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**Proceedings of the
4th International Conference on
Tourism Research**

**A Virtual Conference hosted by
Polytechnic Institute of Porto,
Portugal**

20-21 May 2021



**Edited by
Prof. Cândida Silva, Prof. Mónica Oliveira
and Prof. Susana Silva**

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Proceedings of the

4th International Conference on Tourism Research ICTR 2021

**Hosted By
The School of Hospitality and Tourism
(ESHT), Polytechnic Institute of Porto,
Portugal**

20-21 May 2021

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E-Book ISBN: 978-1-912764-92-1

E-Book ISSN: 2516-3612

Book version ISBN: 978-1-912764-93-8

Book Version ISSN: 2516-3604

Published by Academic Conferences International Limited

Reading, UK

+44 (0) 118 324 6938

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Preface

These proceedings represent the work of contributors to the 4th International Conference on Tourism Research (ICTR 2021), hosted by The School of Hospitality and Tourism, of Polytechnic Institute of Porto, Portugal on 20-21 May 2021. The Conference Co-Chairs are Prof. Cândida Silva, and Prof. Mónica Oliveira and the Programme Chair is Prof. Susana Silva, all from School of Hospitality and Tourism of Polytechnic Institute of Porto (ESHT/P.PORTO), Portugal.

ICTR is a well-established event on the academic research calendar and now in its 4th year the key aim remains the opportunity for participants to share ideas and meet the people who hold them. The conference was due to be held at The School of Hospitality and Tourism, of Polytechnic Institute of Porto, Portugal but due to the global Covid-19 pandemic it was moved online to be held as a virtual event. The scope of papers will ensure an interesting two days. The subjects covered illustrate the wide range of topics that fall into this important and ever-growing area of research.

The opening keynote presentation is given by Sérgio Guerreiro, Senior Director at Turismo de Portugal & Executive Director on the topic of *Data for Destination Management or Innovation*. The second day of the conference will open with an address by Professor Antonio Carles, External Auditor and member of the Tequal Advisory Board from the UNWTO Academy, who will talk about *Quality of Knowledge Assurance Under the Pandemic*. The closing keynote will be delivered by Rita Marques, Secretary of State for Tourism on the topic *Tourism in Portugal During this Difficult Period*.

With an initial submission of 130 abstracts, after the double blind, peer review process there are 67 Academic research papers, 5 PhD research papers, 3 Masters Research papers and 1 work-in-progress paper published in these Conference Proceedings. These papers represent research from Austria, Bahrain, Bulgaria, Colombia, Cyprus, Czech Republic, Ecuador, Finland, Ireland, Jamaica, Japan, Oman, Peru, Poland, Portugal, Romania, Russia, Saudi Arabia, Slovakia, South Africa, Spain, The Netherlands, UK and USA.

We hope you enjoy the conference.

Prof. Cândida Silva, Prof. Mónica Oliveira and Prof. Susana Silva
The School of Hospitality and Tourism, of Polytechnic Institute of Porto
Portugal
May 2021

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Biographies

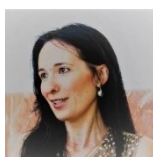
Conference and Programme Chairs



Cândida Silva is a Professor of Technologies and Information Systems at School of Hospitality and Tourism of Polytechnic Institute of Porto (ESHT/P.PORTO), Portugal. President of Technical-Scientific Council and Head of International Relations of ESHT/P.PORTO and was Director of Department of Informatics and Mathematics of ESHT/P.PORTO. Her PhD was in Information Systems and Technologies, Master in Industrial Engineering, and a Degree in Computer Science Engineering, all by School of Engineering of University of Minho. Candida is a principal researcher of CiTUR – Centre for Tourism Research, Development and Innovation. Researcher and a collaborator in the group of Information Systems and Technologies for the Transformation of Organizations and Society (ISTTOS) at the Algoritmi Centre of the University of Minho. She is an active member the organization committee of several national academic seminars and conferences, reviewer of several international conferences and journals, and has several scientific papers and communications.



Mónica Oliveira holds the title of Specialist in Hotel and Restaurant studies, Vice-President and professor at School of Hospitality and Tourism of the Polytechnic of Porto. She developed the training, coordination, educational guidance for Turismo de Portugal from 1998 to 2017 and was nominated by Turismo de Portugal to prepare their exams and be a member of the evaluation jury. She was also appointed as a representative of Turismo de Portugal for evaluation of the Final Assessment Tests of some Professional Courses in active service. Both her professional and research experience in Tourism and Hospitality since 1991, gives her the ability to critically analyse market needs and future trends.



