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Transforming Communication Channels to the Co-Creation and Diffusion of Intangible Heritage in Smart Tourism Destination: Creation and Testing in Ceutí (Spain)

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Abstract: Creating smart tourism destinations requires innovative solutions which cover the main pillars of sustainability as sociocultural, environmental, and economic aspects, in order to spread the cultural heritage of these tourist destinations to their visitors. One of the most demanded approaches by the new hyper-connected visitors is the expectation of plunging and becoming a short-term resident to receive a real experience during their visit. Therefore, the scope of this research covers the objective of designing an innovative communication channel between a visitor and a point of interest (POI), which in turn allows agile experiences to be built and provided and increases the dissemination of cultural heritage through new technologies, considering the real needs of the territories and the new digital visitors. In order to address these topics, this paper proposes an innovative and co-created progressive Web-App for visitors called Be Memories in order to spread the intangible heritage of a tourist destination, where the content is co-created by residents of the destination. The tool has been tested in Ceutí, a Spanish village with a high cultural value, which needs to be disseminated through new innovative tools. The trial was launched during local festivities of the village using an Internet of Things device, called a Smart Spot, to establish a communication channel between the visitor and POI. The results of the test were measured using Google Analytics, the reactions of Be Memories in social networks, and the acceptance of other cities and European committees. The results have concluded that Be Memories is able to enable a local experience via agile, fresh, and crowd-sourced content that people enjoy. This channel presents a complementary level of information with respect to official sources, documentaries, and local guide tours, at the same time enabling a mechanism to promote physical visits, walking tours, and cultural heritage via low-cost and sustainable infrastructure.

Keywords: smart tourism destination; point of interest; ICTs; co-creation; tourist guides; hyper-connected users; prosumers; residents; Internet of Things (IoT); sustainability

1. Introduction

The sustainability of tourism destinations is one of the main current pillars of the territories building smart tourism destinations and smart cities. This approach to the sustainable development of cities and

towns, in addition to considering the environment as a fundamental aspect, also involves cultural and economic aspects as important roles in the creation of sustainable territories. Therefore, sustainable tourism is based on three main aspects when building a smart environment: the environment, socio-culture, and economy [1]. Organizations such as United Nations World Tourism (UNWTO) [2] have highlighted the relevance of the sustainability of tourism destinations to be considered smart when using its resources with powerful strategies. This aspect is not only affecting the tourism domain as it is also related to the growing concept of the smart city, which was born to apply sustainability in city management.

Therefore, the purpose of smart cities is to design strategies based on the real needs and resources of the city in order to transform the territory based on improvement of its different processes and networks [3]. It is here where the role of information and communication technologies (ICTs) stands out because they are able to improve these strategies and changes by taking advantage of the benefits that these technologies provide, such as Big Data collection, the automation of processes, sensors, wearables, etc.

The evolution of new technologies in cities and towns, coupled with the advantage of smart and sustainable cities, have defined the main pillars of the smart tourism destination concept, representing a new way to build destinations that gives rise to the opportunity of living personalized experiences between cultural heritage and visitor's due to technological tools [1]. In addition, these new types of territories deploy a smart infrastructure to obtain knowledge on the needs of tourism/visitors and improve the offer with different strategies. Therefore, smart tourism destinations must meet the main pillars of sustainability: the environment, economy, and socio-culture, establishing a perfect combination of the three parties by leveraging ICTs and data analysis [4,5]. In the field of smart tourism destinations, Spain is one of the pioneer countries in promoting them. SEGITTUR, the Spanish State Society for the Tourist Innovation and Technologies Management, has the Smart Tourism Destination Project (*Destino Turístico Inteligente*) [6], which helps with and manages the tourism sector with the aim that its tools, strategies, and solutions will evolve towards a smart approach, making them more sustainable.

As a result of the new paradigm that mixes sustainability, smart tourism destinations, and new technologies, this research presents a solution for smart tourism destinations called Be Memories to valorize the culture of smart territories based on previous experiences like the TreSight project [7] as a real deployment in a Spanish town called Ceutí. This solution is based on the digital natives (users) providing cultural stories of their regions and designing a new guide, being co-created by the residents and visitors, and at the same time, reducing the work of the tourist managers. The scope covers the objectives of designing an innovative communication channel that builds agile experiences, increases cultural dissemination, and validates the feasibility of creating a sustainable cycle of content through the cooperation of digital visitors and prosumers, equipping the tourist destination with a sustainable tool for cultural heritage, at the same time as improving the role of the town on a regional and national level, being respectful of their environment.

Be Memories is a new concept in the form of a visitor's guide that uses new technologies and local knowledge of the residents of a territory. This tool disseminates cultural content between visitors and residents of smart tourism destinations, which is based on two lines of innovation:

- A new channel of easy and agile interaction: through devices called Smart Spots, which enable an open Wi-Fi network and can be located in different cultural points of interest (POIs) of the city, Be Memories creates delimited smart areas named Smart POIs (smart points of interaction). Thereby, any user with a smartphone can interact with Be Memories and access the tool's content when connecting to the Wi-Fi network generated by the available Smart POIs. This network automatically opens a website stored in the device with all the information about the cultural POI.
- A new way to know the city through the voice of its residents: Be Memories bases its content on the intangible heritage that resides in the popular knowledge of residents, integrating visitors into the city's network. These stories are presented in a short-time video-interviews format that visitors and residents can watch and listen to while visiting the different POIs in the cities where Smart POIs are enabled.

The tool has been validated in Ceutí, with a highly cultural value, which requires new tools to spread their culture. To carry out the test of Be Memories, 15 Internet of Things (IoT) devices were deployed throughout the village. These devices are called Smart Spots. A Smart Spot generates an area called a smart point of interaction (Smart POI), which sends a notification (non-intrusive) with a URL through Bluetooth (nearby Google technology) and Wi-Fi (captive portal). This communication channel functions without the need to download a native application, facilitating the interaction by proximity [8]. The content of the pilot is composed of a progressive Web-App that offers a seed content (short video-interviews where the residents tell popular stories). The trial was launched during local festivities (6–19 August 2018).

The structure of this article begins with the state-of-the-art, where the value of the pillars of sustainable tourism is presented. In addition, the concepts of a smart city and smart tourism destination are explained as the basis of the research. For this, the role and needs of the new digital visitor are also analyzed. In the second section, the methodology used to design the pilot, according to the research and analysis of the main characteristics of the city living lab (Ceutí), is described. The results section encompasses all the processes realized to improve the first draft, based on the Smart POI concept [9] presented in previous studies, to adapt it to Ceutí needs through research on the target and meetings with the city council managers. In the discussion, the outcomes and repercussions of the city pilot are given and compared with other solutions and studies. Finally, the conclusions show a global research and result vision and the following steps.

