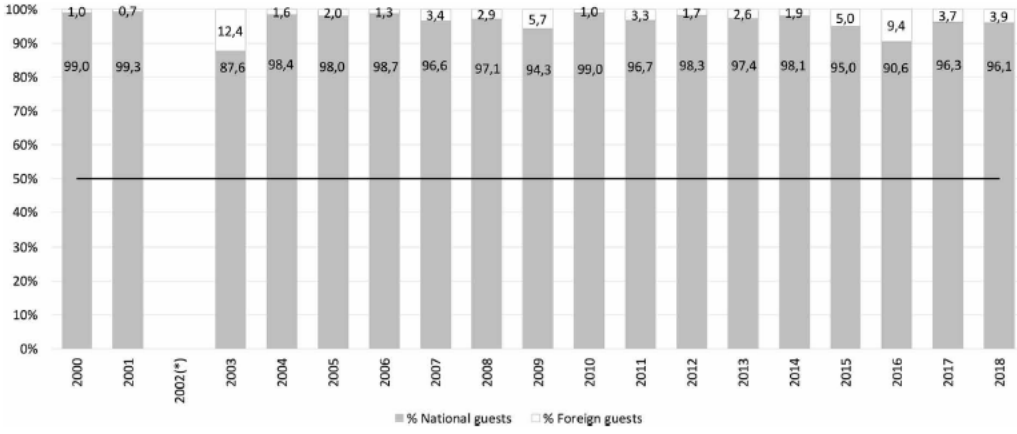
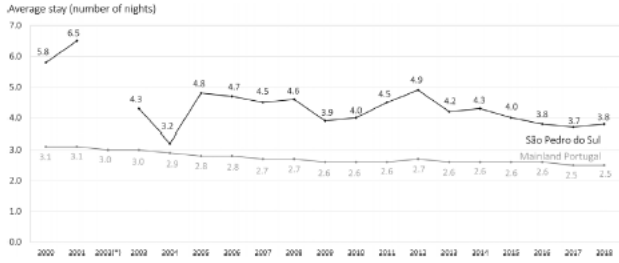


Figure 9. Monthly variation of overnight stays in the hotel establishments of São Pedro do Sul, in 2000, 2005, 2010, 2015, 2017 and 2018
Source: Data resulting from specific information, Instituto Nacional de Estatística, 2020, Lisbon

Figure 10. Average stay (number of nights) in São Pedro do Sul and in mainland Portugal, from 2000 to 2018
Source: Data resulting from specific information, Instituto Nacional de Estatística, 2020, Lisbon



of 16,000 clients used the São Pedro do Sul thermal facilities. Usages for medical (classic thermalism) and wellness purposes showed opposing trends, with a slight increase in overall usage (Figure 11).

Traditional, health-related treatments continue to dominate by far the number of visits; clients are mostly 66 years in age and older, with a significant number between 45 and 65. Regular visits have declined in recent years, while the number of visitors seeking wellness and comfort activities has been steadily increasing, especially recently. Visitors seeking wellness services are predominantly in the 45 to 65 age range (Figure 12). Due to their relative youth, they are more likely to be active and possibly receptive to adding complementary activities to their daily wellness routines. In addition, the number of 26-35 year olds has also grown in recent years. The 36 to 44 year old segment has decreased recently, while, nevertheless representing an important portion of this type of clientele. These segments, when taken all together, demonstrate a viable potential market for projects integrating digital technology to enhance the tourist experience by creating memorable interactions with a genuine culture and preserved nature.