Susana Silva is a full professor at School of Hospitality and Tourism of Polytechnic Institute of Porto (ESHT/P.PORTO), with master and PhD degrees in Psychology. She teaches in the degree and master courses of restaurant management, tourism, and hospitality. Currently, she is the President of Pedagogical Council and Head of Communication Office at ESHT/P.PORTO. Member of the Unit of eLearning and Pedagogical Innovation of P.PORTO (EIPP/P.PORTO) As researcher, she integrates as principal researcher CEOS.PP – Centre of organizational and social studies and as research collaborator CiTUR – Centre for Tourism Research, Development and Innovation. Her research interests are in the field of social sustainability, human resources management, leadership, communication, hard and soft skills, research methodologies, customer behaviour applied to the field of tourism and hospitality. She has been member of the organization and scientific committee of several national and international academic seminars and conferences, and has several scientific papers and communications.

Keynote Speakers



Antonio Carles is an external auditor and member of the Tequal Advisory Board from the UNWTO Academy. His relationship with the tourism industry began in the year 1996, developing a Quality Control system for the processes that were followed at the Spanish Tourism Offices. In the year 2000 Antonio began a collaboration with the World Tourism Organisation developing the quality approach for the tourism management at destinations and participating in the construction of a System to certify Tourism University Programmes that meet the required UNWTO quality standards, the Tedqual System. Since then, he has carried out audit certification reviews around the world in Universities that deliver Tourism programmes including institutions such as: La Rochelle, Bournemouth, Nebrija (Madrid), Auckland University of Technology, Beijing International Studies University and Sultan Qaboos University, Oman.



Sérgio Guerreiro holds a PhD in Tourism from Univ. of Lisbon, an MSc in Public Management and Administration and a degree in Economics. He has over 20 years of experience in the field of tourism, working as a policy analyst and Director at Turismo de Portugal. Currently in charge of statistics, business intelligence, entrepreneurship and innovation, he is responsible for the program Tourism 4.0, an integrated program to foster innovation in the tourism sector involving more than 350 startups. He also represents Portugal at several working groups at UNWTO, OECD and European

Travel Commission. He is currently Chairman of the OECD Tourism Committee and Chairman of the European Travel Commission's Market Intelligence Group. He is Executive Director of NovaSBE's Westmont Institute of Tourism and Hospitality and a visiting lecturer at Nova-SBE, NOVA-IMS and European University Canarias.



Rita Marques holds a degree (1998) and a master's degree (2000) in Electrical and Computer Engineering from the University of Porto's School of Engineering and has an MBA (2007) from the University of Southern California. She has also completed several executive leadership programmes held at the Instituto de Empresa Business School (2018), London Business School (2017) and the University of Texas at Austin (2016). She was the CEO of Portugal Ventures (2018-2019), Executive Director of Porto Business School's MBA and Post Graduate programmes (2016-2018), Coordinator of the University of Porto's Project Unit (2008-2016) and Manager of the Asia-Pacific Market and of the Technology and Tourism sectors at Agência Portuguesa para o Investimento (2003-2006). She was also Senior Consultant at Microsoft Corporation (2006-2007), in the United States, and specialist at ANACOM (2001-2003). Additionally, she was the Chair of the Portuguese Youth Foundation Supervisory Board up to 2019 and provided consultancy services to several public and private entities related to innovation, public financing, internationalisation and foreign direct investment. Rita Marques is presently the Secretary of State for Tourism of the XXII Portuguese Government, appointed since 26th October 2019.

Mini Track Chairs



Alexandra Correia is Associate Professor in Tourism Studies (UN-WTO Tedqual certified) at the Polytechnic Institute of Viana do Castelo, Portugal. She is currently the Course Leader of the Master's in Innovative Tourism Development. Alexandra holds a Ph.D. from Bournemouth University (UK). Her areas of interest include wine tourism, inter-business cooperation, tourism marketing with a special emphasis on experiential marketing, Social Media in Tourism.



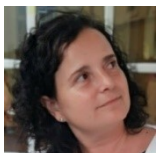
Luís Correia is a Professor of Hospitality and Tourism at the School of Hospitality and Tourism, Polytechnic Institute of Porto. He holds a PhD in Tourism and has been involved in research and projects in the areas of gastronomy and wine tourism. Over the past 5 years, he has organised "Ao Encontro dos Sabores", an event in which local and regional food products and wine are promoted. Luís Correia has also been a panel member in different gastronomy and wine awards. He is presently a member of CITUR and GOVCOPP research centres.