2. State-of-the-Art

This study explores the use of technological innovative channels, tested in a real-world environment, to offer agile visitors experiences according to new visitors and the city profile focused on economic, environmental, and socially sustainable tourist destination areas. Therefore, the concepts of sustainable solutions for smart cities, smart tourism destinations, and the new visitor profile, among others, are introduced and analysed in the following.

2.1. Sustainable Tourism

In 1987, the sustainable concept was defined in the Brudtland report as "*development that satisfies the requirements of the current generation without compromising the capacity of further generations to satisfy their own necessities*" [10]. After the publication of this report, safeguarding of the environment and cultural heritage has been a constant matter for international organizations, governments, and society in general.

Regarding tourism areas, in 1989, the World Tourism Organization (UNWTO) declared, in The Hague Declaration on tourism, that not only were natural, cultural, and human environments essential for tourism development, but also, that suitable tourism management could contribute to the physical environment and cultural heritage protection, enhancing the residents' quality of life [11]. Therefore, the UNWTO has defined sustainable tourism as "*Tourism that takes full account of its current and future economic, social and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities*" [4]. Moreover, it has declared that the development of sustainable tourism satisfies the current necessities of both visitors and host regions, protecting and enhancing opportunities for the future. By concentrating on the integral management of resources, the fulfillment of economic, social, and aesthetic requirements is achieved while respecting the cultural integrity, essential ecological processes, biological diversity, and life-support systems.

On the other hand, the Members of the World Committee on Tourism Ethics, when reuniting in Madeira in 2007, insisted that the application of the Global Code of Ethics for Tourism is vital for the successful development of the tourist industry, in this way contributing to the growth of sustainable societies [12]. Further, the United Nations (UN) General Assembly resolution 66/288 of 27 July 2012, endorses the document of the UN Conference on Sustainable Development entitled "*The Future We Want*". In this document, it is remarked upon that well-designed and guided tourism can make a

great contribution to the three dimensions of sustainable development (economic, environmental, and sociocultural), as well as generate commercial opportunities and decent jobs [13].

An emphasis is placed, in the Charter for Sustainable Tourism [2], on the following eight relevant aspects about how sustainable tourism must be developed:

- Tourism development must be based on sustainability that is ecologically bearable in the long-term, economically viable, ethical, and socially equitable for the local community;
- Tourism must contribute to sustainable development and integrate itself within the natural, cultural, and human environment;
- Tourism must consider its effects on the cultural heritage and traditions of each local community;
- Tourism contributes to sustainable development in an active manner through solidarity, mutual respect, and the participation of all tourism actors;
- Tourism must preserve, protect, and appreciate the value of the natural and cultural heritage, as well as propitiate cooperation between those responsible by assuming the cultural, technological, and professional innovation challenge;
- Quality criteria must be determined in conjunction with the local community and must be present in the main objectives of the formulation of tourism strategies to both satisfy the visitors and preserve the tourist destination;
- If tourism wants to participate in sustainable development, it must be based on different opportunities that contribute to the local economy;
- Any tourism development option must enhance the quality of life and influence the sociocultural enrichment of the tourist destination.

Furthermore, the tourist sector has an extraordinary capacity to link the economic, social, and environmental aspects of sustainability. This is possible since tourism as an economic activity is based on intact environments, rich cultures, and welcoming communities. Therefore, technological tools, such as the one described in this research work, allow the generation of jobs and incomes from cultural experiences [14]; in this study case, from the intangible cultural heritage of the community that held the tourist destination.

2.2. Smart Cities

Before introducing the smart city concept, it is crucial to understand the city as an environment where people and communities evolve and live. Landret describes cities as a sensorial and emotional place where people live, grow, and have experiences [15].

The smart city concept is heterogeneous since it describes many actions and areas of city networks; for that reason, the literature shows different points of view about this concept. The term has been evolving since 1994, with the first definition emerging in 2011, when the European Union echoed its importance [16] due to different events, such as the Kyoto Protocol (1997). This event placed smart cities in the international spotlight, being of great interest for big organizations such as the Organization for Economics Co-operations and Development (OECD). Through the analysis of papers and research published about smart cities, crossed with important world events, A. Cocchia [17] analyzed and found five outstanding dates when the smart city concept witnessed an expansion:

- 1997: As previously mentioned, in this year, the Kyoto Protocol was defined and the United Nations established environmental protection as one of the main issues to solve, as well as the intentions to join forces to reduce the six main greenhouse gases (CO_2, CH_4, N_2O, HFC_S, PFC_S, and SF^6) [18]. The cities of the participant countries started to work on environmental strategies due to this commitment;
- 2000: The Internet started to be part of the personal, academic, and business sectors. Moreover, Information and Communication Technologies enabled the processes of cities and people routines [19];

- 2005: The Kyoto Protocol started the development of the previously defined environmental protection strategies;
- 2008: International Business Machines (IBM®) corporation defined the smart planet concept in the middle of an economic crisis, a field that proposed Big Data potential exploitation by councils, governments, and businesses to improve their strategies [20]. In addition, the Covenant of Mayor was defined, a European cities initiative to work on climatic change through different cities' synergies [21];
- 2010: The Europe 2020 framework was presented by the European Union as a program with funding of €80 billion, for the period 2014–2020, to improve the competitiveness of Europe in global growth [22].

The smart city is a new approach for cities that is based on the need for urban strategies in the care and improvement of inhabitants' life and environment [3]. For that reason, smart cities have to work across several research domains to provide multidisciplinary solutions and strategies that address the needs and issues of a city network. Furthermore, these new solutions and strategies must respect the cultural (religion, ethnic, immaterial heritage, folklore, etc.) and environmental value (waste generation, pollution, use of natural resources, etc.) of communities and regions. For example, in diverse smart city approaches, experts analyze the implication of these solutions in the fields of the economy, people, environment, governance, mobility, and human-wellbeing [23]. Other authors support this vision of the concept in terms of three big trends of urban development: green, digital, and knowledge cities [24].

In addition to the smart strategies related to urbanization, ICTs are one of the growing trends employed to improve and protect environmental factors, day-to-day life, and communication channels between people, communities, and territories. ICT in smart cities is indisputable; it has a big role in the new cities as an enabler, making these new environments more agile and sustainable for people and managers in all the different areas. Authors such as Nam and Pardo [25] have highlighted three main pillars in these type of territories (Figure 1): technology, human, and institutional dimensions.