Figure 11. Number of guests in São Pedro do Sul's thermal facilities in the last seven years
Source: Data from Direção-Geral de Energia e Geologia, 2020, Lisbon

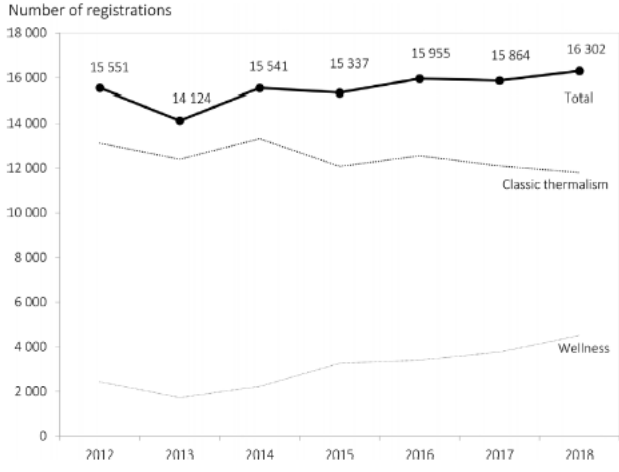
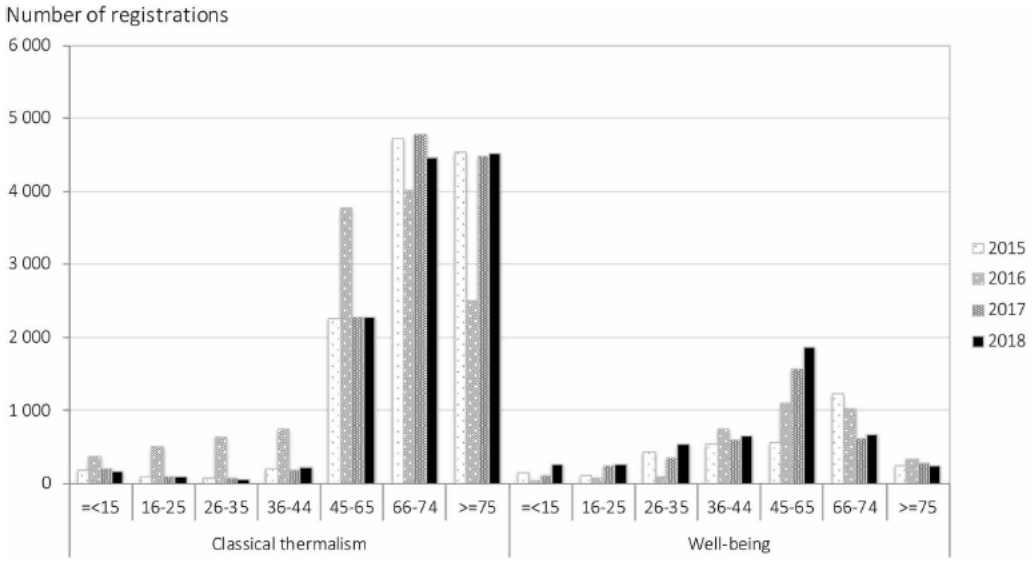


Figure 12. Number of guests in São Pedro do Sul's thermal facilities, according to age groups, from 2015 to 2018
Source: Data from Direção-Geral de Energia e Geologia, 2020, Lisbon



Nature and cultural tourism can be of great significance to thermal spa clients. São Pedro do Sul has a natural, built and immaterial heritage of significant importance which needs to be promoted in a personalized, creative, innovative and intelligent manner. Digital technology also makes it possible to present information in different languages at minimal cost, which is key to international expansion. All these factors should motivate public and private stakeholders to introduce smart technologies into their activities.

Territorial Valorisation Strategies: The *Phygital* Experience

The term *phygital* is a neologism coined by the Australian marketing agency Momentum in 2013. The word results from joining the words 'physical' and 'digital' and it refers to the new concept of mixed spaces. In tourism, this notion has given rise to a new approach: the *phygital* experience, a novel way of interacting with the world around us.

The *phygital* experience results from the fusion between digital information and physical reality (Nofal, Reffat, & Moere, 2017; Neuburger et al., 2018; Nofal, 2019), which complement and reinforce each other. Digital elements are often used to trigger or heighten an immersive real-world experience, but the process can also work the other way around: a physical action can promote a search or prompt an alert, usually through interaction with sensors or machine-readable traces that can convey information to users through digital interfaces.