Paula Odete Fernandes, PhD in Economics and Management, Professor of Management at the Polytechnic Institute of Bragança (IPB) - Portugal. She is a researcher and Scientific Coordinator of UNIAG and was a researcher at the Research Unit in Business Sciences (NECE-UBI, 2010-2017). Her current research interest is in Tourism Research, Importance-Performance Analysis, Management, Artificial Neural Network and Entrepreneurship.



Fernanda A. Ferreira is a full Professor at the School of Hospitality and Tourism of Polytechnic of Porto, Portugal. She is Director of the Department of Information Systems and Mathematics. She holds a M.Sc. (in 2002), and a PhD in Applied Mathematics from the University of Porto (in 2007). A researcher and coordinator of UNIAG (Applied Management Research Unit, since 2013), her publications, more than 100, cover her main research interest areas Tourism Research, Hospitality Management, Industrial Organization, and Operational Research. (ORCID ID: orcid.org/0000-0002-1335-7821).



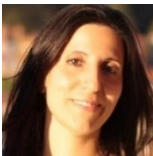
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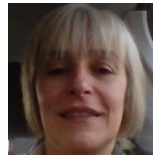
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Reengineering the way Tourists Interact with Heritage: A Conceptual IoT Based Model

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DOI: 10.34190/IRT.21.084

Abstract: Tourism is an information-intensive sector and today's tourist is hungry for information about everything that surrounds him and is increasingly demanding about the mechanisms that are made available for access and interaction with information. This new reality requires rethinking many of the existing solutions. In this context, the Internet of Things (IoT) is revolutionizing the way we think, design and implement Information and Communication Technologies (ICT) solutions for the tourism sector, opening up unprecedented opportunities in terms of how we can provide information and services. This new reality is enabling reengineering the interaction-process between tourists and its surrounding space. For heritage spaces, typically visited by countless tourists, there is an opportunity to rethink the entire process of supporting the interpretation and fruition of heritage, carried out by tourists. In order to understand how this reengineering can be carried out, a review of the state of the art is carried out with regard to how the IoT has been applied in the context of tourism. Then, the methodology that governed the creation of a conceptual model based on IoT is clearly defined, capable of transforming the way physical spaces of tourist interest can be interpreted and how their fruition can be improved. Particular importance is given to the contextualization of the experience, since the information provided must be adjusted to the visitor, according to their profile, which may necessarily reflect different types of interest or prior knowledge about the space. Finally, this article presents a conceptual model where its components are described and where it is discussed how the model can transform the experience of visiting touristic spaces and how tourists can access information and services that entities promoters of these spaces wish to make available. In the dissertation carried out, important aspects of the model and the gains it may generate for the revitalization and promotion of heritage are discussed.

Keywords: Tourism, Heritage interpretation, IoT, Cultural consumer, Model

1. Introduction

Tourism is an information-intensive sector where the role of Information and Communication Technologies (ICT) has revolutionized the tourism industry, shaping the competitiveness of organizations and destinations (Buhalis, 2000). In the wake of this revolution, the term "smart tourism" has been applied to describe the growing dependence of the various players in the tourism sector (and tourists themselves) on emerging forms of ICT that allow generating value from the huge amounts of data generated and consumed by the whole tourism ecosystem (Gretzel, Sigala, Xiang, & Koo, 2015). In this context the Internet of Things (IoT) arises. In a study conducted by Patel, Patel and Scholar (2016), IoT concept is defined as a network interconnecting multiple objects with three categories – people for people; people for machines/things and things/machines for things/machines. In all this three perspectives the interconnection and interaction among the different elements is supported by the Internet. According to Verma and Shukla (2019), IoT is impacting the tourism industry in a multifaceted way and tourists are growing along with the need for mobility and flexibility throughout their tourist experiences, which will lead to an increasing demand on the technological mechanisms available to tourists.

The role of tourism interpretation is a crucial mechanism, as it ensures that tourists are able to obtain the authentic values of heritage destinations; the effectiveness of tourism interpretation will determine the delivery of natural and cultural values of destinations (Weng, Liang, & Bao, 2020). In the past, heritage documentation was supported using information printed on more or less complex documents (e.g. travel guides) that were made available to tourists before, during and after the visit. In fact, this practice still exists today. However, this approach is undone with the expectations of today's tourist. Some of the most recent developments in ICT allow

a new approach in the way that destinations can be promoted and interpreted before, during and after the visit. There are several technologies that have been applied and studied in the tourism ecosystem.