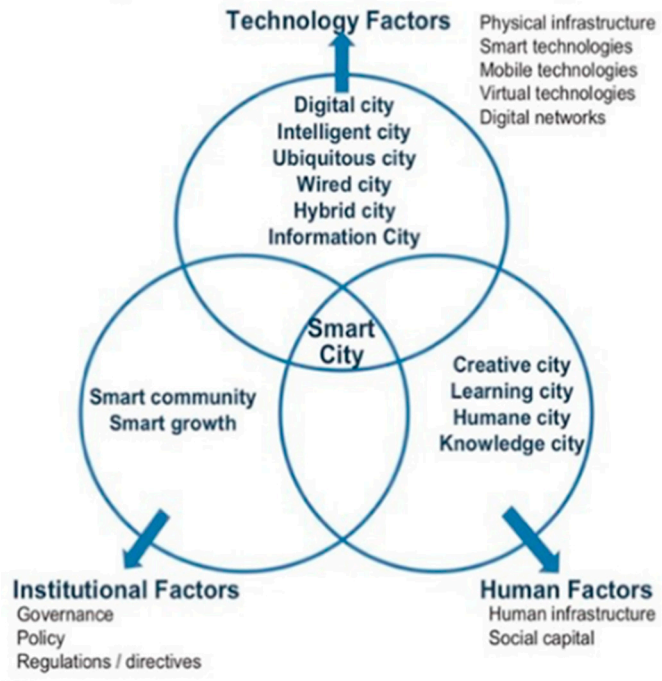

Figure 1. The main pillars of a smart city [25].

Smart cities adaptation is a complex process; Europe is on top, and the Spanish role is very important, as one of the first countries working on this new concept. The IDC Consultant (https:

//idcspain.com/) analysed 44 Spanish smart cities by considering the dimensions and human initiatives, as well as the economic and technological resources used [26], and cities such as Málaga, Barcelona, Santander, Madrid, and Donostia were highlighted for different institutions as a domain referent [27].

2.3. Smart Tourism and Smart Tourism Destination

According to the UNWTO description, tourism is a movement of people outside of their usual area for professional and personal reasons that spend money in such new areas. Visitors are users that visit these areas and they can be residents and non-residents of the destination, while tourists are the visitors who stay overnight in the area and are non-residents [28]. The destination is one of the main pillars in tourism analysis; experts have defined it as the place where culture, geography, and marketing are combined by producers, consumers, people, and authorities to build a final product that works within the economy, culture, global network, and local communities' fields [29].

The high impact of tourism as an economic activity in destinations requires the development of strategies based on sustainable and adaptable models that can be easily adapted to new trends. For that reason, the smart adjective in tourism and destination domains, a phenomenon that began to be used in tourism research five years ago, is an extrapolation of smart city strategies to the tourism domain. Yigitcanlar [30,31] found eight pillars in the smart city concept that were acquired from destinations and smart tourism concepts: governance, planning productivity, innovation, liveability, wellbeing, sustainability, and accessibility.

Smart tourism is highly related to technologies, and Buhalis and Amaranggana [32,33] have explained how ICTs and IoT can improve the experience and increment the competitiveness of the destinations by providing personalized products andservices during the travel. It is noteworthy that different researchers make a distinction between smart tourism and e-tourism [34]:

- E-tourism: Uses the benefits of ICTs to create channels in order to exchange information through digital chains and the virtualization of tourism and smart tourism destination services. This concept is used in the three levels of the visit (previous, during, and post visit). An example is platforms to book hotels in which visitors can interact before their visit to book it, during the visit for any questions and contact during their accommodation, and after the visit to value the hotel commodities.
- Smart tourism: Adopts the benefits of virtual processes and tools, combining it with the physical world to build a strong destination and government for it. Smart tourism only works in the experience field as opposed to e-tourism. An example is an interactive visitor's tool through Quick Response Barcodes (QR), Beacons, Near Field Communication (NFC), and others smart tags for the visitor's interaction with the physical territory during their visits.

Through the comprehension of smart tourism, e-tourism, and the smart city concept, the smart tourism destination is defined as a territory of interest for visitors that is effectively managed due to the opportunities that the use of data and ICTs provide [35]. These destinations need to be innovative and they are built on technological infrastructure for the sustainability and accessibility of the territory, working on the visitor's integration and quality of experiences [6].

Because of that new vision of the destinations, the visitors' smartphone is placed in the spotlight of the cities and destination marketing organizations as the device is capable of allowing a new type of communication among territories and visitors/residents, as well as representing a new method for understanding the needs and requirements of users [36]. This trend has resulted in the emergence of the mobile tourism concept [37], which transforms the city services in apps, Web-Apps, platforms, and social network profiles to allow the user to interact via smartphones and tablets to, for example, buy tickets [38].

The high relevance of the development of smart tourism destinations has led the UNWTO to recently promote the Annual World Congress on Smart Tourism Destinations. This congress aims to discuss the challenges and opportunities in the tourism sector that arise from the development of

innovative tourist products based on new technological solutions. This has the objective of leading to new development tourist models based on the five principles previously mentioned: innovation, technology, sustainability, governance, and accessibility. These congresses constitute the largest world forum of experts in the tourism and academy sector, public administrations, technological centers, local agents, and civil society to analyze and build the tourist model of the twentieth century [39].

Destinations such as Spain, China, and South Korea are at the forefront of the smart destination research and development [40]. SEGITTUR has a project named Smart Tourism Destination (*Destino Turístico Inteligente*—DTI), an innovative proposal in the international domain developed to help destinations in this evolution. Their recommendations are based on a first integral diagnosis to design an action plan working on five pillars: governance, technology, innovation, accessibility, and sustainability [24]. This project is being pursued to improve the positioning of Spain as a world tourist destination. To achieve this, innovation and ICTs are promoted, and differentiation of the offered services is researched. Consequently, this project has allowed a homogeneous framework to be built that establishes the minimum requirements for classifying a tourist destination as a smart tourism destination based on smart cities [41]. With this purpose, AENOR (*Asociación Española de Normalización y Certificación*) approved the UNE (*acronym of Una Norma Española*) Policy 178501:2018 that regulates the smart tourist destinations management system, an international pioneer policy for a new tourist destinations management model in the XXI century [42]. This policy specifies the requirements that a smart tourist destinations management system must accomplish based on the four pillars on which smart tourism destinations are founded: innovation, technology, accessibility, and sustainability.