The massive use of information technologies tends to weaken the divide between the physical and digital worlds. Bridging the physical and the digital realms has been touted as central to smart tourism

development, while it also poses a major challenge to the design of smart tourism destinations (Gretzel et al., 2015; Ballina Ballina, 2019). The *phygital* concept suggests that contemporary society is at the dawn of a new stage in cybersociety. Things are no longer online or offline; they are at the same time online and offline. Physical and virtual space are increasingly intertwined (Neuburger et al., 2018). This changes not only tourists' relationship with the territories, but it also changes their perceptions and behaviour, creating new forms of experiencing space and place. *Phygital* experience is geared to induce user action through emotional stimulation, and this strategy is already being tested in some tourist attractions linked to natural and cultural heritage. Illustrative examples can be found here http://www.augmentedasburypark.com/index.html for Asbury Park in New Jersey, and here https://vimeo.com/337470310; https://vimeo.com/336834958; https://vimeo.com/337470276 for the Egyptian Djoser Complex in Saqqara (Nofal, 2019).

In this case study, several limitations have to be considered when contemplating ideas for implementing *phygital* experience projects. Firstly, there are organizational and institutional constraints, as, at this stage, this work is only an academic essay without either formal or informal relationships with local agents. There are also technological restrictions related, for example, to the internet coverage limitations.

Thus, the approach was to focus on ideas and proposals that might feasibly be concatenated into a gradual process of evolution. At this initial phase, the focus was set on user-targeted actions requiring little investment and low technological disruption, hence empowering the narratives about the place over technological sophistication.

Building on existing elements, the first step is emphasizing the harmonious bonds between thermal springs, health, wellness and nature tourism. São Pedro do Sul thermal baths and their surroundings have a unique natural and cultural heritage that smart technologies can help visitors to (re)discover. The city is crossed by the Vouga River (Figure 5 and Figure 6), and several of its tributaries (Sul River, Teixeira River and Varosa River) which provide perfect spots for gentle and more radical activities such as enjoying the river bank foliage, river swimming, and canyoning or hiking along the river valleys and exploring the natural waterfalls, pools and pits of the valley beds (e.g. Poços do Teixeira, Livraria da Pena).

In addition to the natural heritage, São Pedro do Sul has also a wide range of cultural legacies, both material and immaterial, from manor houses, palaces, convents and churches (e.g. Solar dos Condes da Lapa, Solar do Barão de Palme, Palácio do Marquês de Reriz, Mosteiro de São Cristóvão de Lafões, Convento dos Franciscanos, Igreja Matriz de Carvalhais) to archaeological ruins and artefacts (e.g. Castro da Cárcoda, Castro de Beirós, Pedra Escrita de Serrazes, Ruínas Romanas e Medievais das Termas de S. Pedro do Sul) to ancient, traditional mountain villages (e.g. Manhouce, Pena, Candal, Covas do Monte, Covas do Rio, Póvoa da Leiras, Fujaco).

Some of these sites are included in the Magical Mountains®'s large tourist routes that cross the municipality. These routes have some, limited, signage for on-the-ground identification and description (Figure 13, left) as well as an online site (http://rota-ap.pt/linha/arada) with little additional information. Moreover, from a tourist's point of view, these panels are of little use, as they are made up of static information of a purely descriptive nature. What is more, even when a map of the route exists indicating the site's whereabouts, difficulty of access and kind of trail, it is often practically impossible to make out the route's circular path as illustrated on the panel.

In other cases, as in the area of the Roman ruins of the São Pedro do Sul Thermal Baths, the available information is even more limited, being circumscribed to a single *in situ* bilingual descriptive text (Figure 13, right).

Figure 13. Tourist information panels available on site. On the left, a panel on the Route of Water and Stone (Magical Mountains®). On the right, a panel related to the Roman and Medieval ruins located in the São Pedro Sul thermal baths

About a dozen trails, certified by the Portuguese Camping and Mountaineering Federation, are also available with standard signage on the ground. These routes are supported by leaflets with additional information, available online (in PDF format; http://www.cm-spsul.pt/conteudo.asp?idcat=192) or on paper at the local tourism office (Figure 14).

The municipality of São Pedro do Sul also provides an application for Android and iOS systems ("Discover São Pedro do Sul") free of charge (Figure 15). The design is meagre and the information available is spartan, particularly so any georeferenced information about the most important tourist attractions.