According to Labanauskaitė, Fiore and Stašys (2020) e-marketing has been used by companies to send marketing messages to the target segment using the Internet and digital marketing tools, such as social networks, Search Engine Optimization (SEO), mobile environments, blogs and more. Vinodan and Meera (2020) refers to mobile tourism (m-turismo) that applies mobile devices such as smartphones, tablets, smartwatches, GPS locators and associated software for tourist services. Kim, Lee and Preis (2020) studied the impact of Virtual Reality (VR) on the creation of authentic experiences and the behavioural intention of tourists. Cranmer, Tom Dieck and Fountoulaki (2020) explored the value of Augmented Reality (AR) for tourism and how it can be introduced to create value for tourism managers. Gao (2021) studied the development of Big Data for tourism resources based on the 5G network and the IoT system, advocating that companies in the tourism sector will focus on the development of IoT-based solutions in order to accelerate the development of the sector. According to Nitti et al. (2018), IoT concept is the key technological enabler for the development of smart urban environments. Also, the IoT will lead to a cross-cultural change, as the number of machines, devices, sensors and actuators grows more and more interconnected to each other and integrated with higher level systems (Nitti, Piloni, Giusto, & Popescu, 2017).

The various ICT subdomains have been applied across all business domains and tourism is not and will not be an exception. However, the application of technology in a given tourist process, by itself, does not guarantee success. It is essential to understand the needs of all tourism players. ICT should lead to a reengineering of how we promote territories and how we enable and assist the interpretation of heritage by tourists.

This paper, after reflecting on the promotion of territories, the act of interpreting the heritage and the concept of cultural consumer, analyses the way in which the introduction of ICT has been traced in the tourism ecosystem and more specifically in the way strategies have been designed to support tourists when of the visit. Finally, it presents and discusses a conceptual IoT based model that contributes to the reengineering of the way heritage and cultural spaces are promoted and interpreted, focusing on the visitor's profile and taking advantage of the most recent technological advances that allow the existence of smart spaces – heritage as a smart space.

2. Heritage and Tourism Promotion Overview

In Portugal, patrimonial assets are subject, in legislative terms, to the Basic Law on Cultural Heritage, Law 107/2001 of September 8 (repealing Law 13/85). In nº. 1 of artº. 2 it is defined that "(...) integrate to the Cultural Heritage all the goods that, being testimonies with value of civilization and culture bearing relevant cultural interest, must be object of special protection and valorisation. In nº. 3 it is specified that "The relevant cultural interest, namely historical, paleontological, archaeological, architectural, linguistic, documentary, artistic, ethnographic, scientific, social, industrial or technical, of the properties that make up the Cultural Heritage will reflect values of memory, antiquity, authenticity, originality, uniqueness or exemplarity". To these forms of evaluation are added the generic criteria of appreciation patented in artº. 17 of the same law. The concept is very complex and has evolved over time. It is the legacy that is received from the past, lived in the present and transmitted from generation to generation: it is an irreplaceable source of life and inspiration, point of reference, community and individual identity. It is composed of a set of built elements, such as monuments, groups of buildings and sites that have historical, aesthetic, archaeological, scientific, ethnological or anthropological value as well as intangible goods such as language, literature, music, dance, games, mythology, rites, customs, crafts, architecture, performing arts (UNESCO, 2002). Heritage is considered not only for its intrinsic value, but also for its capacity to generate development and bring value to the territories and new companies have been created linked to the provision of cultural services, conservation and interpretation of heritage in its core business.

According to the ENAME Charter, the "Interpretation refers to the full range of potential activities intended to heighten public awareness and enhance understanding of cultural heritage site. These can include print and electronic publications, public lectures, on-site and directly related off-site installations, educational programs, community activities, and ongoing research, training, and evaluation of the interpretation process itself" (Icomos, 2007, p. 3). The relationship with art is also made by the Spanish Association for Heritage Interpretation (AIP Spain): interpreting will be the art of revealing the meaning of natural, cultural or historical heritage to the public (Ballart Hernández & Juan Tresserras, 2001). To this end, different human, physical and/or digital resources are used, such as: exhibitions, storytelling, films, maps, interpreting centres, interpreter-guides. Tilden

(2007), considered the pioneer of the interpretative philosophy of heritage, outlines six guiding principles: 1) Any interpretation that does not in any way relate what is being presented or described to something in the personality or experience of the visitor will be sterile. 2) The information itself is not interpretation. 3) Interpretation is a revelation based on information. But they are completely different things. However, all interpretation includes information. Interpretation is an art, which combines many arts, whether the materials presented are scientific, historical or architectural. Any art can be taught, to some extent. 4) The main purpose of interpretation is not instruction, but provocation. 5) Interpretation should seek to present a whole rather than a part and should address the individual as a whole and not just any of its facets. 6) The interpretation should adapt the discourse to its audiences, i.e. information aimed at children (say up to the age of 12) should not be a dilution of the presentation to adults, but should follow a fundamentally different approach. To be at its best, it requires a separate programme.