Several examples, such as the following, can be highlighted: "*Palma de Mallorca (Balearic islands) built the largest free Wi-Fi zone of Europe and developed its tourist monitoring platform. Las Palmas de Gran Canaria started its first model to boost shopping tourism in the city through multiple language mobile technologies, and had the first tourist information office to be completely digitalized. On the other hand, Badajoz implemented the first tourism information integral system, which gathers and manages millions of structured and unstructured data in real time. And last but not least, the island "El Hierro" (Canary islands) is considered the first smart island in the world*" [43].

In order to foment a smart tourist destinations network, the website "www.destinosinteligentes.es" created in Spain incorporates a special section within the tourism destinations that is part of the DTI Project. These destinations include El Hierro, Villajoyosa, Castelldefels, Palma de Mallorca, Las Palmas de Gran Canaria, Marbella, Murcia, Almería, Badajoz, Loret de Mar, Jaca, and Valle de Arán, as well as Cozumel and Tequila, which are both in Mexico. Furthermore, in April of 2019, Spain received the *WTTC Global Champion Award* granted by the World Travel & Tourism Council (WTTC) in the category of innovation and technology for the DTI project [44].

2.4. New Target and Tools for Smart Tourism Destinations

The emergence of smart tourism destinations has been influenced by technology and smartphone strengths in labor and personal daily life. Due to the emergence of this domain, the visitor has become a smart visitor; that is, a visitor that is more informed than before and that seeks assistance from technology during the three phases of the trip (before, during, and after) [45,46].

Throughout these changes is where the digital visitor appears. Digital visitors are mainly composed of people who are between 20 years old and 35 years old, commonly called "Millennials" (born between 1981 and 1996), that identify tourism as one of their main needs. Furthermore, digital visitors also comprehend those individuals that are characterized by new demands (Z Generation—people born between 1996 and 2010) and from those that acquired ICTs as their main information tools (Hashtag Generation) [47]. These generations can be perceived as travelers who want to learn and put aside the routine, seeking personalized adventures to feel integrated as residents while experiencing personal development. These new visitors' profile rejects tinned experiences and participates in activities related to social trends. For this reason, the digital tourist/visitor will share their personal data if it permits living a personalized tourist experience [48].

Inside of the new social tourism paradigm, it is important to consider the prosumer profile. This profile refers to a producer and consumer of content who generates and shares opinions, experiences, and information through their digital contact network [49]. Currently, tourist services and tools' content do not depend on the business; prosumers seek their participation in the co-creation of content based on their experiences [7]. The digital tourists/visitors are more influenced by comments/recommendations shared on social networks by other users than by information provided by a tourist agent. For that reason, new tourists/visitors grant the main role to experienced visitors as generators of useful content to plan and enjoy a trip.

The new tourism concept opens a digital and online tourist market which allows interaction among the visitors/tourists and the territory via a smartphone. These solutions should be social, interactive, and customizable to leave behind the traditional holiday package scheme and they must promote a trend towards the client-to-client approach (C2C) [50]. It is important to combine the smart part of the technology with the hospitality and social aspects of human interaction [51].

Intangible heritage is gaining relevance as a personalized territorial offer, which needs to be lived in person. Researchers such as Greg Richards have highlighted the relevance of studying intangible tourism for destinations for two big reasons: tangible heritage is increasingly hard to conserve over time and new visitors want to enjoy new experiences. In his research, Richards [52] defines cultural tourism as "*A type of tourism activity in which the visitor's essential motivation is to learn, discover, experience, and consume the tangible and intangible cultural attractions/productions in a tourism destination*". Moreover, the author declares that cultural tourism improves the smart tourism destination sector by helping to preserve heritage areas and that the use of technologies and social networks could help to establish contact with visitors after their trip.

This trend has resulted in the emergence of the mobile tourism concept [53], which involves special attention to the design, user experience, and content of apps and websites [54], as well as their dissemination and communication. In addition, it is important to define the purpose of these tools in the tourism domain to build a successful solution. Visitors search for help and information on their app marketplace and browser during their visit, transforming their smartphone into the new tourist office of the cities. An example of these tools is TAIS (Tourist Assistant Infomobility System) [55], an infomobility tool system, which combines information and recommendations about a region based on a user´s preferences and location, behaving as a personalized tourist guide.

Beyond the apps and websites for smartphones that are used during the visits, it is now possible to find solutions that interact with the territory to offer content based on location. As part of the content offer, tourists can find smart points of interaction; that is, smart areas that cover from 1 m to 80 m of radio, where they can interact with their smart device (smartphone or tablet). This interaction is achieved due to the use of devices called Smart Spots. These devices disseminate content through Wi-Fi (captive portal) as an open Wi-Fi network. Furthermore, they allow access though Physical Web technology developed by Google (Bluetooth and GPS) [8]. In addition, according to the environmental pillar of tourism sustainability, these devices are the basis of Internet of Things deployments, including sensors that allow the counting of people, air quality measurement (gases and particles), and noise monitoring.

One previous project was the TreSight in Trento, which used IoT to create an immersive tourism experience [56]. The TreSight project's objective was to combine innovation and traditions with a tool that offered information and recommended local businesses to visitors by using the Open Data of Trento; where points of interest, restaurants, and environmental data are stored. At the tourism office, visitors receive both a wearable device (bracelet) that collects data about the user's environment and location, as well as a website link to download the app that gives suggestions based on the crossed data.

According to this new tourism domain, focused on the use of new technologies to develop tools and services for the visitants, territories and ICT companies are seeking solutions based on their needs. Among the big mobile marketplace of tourist solutions, specific objective tools and other solutions that intend to gather the required information during the tourist experience can be found. Spanish regions have deployed interactive tourist solutions, such as the case of Smart Wine Route Ribera del Duero.

The project designed the first smart Spanish wine route, creating digital panels based on the Physical Web technology (Bluetooth connection with smartphones nearby). In total, 103 beacons have been used to deploy the Physical Web connection that is detected by the Inventrip app (https://inventrip.com/), a platform oriented to travel management. In this way, it increases the number of tourist information offices to 103. This project uses devices based on the Physical Web in conjunction with information from physical signals to create a geolocated experience [57]. The results of this research work highlight the solution to the Ribera del Duero signage problem through the use of beacons, and the aperture of a new research line focused on updating the cultural heritage communication channels.