Starting from this background, the first proposal is the development of a set of actions to increase smart tourism in the region of São Pedro do Sul that would consist of the gradual introduction of digital technology to support local tourism. The first, low-cost initiative involves the use of social networks to enrich the tourist experience, while simultaneously improving physical signage on the ground to create a continuous flow of information between tourist agents/local entities and potential visitors, promoting the User-Generated Content (UGC) within the tourist routes activities.

Maintaining official Facebook, Instagram and/or Twitter pages will broaden interaction with national and international markets. These platforms provide a wider showcase of local available tourism resources, while promoting the development of a virtual community to share experiences and personalised audio

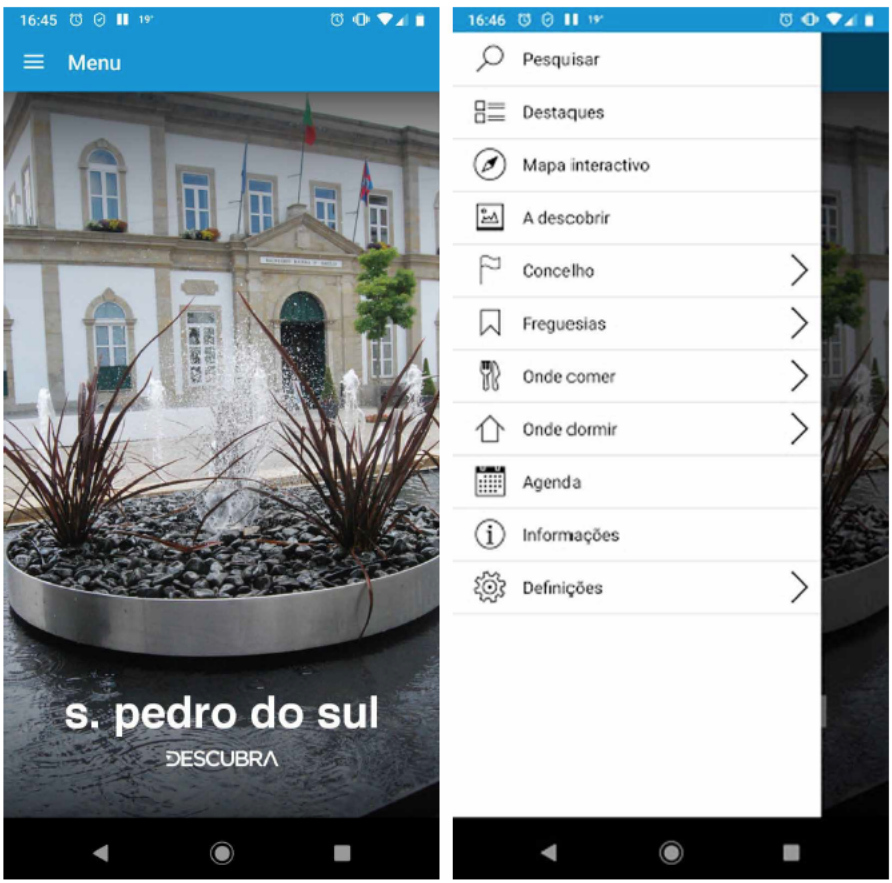
Figure 14. Folding tourist brochure with information to support the short distance pedestrian route (PR)

and video testimonials among residents and visitors. Another relevante tool in this context and, presently, not used in a systematic way to support the tourism activity in São Pedro do Sul is Youtube. The creation of an *São Pedro do Sul Youtube channel*, managed by a local entity, could be an important source for audio and visual contents related to the diversity and authenticity of cultural and natural resources in the territory that translate into unforgettable tourist experiences. Audio-visual content engenders the greatest levels of emotional involvement, awareness and entertainment, so a major goal in this process should be the nomination of an administrator to promote the publication of online content.

This is a simple, inexpensive and very effective way to disseminate up-to-date information about tourist events, places and products related to route tourism. It would enable the local tourism system to gather feedback from a growing user community, especially if the strategy also focuses on the access to foreign markets, starting with Spain, due to its geographical proximity.