Later, Icomos revisited and improved the principles pointed out by Tilden through the ENAME Charter, adding to them the need for innovation and adaptation to technological evolution, authenticity, sustainability, training, monitoring and involvement of host communities (ICOMOS, 2007). The focus is on access and understanding. Thus, for interpretation to be adequate and sustainable it must facilitate visitors' physical and intellectual access to cultural heritage, which to be effective must enhance experience, increase respect and understanding of the public. In this sense, Interpretation should aim at stimulating interest and learning, encouraging communities and their members to reflect on their own perceptions of a site, to establish a meaningful connection with that site, to contribute ideas and facts, and to communicate the importance of heritage conservation. The second principle of the ENAME Charter states that sources of information should be based on evidence obtained through scientific, academically accepted methods, and show the range of oral and written information, relics, traditions and meanings attributed to a site, and should clearly identify the sources of that information, also incorporating oral testimony. Within the framework of the third principle of the ENAME Charter, the interpretation of cultural heritage sites should relate to their social, cultural, historical, natural contexts and their configurations, exploring the historical, social, political, spiritual and artistic significance of a site, considering all aspects of cultural and environmental importance of the site. The fourth principle defines authenticity, the fifth sustainability, and the sixth inclusion, and finally the last principle the evaluation of research and training within the Interpretation process. The Charter calls for constant research, training and evaluation as essential components of Interpretation. The Charter refers to the replacement of traditional information media, requiring new systems in which technology disseminates all necessary information in real time, in a more accessible, attractive, organised and complete way. Given that the messages disseminated are not limited to simple text, it is essential to combine images, sounds and even videos in order to get the attention of tourists.

Technological advances allow the use of digital means of interpretation of locations to the detriment of physical means on a global scale, improving the tourist experience. In this communicative effort, the town councils, as managing bodies of the territories, are in accordance with the principles pointed out by Tilden and the ENAME Charter, opting for investments in technological devices with informative contents that maximise the experience of the destination, improving, more and more, the tourist experience. The availability of multimedia content allows those who visit the destinations to have access to information about the territory/municipality and its tourist offer, both in terms of natural and cultural resources, as well as in terms of commercial offer and tourist activities.

The democratization and fruition of tourism to a much wider range of the world population, leads us to have a very different audience, regardless of the categorization we want to apply (e.g. age, place of origin). This reality, combined with the digitization and globalization of access to technology, has given rise to a concept of visitor thirsty for information, who has technology and who has become demanding about the mechanisms that guarantee access to information and services, wishing that this be provided in a contextualized, personalized and innovative way. Only fulfilling these expectations will fully satisfy the cultural experience of the visitor. In this way, we will be able to look at this, as a true cultural consumer, who expects innovation and differentiation in the cultural products he wants to consume.

3. Cultural Consumer

Cultural tourism represents almost 40% of international travel and tourist destinations with cultural heritage have deserved special attention (World Tourism Organization, 2018) being considered an important segment of

global tourism, which triggers by tourist destinations a bet on its cultural offer (Richards, 2018a). The evolution felt in culture gave rise to changes in the form of production and consumption of cultural tourism, with reference to Cultures 1.0, 2.0 and 3.0 (Sacco, Ferilli, & Blessi, 2018).

In Culture 1.0, culture was considered a by-product of industrial growth, in which traders and industrialists invested in culture to reinforce their image and for social well-being. In the 20th century, Culture 2.0 emerges, a new form of relationship between cultural production and the creation of economic value, with cultural and creative industries. Culture 3.0 appears as a 'source' of new values, with a diversity of cultural preferences, fragmentation of the cultural offer and access to new Information and Communication Technologies - ICT (Richards, 2018a).

Public and private entities that manage cultural heritage should adopt ICT for a more effective interpretation of heritage, considering the perceptions and preferences of the cultural consumer. One of the reasons, among others, that encourages the interpretation of heritage, is the location to identify or connect to the visitor's identity using ICTs (Poria, Biran & Reichel, 2009). This connection enriches the experience lived in the interpretation of the local heritage and associated with other experiences, namely: i) emotional experience; ii) recreational experience; iii) educational experience (Poria, Butler & Airey, 2004). In the emotional experience, the visitor creates a perception of the heritage; in the recreational experience the visitor enjoys the cultural space as a place of leisure; in the educational experience the visitor enjoys the attributes of the heritage.