3. Research Methodology

3.1. Purpose and Research Assumptions

Due to the current need to evolve tourist destinations to a smart version, this section defines the purpose and assumptions of the research and development proposed in this article to support this evolution. Subsequently, the methodology proposed to achieve the objectives defined in this section is described.

The proposed research work aims to design and validate an interactive and agile tool to disseminate the cultural content of a territory between visitors, based on the real needs of a territory and with the main pillars of sustainable smart tourism destinations. According to the needs of the Ceutí visitors and the needs of the city council, the solution proposed should be a tourist guide that transforms visitors into short-time residents. On the other hand, the research intends to design a scalable solution, which can be installed in different types of territories according to their size and cultural offer. For that purpose, this solution will use ICT tools since they allow the benefits of the new implicated resident and the target digital visitor to be increased in order to create a sustainable information cycle, which involves a low level of participation of the destination managers.

Therefore, according to all the information, this research work proposes a smart tourism destination tool designed in two phases: A first artefact based on the state-of-the-art/ICT analysis and its adaptation to Ceutí, which will be evaluated and validated (prototype). The prototype development is composed of two main pillars of innovation:

- A communication channel based on smart point of interactions (Smart POIs), created with the Smart Spot devices, which send non-intrusive push notifications to users' smartphones with online geolocated content through Bluetooth (nearby technology) and Wi-Fi (captive portal), without the need to download an application for the users [8];
- Content disseminated by Smart POIs about the Point of Interest (POI) of Ceutí, created by different resident communities, and focused on the culture and heritage of the territory, addressing stories, experiences, and traditions in short-time video-interviews.
- To achieve these objectives, the following methodology is proposed.

3.2. Research Method

- Qualitative:
    - Study the state-of-the-art. The research methodology begins with a study of the state-of-the-art about the sustainability concept, which is the major principle of smart cities and smart tourism destinations. In addition, these research lines have been analyzed to obtain knowledge on the global situation and the role of them in Spain as one of the leading countries in the field. In the same way, a study of different ICT tools and deployments used for tourist destinations at a global level is carried out;
    - Detect the needs of the tourism destination from interviews. This study will explore the needs and problems of tourism innovation that the tourism destination requires to boost its visitor activity in a smart manner; that is, to spread its culture and tourist information and

to determine how it can capture the interest of its visitors. This study will be carried out through different meetings and interviews with the tourism and City Council managers;

- Quantitative: Define the profile of the visitor from a survey. Once the needs of the tourist destination are defined, the research analyzes the target profile of the user of the solution to generate a solution based on their preferences. This process is carried out through a non-probabilistic cluster survey aimed at a representative sample of the population to gain knowledge on how they use digital tourist resources;
- Description of the trial:

    - Define the first draw of the solution. After analyzing the state-of-the-art, a first artefact of the tourist guide is defined to disseminate tourist content between visitors. This solution must provide an innovative communication channel (the first pillar of innovation) based on the possibilities of ICT technologies, using IoT devices called Smart Spots [8] to create interactive areas for users;
    - Research the Territory. To test the artefact of the solution, research about the tourist destination is carried out in information sources related to tourism and through meetings with the tourism managers of that territory;
    - Develop and deploy the prototype. According to the context obtained from the previous investigations, the POIs are established by the people in charge of tourism in the territory. This solution provides an innovative communication channel, as well as content co-created by the residents of the tourist destination, the second pillar of innovation of the prototype, highlighting the intangible cultural heritage. Subsequently, deployment of the solution in the tourist destination is carried out. For this, the type of content of the solution is defined to motivate the participation of residents who may be involved with said content. Therefore, it is proposed that a dissemination campaign should be designed. The objective of this campaign is to disseminate the proposed solution between residents and visitors of the tourist destination to spread the prototype of the territory, as well as to motivate the co-creation of content among the inhabitants of the place;
    - Know the impact of the prototype. To know the impact of the proposed solution, this research will analyze the acceptance of the proposed tool in the territory through quantitative information provided by tools, such as Google Analytics and social networks, as well as through meetings with the city council about the impact on the tourism office.

3.3. Sampling

In order to know the profile of the visitor of Ceutí, a representative sample of the population will be established to provide the designed survey. To establish a representative sample of Ceutí visitors, the available tourism statistics were consulted. However, the official data are not divided by municipality, but by larger geographical areas and with similar characteristics, in terms of the environment and proximity. Therefore, the tourism received by the central area of the Region of Murcia is taken as a reference because Ceutí belongs to this area, composed of a set of localities with similar characteristics, such as a rural environment. This area receives, according to official data, mostly visitors that are resident in Spain (between 80% and 90% of the total), whilst the rest are foreigners with an average stay of 1.53 nights [58]. These data were confirmed by the city council technicians, responsible for tourism in the town, who reported that approximately 85% of their visitors were residents in the Region of Murcia.

Thereby, the representative sample is established based on 200 people: 173 surveys to residents in Spain (86.5%), mainly from the Region of Murcia, and 27 surveys to non-residents in Spain. In addition, three clusters of age groups for residents of Spain are established to distribute the surveys; however, for non-resident visitors in Spain, age clusters are not defined since there is no data related to age.

As good average representation of the period of time (taking into account the months with a high and low number of visits) of the monthly visits of Ceutí during the year, the survey uses the data of February 2017, when the center of Vega Media of Murcia had an influx of 3979 Spanish travelers, where 3437 (86.4%) were residents of Murcia and 542 (13.6%) were non-residents [58]. The original data do not specify the locations of travelers residing in Spain, so with regards to qualitative research based on official statistics of visitors from the area under study and with a consultation with municipal technicians, it was established that visitors in Ceutí were residents from the Region of Murcia and nearby zones. Due to the number of foreseen visitors being too low, the locations for the respondents were not specified. Hence, a clusters survey (Survey: https://docs.google.com/forms/d/e/1FAIpQLSfItF0WtZOVJ7sOuzw14SGEqnXxKmtPEAEwk_vHAZvxZMlY2w/viewform) was designed for conglomerates. The target respondent of this survey was members of the population over 18 years old that resided in the Region of Murcia in 2016, as the last data obtained by the census (Table 1).

Table 1. Clusters of age groups for residents of Spain.

Age Range	Percentage	Number of Users
18–30	24.5%	41
31–50	40%	71
>50	35.5%	61
Total	100%	173

The survey was designed to research the user's habits during their tourism experience and to support the development of a recommendation algorithm called "HyRa: Hybrid Recommendation Algorithm focused on Smart POIs" [59], which could be adapted in the final solution. The survey was structured as three sections:

- Personal information;
- Use of digital tools during their tourism experiences;
- Respondents who go sightseeing within the Region of Murcia.