This strategy could also have positive effects at another level. Considering the demographic constraints of the region, boosting cyberspace actions that emphasize the local landscapes and local community values will foster closer intergenerational ties – among young people, who are generally more receptive to digital technologies that support virtual worlds, and the adults/seniors group with a more telluric view

Figure 15. Interface of the Android and iOS application "Descubra S. Pedro do Sul"



of reality – thereby empowering a sense of local identity through increased awareness of local treasures by current and diasporic residents.

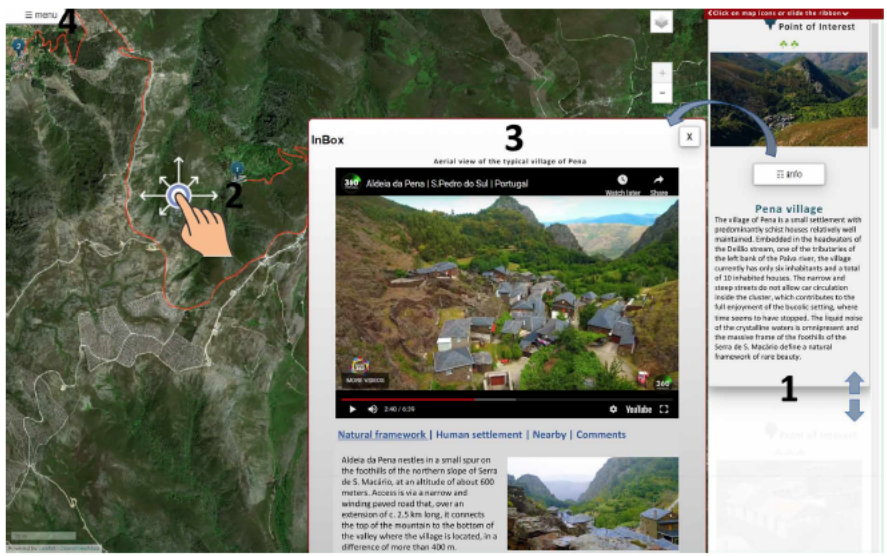
In addition, it is important to renovate, increase and adapt the physical signage throughout the regions. It is of paramount importance to include QR Code labels to facilitate the automatic composition of web addresses used to connect to digital content, which must also be developed. There are two particularly important aspects to keep in mind, in order to make the tourist experience as memorable and as authentic as possible. Firstly, low-cost digital cameras are now available that are capable of producing pictures and immersive videos, i.e., content that can be published in 3D or spherical view (360º), and can be easily embedded into the online content. It is also key to produce multilingual content, which, in the digital world, adds an almost negligible additional effort to the process of production.

The next initiative is slightly more complex and would require greater effort as it aims to emphasize narrative in an enriched tourist experience. It is designed to address the major limitations of currently available tourist information, which is generally uninspiring in content and lacking context sufficient

geolocation data for routes and points of interest. Story Maps is one of the tools that best overcomes these limitations. "Stories and storytelling help define the nature of humanity" (Bassano et al., 2019, p. 10) and it is, therefore, a powerful instrument for enriching tourist experience.

Story Maps are interactive interfaces that allow professionals to combine descriptive content in a variety of fixed and dynamic formats with their map location through a timeline. A simple example of such tools can be found at the following address: https://storymaps-classic.arcgis.com/en/five-principles/. On the one hand, this particular platform offers content readiness, as it is based on a template, while on the other, its flexibility is somewhat compromised as a result. This proposal developed with Open Source Software is a more versatile tool. The prototype can be accessed at http://depgeotur.uc.pt/strmap/ (Figure 16).

Figure 16. Interface of the Story Map for São Pedro do Sul Typical Villages Route (Prototype)



Designed to be cross-platform and compatible with different hardware sizes (namely mobile phones), this tool is compartmentalized into 4 distinct interaction segments:

1. **"TimeLine":** A sequenced list of Points of Interest (POIs) are inserted into the narrative that can be ranked according to a criterion of evaluation expressed in a visual scale. This slat contains the identification and summary of each selected spot along the route. The description can be complemented with visual elements, and a button accesses more extensive information (3). This functionality works in sync with the respective location of each POI on the map, meaning that the user can choose to follow the sequence defined in the "TimeLine" or pursue a more random spatial exploration across the map.