Culture is considered a determining factor of tourist consumption that provides a Cultural Worldview - CW (Kang, Lee, & Lee, 2016; Lam & Hsu, 2006; Mousavi et al., 2016). The CW results from the visitor's assessment considering their cultural values and beliefs, and the values influence the thoughts, behaviors and actions. The knowledge of their own culture is considered a point of reference for the visitor to interpret other cultures, in addition to the interactions and personal experiences at the destination. The CW has been used as a perceptual filter to assess tourist experiences with other cultures (Kang et al., 2016; Richards, 2018b). A concept inherent in the cultural consumer decision process is 'authenticity'.

A concept associated in the cultural consumer decision process is 'authenticity'. For Morgan and Pritchard (1998) and MacCannell (2003) 'authenticity' is associated with the tourist experience sought and lived in the destination, and the objective of the tourist who seeks 'authenticity' will be to live local life as it is, and experience local cultures and traditions. Authenticity is defined by the form of interpretation and use of cultural tourist resources, as something unique, genuine and real, by the visitor (Kolar & Zabkar, 2010). The visitor tends to interpret the cultural heritage in view of his own cultural vision and information available in the territory, in its various information formats (e.g. interactive panels). This concept has been explored in terms of experiences of sustainable tourism, cultural tourism and cultural heritage (Chhabra, Healy, & Sills, 2003; Kolar & Zabkar, 2010; Sims, 2009). CW and authenticity play an important role in predicting the behavior of cultural consumers (Lee et al., 2020).

Based on the importance of providing information, services, formats and a whole set of interaction mechanisms, adapted to the specificities of each cultural client, there is an urgent need to create models that are able to meet the expectations of visitors in its various dimensions and, in this way, making the experience of the visit and cultural interpretation a personalized act, contextualized with knowledge, with culture, with interest, dynamics and adequacy able to satisfy the visitor and better convey the purpose of the promoter of the cultural space and assimilation cultural values.

Next, a conceptual model is presented, capable of providing contextualized and personalized experiences of interpreting cultural spaces appropriate to the visitor's profile and using an IoT approach.

4. Conceptual Model

In order to respond to the new challenges of cultural promotion, fruition and interpretation, during a visiting process, a conceptual model in its main dimensions is proposed. In this way, 4 dimensions are analysed: i) the dimension of the user's profile while guaranteeing the ability to personalize and contextualize the visiting experiences; ii) the dimension of visitor recognition and the visitor/space and space/visitor interaction mechanisms; iii) the dimension of information processing until it reaches the user in an appropriate manner;

and, finally, iv) the dimension of personalization of the interaction is presented, according to the profile of the visitor, in order to fulfill their expectations, maximizing the experience of cultural fruition.

In order to personalize a visiting experience and maximize visitor satisfaction, it is imperative to know that visitor. Thus, it is crucial that the visitor registers in the information system of the cultural space. The information profile contains an initial aspect consisting of the amount of data it makes available when registering (e.g. nationality, interests) and a dynamic aspect that is intelligently created as a result of the set of interactions that the visitor with the space. In this way, the database containing the user's profile comprises not only the visitor's initial needs, but also the needs that the visitor builds over time. This will allow you to differentiate the response of the system over time (i.e. at each visit). Figure 1 illustrates this dimension.