4. Results

4.1. First Artefact Using ICTs to Build Smart Tourism Destinations

As a first result of the research, based on the analysis of available ICTs and the state-of-the-art, a tourism tool composed of an IoT device called a Smart Spot and a Web-App was produced. This design of a new tourism tool is based on the Design Thinking methodology. This device determines the artefact to be tested in the application scope in order to know the issues that could arise during the actual deployment to discover these aspects during the product/service definition process [60].

This draft is based on previous research called Smart Tourism Destination & Cultural Heritage: A New Unexplored Sector in Smart Cities Development [9], which analysed the tourism domain and Internet of Thing (IoT) technologies. Therefore, this paper establishes the use of IoT devices called Smart Spots (Figure 2) [8], which allow the cultural point of interest (POI) to be transformed into a smart point of interaction denominated as Smart POI [9]. These smart areas create a new communication channel between the cultural offer and the residents/visitors as the first pillar of innovation of the prototype.

Figure 2. Smart Spot.

The Smart POIs spread over an area of one to 80 m, where the user can interact with their smartphone in two ways (Figure 3):

- Wi-Fi: The device creates an open Wi-Fi network using the city Internet network or a SIM card. When the user connects their smartphone to the Wi-Fi network indicated in a cartouche, a webpage with content about the POI is opened automatically;
- Physical Web: Additionally, the device disseminates the same content through the Bluetooth signal, sending a push notification (push notification: A simple way to interact with the smartphones of users through a non-intrusive mobile notification) to the nearby smartphones, which have the Bluetooth and GPS options turned on.

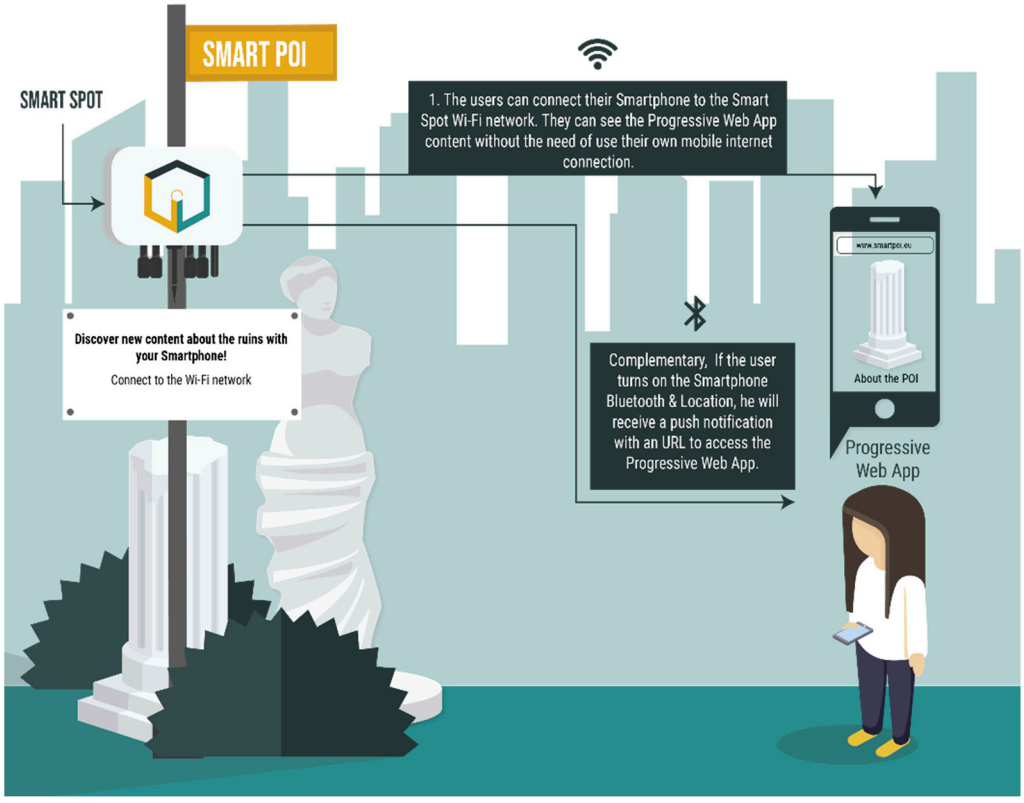

Figure 3. Smart Spot functions.

Smart Spots can be installed in facades, streetlights, and masts, etc., in either rural or urban areas. These devices can obtain the electricity they need to operate from a battery or from solar panels, avoiding the need to wait for electrical wiring infrastructure and an Internet-wired connection. Thanks to their versatility, the Smart Spots allow the Smart POIs to be created in all types of areas, disseminating their content through the visitors´ smartphones, without the need to download an app. Similarly, their capability to provide the Internet makes it possible to enjoy multimedia content, podcasts, and other types of content without the need to use the user's Internet connection.

4.2. Research on the Territory to Test the Artefact

The final tool was adapted to face the needs of the city lab, Ceutí, with the aim of knowing the issues, benefits, and real-world impact of this device in the town's daily life. The town is an agricultural village and its cultural heritage is interesting, being based on irrigation agriculture culture, ancient detachable canning factories, and avant-garde contemporary art represented in the streets [61]. This culture shock makes this territory the perfect place to carry out the proposed experiment since the use of new technologies can be the most useful tool to transform all this cultural content into an attractive offer.

4.2.1. Ceutí as a Destination

According to research on the territory carried out to execute the trial, based on interviews with city managers and the revision of other projects and documents, the research defined the main characteristics of Ceuti as a tourism destination.

Ceutí has a broad cultural and artistic heritage in its streets. This village has an outdoor museum with a collection composed of big murals, sculptures, churches, and different international museums. The municipality, which has less than 20,000 habitants [61], is visited because of its gastronomy and artistic offer by habitants of the same region (Region of Murcia), who spend the weekend there. A secondary visitor source is composed of motorhome tourists, who park in Ceutí´s large esplanade, and French people, who emigrated years ago and are visiting their families. This research on Ceutí´s target audience was accomplished through meetings with the city council managers, who supported the project during the entire process. The first findings have been documented in the article called "Towards the Development of a Smart Tourism Application based on Smart POI and Recommendation Algorithms: Ceutí as a Study Case" [62].