2. **"MapBase":** The base map can be customized into two distinct types: aerial photography mode (more detail) and topographic map mode (more simplified) in accordance with user needs. The base map is directly interacted by the user, who can adjust the reference position, zoom in, zoom out or move the displayed area. Further map elements for contextualizing or adding utilitarian information can also be appended or removed by the user (e.g. picnic parks, restaurants, ATMs). Each POI is identified on the map with a clickable pin, triggering the repositioning of the "TimeLine".
3. **"InBox":** This element constitutes an open space for inserting additional information related to each POI and can incorporate any content supported in HTML. Here it is possible to incorporate several tools to interact with users for processes of content evaluation, feedback, or submission of UGCs.
4. **"Menu":** Folding area containing a hierarchical list of links for integration into larger navigation structures.

This application also has great potential for the integration of a gaming component that might intensify the tourist experience by incorporating adventure, suspense, and intellectual gratification into the interaction. Using digital contents in this way could support the exploration of natural or constructed physical elements in the real world (e.g. geocaching, peddy-paper/ rally-paper or even what is known as H3 – Hash House Harriers – an informal gathering for an athletic activity, such as walking or running, followed by a drinking session. In the context of this proposal, this session could be adapted to meet the rich gastronomic diversity of the Lafões region).

CONCLUSION

Tourism is undergoing a profound transformation as a result of the increasing incorporation of digital technology. The interaction of visitors and tourists with places and heritage is increasingly mediated by information and communication technology, transforming not only tourists' experiences but, more broadly, all the interactions between the components of the tourist system.

Parallel to this technological expansion, there is a growing interest in natural and cultural heritage, linked to the local communities, that lives, preserves and maintains these elements of differentiation and individualization of tourist destinations. Especially in rural areas, with their increasingly sparse populations, the valorisation of natural and cultural vernacular heritage through tourist activities seems to be a viable strategy towards sustainable forms of socioeconomic development.

The overlap of these two realities poses interesting theoretical and practical challenges, reinforcing the need for greater cooperation between academic entities oriented to tourism research and those directly involved in the implementation and management of tourist activities, adding value to local resources.

The tourist experience is by nature idiosyncratic, and the digital revolution reinforces this characteristic by enabling it to be increasingly customized. This focus on personalization can, however, contribute to aggravating the asymmetries between tourist sites, depending on the respective degree of development of the digital infrastructure. In Portugal, these differences are particularly noticeable between the rural and the more urbanized spaces. They must be mitigated in order to ensure a more homogeneous development of the territory.

Meanwhile, and despite the three major constraints of this work, namely, (i) organizational and institutional constraints: this is an exploratory academic work that, at this stage, does not have either formal

or informal relationships with local agents; (ii) technical constraints: ex. internet access limitations in several areas of the municipality, and (iii) functional constraints: the implementation of innovations in tourism tends to be more successful if it is done through a succession of small evolutionary phases, to the detriment of great circumstantial advances, several initiatives can be implemented to enhance the role of sustainable tourism in the development of these predominantly rural areas. In this work, the focus was in the municipality of São Pedro do Sul, a region with a rich tradition of thermal tourism but which is in need of greater diversity in the offer of tourism activities which might spread socio-economic benefits more evenly throughout the municipality.

In this territory, water and water related landscapes are natural resources of great relevance to tourists. Equally, the mountain landscapes and the peculiarities of the mountain villages constitute an important local feature that might encourage memorable and authentic tourist experiences. A good strategy for taking advantage of these endogenous resources is the implementation of tourism routes, and several are already available. The main intention has been, however, to imagine ways of intensifying the tourist experience in this context, linking digital information to the physical elements in the real world, thus embodying the concept of *phygital* experience.