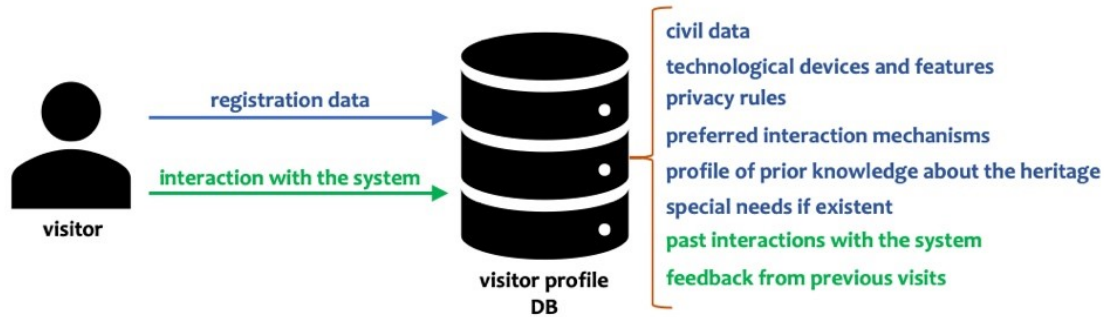


Figure 1: Visitor Profile Data Base Schema

IoT allows the creation of spaces where technology is perfectly embedded. In this way, a concept of cultural space embedded with sensory mechanisms capable of detecting the presence of visitors in multiple ways (preferably previously registered) should be made possible in order to understand its profile and thus make it available through various mechanisms of action (also embedded in the physical space) according to the most appropriate approach for each visitor or, in cases where in a given space there are several visitors, according to the best intersection of common profiles. Figure 2 illustrates a physical space where a sensory layer and a layer of actuators cohabit. This way, each visitor present in the space will be detected (through one or more mechanisms, such as facial identification, smartphone detection, etc.). Then the so-called Intelligent Heritage Information System (IHIS) will analyse the profile of the detected visitors (present in the Visitor Profile DB) and combine the information present in the cultural database (i.e. Heritage DB) with the best interest of the promoter of the space. Finally, orders will be given to the operating mechanisms layer so that information is made available to visitors in a contextualized and personalized way. This last layer can make multimedia information available through existing screens in the space, video or audio projection, sending information to the visiting mobile device.

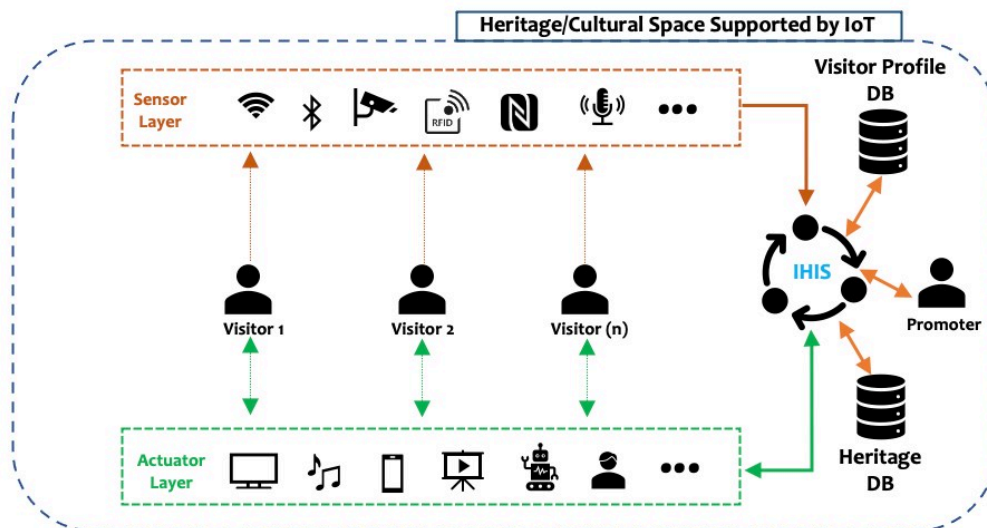


Figure 2: Heritage/Cultural Space Supported by IoT Vision

The IHIS is the system responsible for deciding the actions that are taken. In this way, and as a function of maximizing adequacy, IHIS will take into account the information of the heritage, the profile of the visitor and the strategy of the promoter of the space; combining and interchanging these several parameters. The result will be a set of contextualized actions. This is a cultural view of the classic Customer Relationship Management (CRM) systems. This dimension is striped in Figure 3.



Figure 3: IHIS processing overview

In order to combine the dimensions already presented, figure 4 illustrates a dynamic view of the proposed conceptual model. Imagine that a visitor was detected in space by any sensory system present in the physical space; IHIS will analyse your user profile. In a realistic view, there may be several visitors detected in the same physical space, so IHIS will have analysed the profile of each of the detected visitors. Next, IHIS will analyse the set of information available about the cultural space where visitors were detected; it will cross the detected scenario with the interests of the space promoter (e.g. are you interested in publicizing an event ?, is it a space day for a given visitor profile?). Finally, it will use the performance layer to provide personalized information to each visitor as well as to personalize the physical space (e.g. ambient light, video projection). A possible example could be the delivery to an ordinary visitor of an interactive video on a screen close to that visitor or a VR content played in a VR Glasses. In parallel, a visitor / child would be given a small educational game for a cultural object on display (using a gamification process for cultural education). Finally, we could coexist what was mentioned with an alert to a space employee to support a visitor with special needs (e.g. hearing, visual) in order to maximize their cultural interpretation.