The city council described the majority of people that visit Ceutí as visitors, not tourists. The reason for this is the limited number of hotels offered, with only one hotel outside of the town. Many visitors of Ceutí go sightseeing and eat in typical restaurants, visit the museums, and go to sleep to the Archena hotel, a famous natural spa (https://balneariodearchena.com/), near the municipality. In addition, the tourists that go to the Region of Murcia for its rural culture and orchard visit different towns of the *Vega del Segura* in the same trip and Ceutí is one of the typical planned visits for one day from places such as Mula, Cehegín, Fortuna, Archena, etc. In addition, the residents in the Region of Murcia and nearby territories such as Almeria usually go to visit other territories on Sundays for one day by car, which is a very typical activity for Spanish families and groups of friends.

According to the research, the tourism is based on two small fonts: caravan parking and emigrants who visit families. It has a big caravan park where families and couples (mainly French people) park and spend some days in the center zone of the region. The park is cheap, big, and comfortable, providing water and a power supply, with a big supermarket nearby. According to the emigrants, a few years ago, the majority of Ceutí residents who worked in the orchard had to go to France and Holland to work, collecting fruits and vegetables in the high seasons. Many of those emigrants established their residence in other countries for job opportunities and created new families there. For that reason, they visit their families in Ceutí in holiday periods, and stay overnight in the families' houses.

As a rural territory, its main visitor season is during the winter and autumn, according to the weather in the Southeast of Spain, when the climate is better to visit such territories than in the summer.

However, it is important to take into account that during August, a lot of visitors go to Ceutí to enjoy the local festivities of the territory as a high attraction event in the regional area; mainly the residents that cannot go to the coast during the summer.

Previously, Ceutí was not a big destination at a tourism level. It did not have big buildings and historical places and the city council has changed that through a new strategy based on creating an outdoor museum with different cultural attractions related to its canning, rural, and orchard culture, mixed with new points of interest that are more focused on the contemporary art. In this way, it has much to offer for many types of visitor, which has improved the economic sector and built a more friendly/cultural environment for the residents. Since 2000, it has deployed many cultural points as sculptures, murals, and museums [63]. Its outdoor museum is formed of [63]:

- Bronze nudes (José Planes);
- Violinist (Paco Barón);
- Flying low (Paco Barón);
- Torso (Eduardo Lastre);
- Michelina (Fernando Bellver);
- Customs murals (Marisa Peagudo);
- Canning woman sculpture (Salvador Susarte);
- Live Alegory (Torregar);
- Child in the ditch (Manolo Belzunce);
- Emigrant sculpture;
- My metaphysic Garden (Ouka Leele);
- Contemporary Art Center La Conservera;
- Antonio Campillo Museum;
- 7 Chimneys Ethnographic Museum.

4.2.2. Detect the Needs with the City Council through Qualitative Interviews

As one of the initial activities during the research and in accordance with the main pillars of smart cities, the interviews with the city council managers and technicians represented the first contact with the real needs of the territory. Through these interviews, the researchers involved in this article obtained a list of qualitative results that will help in the development of the final tool, in search of a result based on the real economic, socio-cultural, and environmental needs of the territory. During these interviews, the following relevant aspects were detected for the research:

- Revalorize the intangible culture: Thanks to the previous project called iBrave [64], it was concluded that Ceutí has to work on branding itself through valorization of its intangible heritage by popular knowledge;
- Engaged residents: The residents of Ceutí are proud of its homeland heritage. Therefore, Ceutí is full of communities involved in the preservation of their culture and environment [65]. These communities cooperate with the city council managers to improve their territory through different meetings called Cross-Sectorial Tables, which are regularly organised. Through these collaboration workshops, the residents contribute to the development of their town in different ways, such as through cultural activities. This strong cooperation between residents and the city council has been analyzed and used in several territories as a source of support in the successful preservation and dissemination of heritage, as in the case of Bogda World Natural Heritage in Xinjiang [66];
- Necessity of new attractive tools: This municipality wants to have more tools to spread POI information;
- Digitize intangible heritage: As with other territories like Brandenburg, where an interest in digitizing the cultural heritage of different European initiatives exists [67]. Ceutí seeks to preserve its popular stories to save the essence of the village as the main pillar of its tourist brand.

4.2.3. Ceutí Visitor's Profile

With regard to the results on the tourism relation with the Region of Murcia, 76% go sightseeing in the region and 70.5% visit the municipality. The main reason for visiting this municipality is to go sightseeing, visit relatives, work, and experience the gastronomy.

However, age is a key factor when it comes to sightseeing in the region. Older people make more trips through the region, a behavior that can also be observed among visitors of Ceutí. Furthermore, the users included in older age groups have sightseeing as their main reason for visiting Ceutí, while the gastronomy of this municipality does not interest the youngest.

Most of respondents consult one or two sources during their experience (83%). According to the collected data, the favorite source is the browser (37.7%), followed by the traditional visitor guide (28%), Facebook (16.4%) and, a downloaded app (14.6%). There is no relationship between gender and consulted sources when traveling. The respondents who are 31–50 years old are those who consult their browsers (41%), as well as those who consult the traditional visitors guide (38.8%). The same thing happens when consulting the traditional visitors guide: the middle-aged individuals are those who consult it the most, with a value of 38.8%. However, those who most consult Facebook are the youngest (45%). Age is a decisive factor when posting on social networks: the youngest are those who publish on different social networks, with Facebook being the first option (77.5%) and Instagram being the second option (49%).

4.3. Prototype of the Project in Ceutí: Be Memories

The acquired knowledge has allowed the first prototype to be improved by creating a smart visitors guide with content co-created by residents, according to the needs of Ceutí. The final solution, called Be Memories, is based on two pillars of innovation:

- A new communication channel to disseminate tourist content through the use of IoT devices (Smart Spots) that create interactive areas (Smart POIs);
- Personalized context-aware content created by the residents in a multimedia format, which intends to be as interesting as it is entertaining.

The installation of the Smart Spots devices (Figure 4) allowed the city council of Ceutí to deploy 15 Smart POIs in the facades of the main POIs of the outdoor museum (Figure 5). Thereby, the communication channel, people, and these POIs were established through a Wi-Fi network, without the need to download an app, as explained in Section 4.1.

Figure 4. Smart point of interactions (POIs) for Be Memories.