An excellent way to enrich visitors' experience with little investment involves the use of social networks in conjunction with the reinforcement of physical signage on the ground. In this way, it would be possible to generate a continuous flow of information between tourist agents/local entities and potential visitors and to promote the User-Generated Content (UGC) within the tourist routes in a process of experience co-creation. This UCG can be an important source of information to support the second strategy presented. This is an online tool oriented to the construction of one or several Story Maps to support tourist activities in the route of typical mountain villages. The proposed interactive interface would allow the combination of descriptive content in a variety of fixed and dynamic formats with their respective map location through a timeline. The application might also integrate a gaming component by incorporating adventure, suspense, and intellectual gratification, thereby intensifying the tourist experience.

Further steps in this research would entail the testing of this tool on the ground, seeking, above all, to evaluate the power of storytelling to captivate a wide range of audiences.

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KEY TERMS AND DEFINITIONS

Geotourism Routes: Track, path, way, or otherwise linear itinerary which is evident on the ground and stands out for their natural characteristics or for allowing access to an important cultural or historical heritage. Travelers are expected to travel the geotourism route to visit places of natural, cultural, historical or religious importance.

***Phygital* Experience:** A novel way of interacting with the world, seen as an overlapping of real and virtual spaces, which complement and reinforce each other. Thus, the tourist experience is based on the overlapping of digital information (bits and bytes) with real objects and landscapes (rich in colors, textures, sounds, smells, and flavors). Digital elements are used to trigger or heighten an immersive real-world experience, but the process can also work the other way around: a physical action can promote a search or prompt an alert, usually through interaction with sensors or machine-readable milestones conveying relevant information to users through digital interfaces.

Prosumer: In general terms, the prosumer is a fusion between the notions of producer and a consumer. In the field of tourism, it is someone who actively engages in the process of accessing, consuming, and reviewing touristic services and experiences. Acting as an influencer in the chain of value, the web is used as a medium to reach other potential tourists, transferring professional and personal knowledge and contributing to the thrive of brands and products.

QR Code (Quick Response Code): Is a two-dimensional barcode used to provide easy access to information through a smartphone or other type of device with an imaging receiver.

Smart Tourism Destination: Innovative implementation of advanced digital technologies to the tourism system allowing competitive advantages for the destination. Namely, enhancing the interpretation of heritage, landscapes and others tourist attractions, management optimization of consumption services and support to the decision process (pre, during and post experience), taking advantage of Big Data, Artificial Intelligence, Cloud Computing, Virtual Reality, Augmented Reality, and the Internet of Things, connecting the tourism components in a dynamic neural system.

Story Mapping: Method for arranging stories and information in a digital environment to create a spatiotemporal perspective on how they fit into the overall user experience. In the context of tourism activity, Story Mapping enables the combining of dynamic, interactive, web maps with a temporal narrative expressed by multimedia information. Story Maps provides an excellent input to the roadmapping process.

Tourism Experience: A complex psychological process involving a multissensorial performance. It depends on the personal interests, motivations, perceptions, portrayals, degree of participation and sharing made by the visitors in their tourism trips. The value, meaning and degree of satisfaction depends not only on the social, demographic, economic, and cultural profile of the tourist but also on the quality, authenticity and sustainability of the destination.

Tourism System: A complex socio-economic system, composed of three subsystems (administration, management and services supply; distribution and promotion; demand/consumption) and several components, whose interaction is based on information and communication, open, extremely sensitive to variations in the environment that serves as a context, which is in a dynamic balance, with adaptive adjustments of the system continuously.

User-Generated Content (UGC): Any form of multimedia content generated and posted online by unpaid users or contributors, widespread with the democratization of digital media supported by the Web 2.0. These contents, associated with an increasing mobility in internet access, can be of any type (text, audio, video, image), and are broadcast through a series of digital platforms (website pages, image viewers/organizers, social media platforms and other kinds of online interaction).

Wellness Activities: Multidimensional practices and choices oriented towards a holistic and inspirational active search for a better quality of life, improving individual well-being, including physical (body), mental (mindfulness), spiritual (values and beliefs), seeking a harmonization between the emotional, social, environmental and metaphysical spheres.