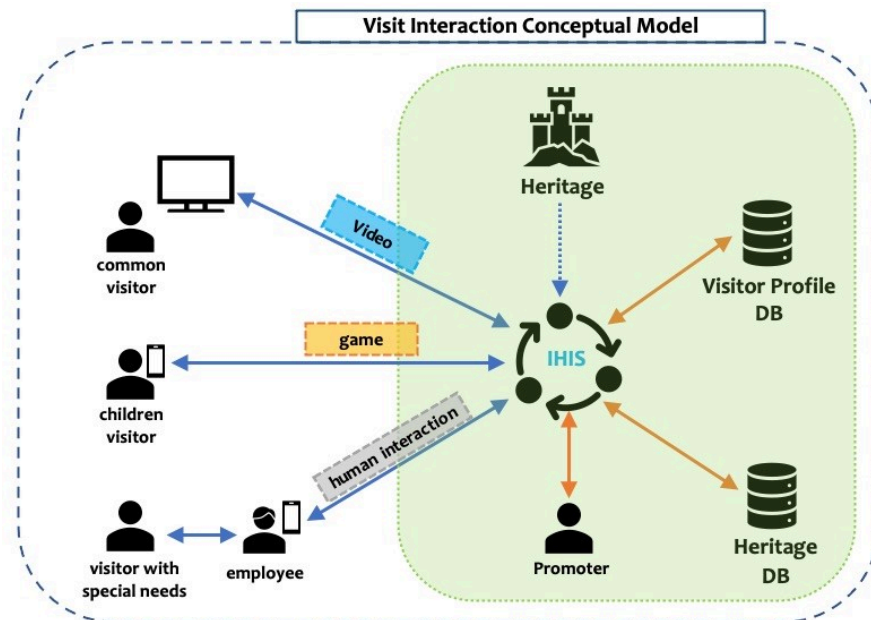


Figure 4: Proposed Visit Interaction Conceptual Model

The IoT combined with intelligent systems, can reengineer in the way we support the need for fruition and interpretation of heritage. It is necessary to break away from attempts to merely digitize content that was once only physical (e.g. flyers, maps). A mere digitization that, for example, passes a paper brochure to a pdf file available on a website, is to use an old mechanism that does not meet the expectations of the current visitor and even more sharply, the visitor of tomorrow.

5. Conclusion

Tourist information should have a special focus on the promotion of best practices, conceptual innovations, innovations in services and products, creativity and interactions between tourists, heritage and communities. It should identify the most significant resources and the profile of visitors, define a vision of how the resource should serve visitors, and suggest how to relate the resources to the characteristics, needs, motivations and desires of visitors, proposing a set more contextualized experiences. Thus, the governance of a destination should seek to know who visitors are and what they are looking for in order to decide what they want to see, learn and enjoy (Knudson, et al., 2003)

To fulfill the expectations of present and future generations - imminently and increasingly digital, it will be necessary to reengineer in the way we design cultural spaces and how we create structures to support the interpretation of cultural spaces and heritage spaces. The evolution of technology, characterized by increasingly intelligent systems, by the miniaturization of technology and universal access to the Internet, made possible the eminent concept of IoT. This view of the world, which reflects in its essence a new paradigm of structuring the world, should govern the processes of support for the fruition and interpretation of culture and support for the visitor who, in the same process of democratization, is today a universal nomadic community without borders.

The role of IoT in the tourism industry has evolved and follows the pace of connecting intelligently with guests all the time in hotel, on transport or at attractions (Verma & Shukla, 2019). The IoT can allow the monitoring of visitors to a museum, through the analysis of data and sensors such as facial recognition, and offer smart and friendly applications to assist visitors. The applications made available can increase the visitor experience, providing relevant, updated, detailed or accurate information depending on the visitor's choice. The same happens with other services of the tourist industry, namely, tourist attractions, which can get closer to the consumer's perception and supply the desired products. The specific information generated with the help of IoT sensors will provide a large amount of data to be analysed by companies.

This paper presents a conceptual IoT-model capable of providing contextualized and personalized experiences, taking into account the profile of each visitor, using innovative content and mechanics, which will tend to maximize the visitor's satisfaction as a cultural consumer and help promoters of cultural spaces to get their message across to visitors.

Acknowledgements

The preparation of the paper was supported by UNIAG, R&D unit funded by the FCT – Portuguese Foundation for the Development of Science and Technology, Ministry of Science, Technology and Higher Education; “Project Code Reference UIDB/04752/2020”.

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