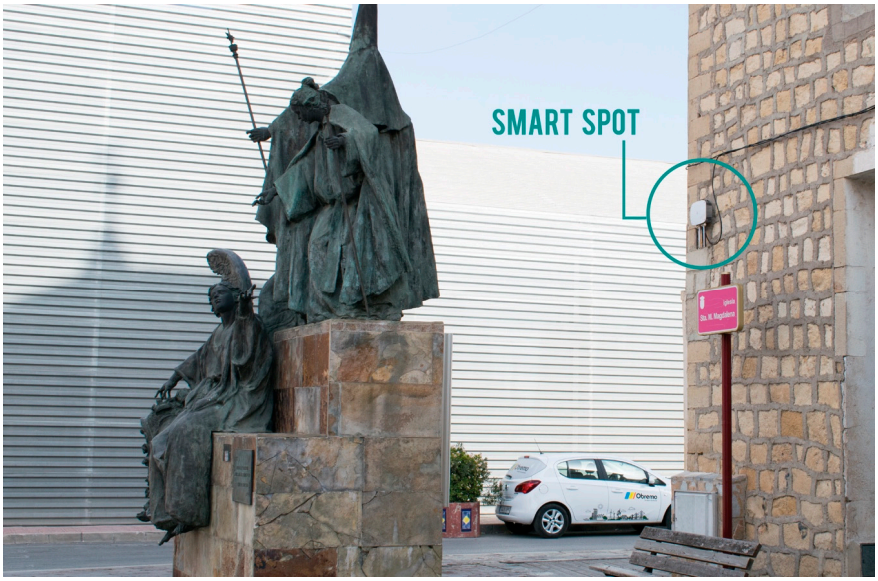

Figure 5. Smart Point of Interaction (Smart POI) deployed in Ceutí.

Thereby, Be Memories content can be accessed by interacting with the Smart POIs through a progressive Web-App, through only having the Bluetooth and GPS options turned on or the Wi-Fi option. The progressive Web-App is a webpage adapted and designed as a native app for enhancing the user experience. This new concept avoids the download of an application to any smart device since access to this type of application is gained through a link (URL) from the browser and the users can directly access it on their smartphones (simulating a native application) if they want. The use and design of Be Memories are based on the knowledge acquired by analyzing the tourism apps, the stakeholder surveys, and the current trends (Figure 6).

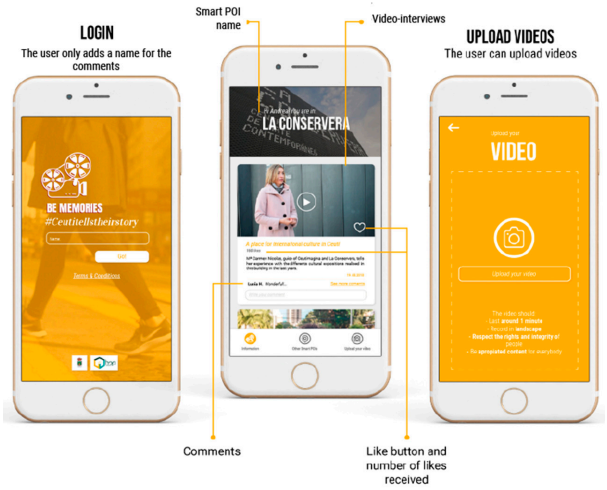

Figure 6. Progressive Web-App design.

Regarding the second pillar of innovation, the content offered is based on the stories, experiences, and traditions of Ceutí, which were provided by the residents involved in the local culture. The content is in a multimedia format in the form of short-time video-interviews (see a trailer of the video-interviews here: https://bememories.hopu.eu/#/login). To generate this content, with the support of the city council, the people involved in this project contacted different communities of the territory, such as students, associations, and museum guides, among others, as well as the artists who participated in the tangible cultural heritage of Ceutí. Once the contact was established, the researchers involved and the city managers carried out different meetings with residents interested in telling their stories to later

select and record the best stories. Thereby, seed content was created to test the solution and, in turn, to encourage the participation of new narrators.

The short-time video-interviews were recorded without a plot, with the narrators telling their story as they lived it. Therefore, through this methodology, the videos can show the essence of the native culture. In the same way, the selection of participants was carried out in such a way that the profiles were inclusive, considering children, art lovers, elderly people, and workers, among others. International artists were also involved. For example, among the people interviewed, there were international artists like Jose Antonio Torregrosa "Torregar", a neo-realistic painter who created a big mural for Ceutí. In addition, the records contain a group of town students who know the different stories of museums, as well as two workers from the old canning factories of Ceutí who describe how they lived in Ceutí 30 years ago as the economic pillar of their family, among others.

The Smart POIs deployed in Ceutí are for the visitors, residents, and non-residents of the town, without the need of overnight visitors in the municipality, as the main stakeholders of the cultural content of the territory. For that reason, Be Memories is designed to provide information for the user that walk through the town as an agile experience to discover the local culture in a short time period. All of the Smart POIs are signaled with an outside cartouche near of the POI for the visitor's knowledge (Figure 7).

Figure 7. Example of a smart point of interactions (POIs) cartouche in Ceutí.

4.4. Project Dissemination Campaign

During the test of the prototype in Ceutí, a Be Memories dissemination campaign was carried out to make it known to visitors and residents of Ceutí. For that purpose, a Facebook page dedicated to Be Memories was opened called @BeMemoriesCeutí (https://www.facebook.com/BememoriesCeutí/?eid=ARDUXoN5jIfowHXwFIyJhFVhj7dmZumqh3wGNoOg_C_Ce1cHGYcMNkBHe1-e0RiGP3brlmhWoX-ftYpr) and, at the same time, flyers and posters were designed to distribute them around the region's streets (Figure 8). The content of this campaign was used to extol the local identity and the recorded material during the video-interviews. According to this, the flyers, posters, and Facebook provided curious facts about the town, gathered from the information of the videos, and introduced the narrators through a header that described their participation in Be Memories.

Figure 8. Banners for Social Networks about the project

During the campaign, on the one hand, on the Facebook page, the residents involved were tagged, with the aim of encouraging post sharing to reach their Facebook regional followers. Furthermore, the regional media helped in the dissemination within the Region of Murcia, such as the case of ROM Murcia (Radio Online Murcia) (http://www.romradio.es/2017/06/06/queremos-que-sean-los-Ceutíenses-quienes-den-a-conocer-su-tierra-andrea-gomez/). On the other hand, the flyer and poster indications about how to use Be Memories were distributed in local businesses, restaurants, street walls, and tourist offices for new visitors.

The launch of the trial occurred during the local festivities of Ceutí, from 6 August to 19 August. During the first 15 days of the campaign, the Facebook page of Be Memories Ceutí had 161 followers and the posts reached 300 users (Figure 9).

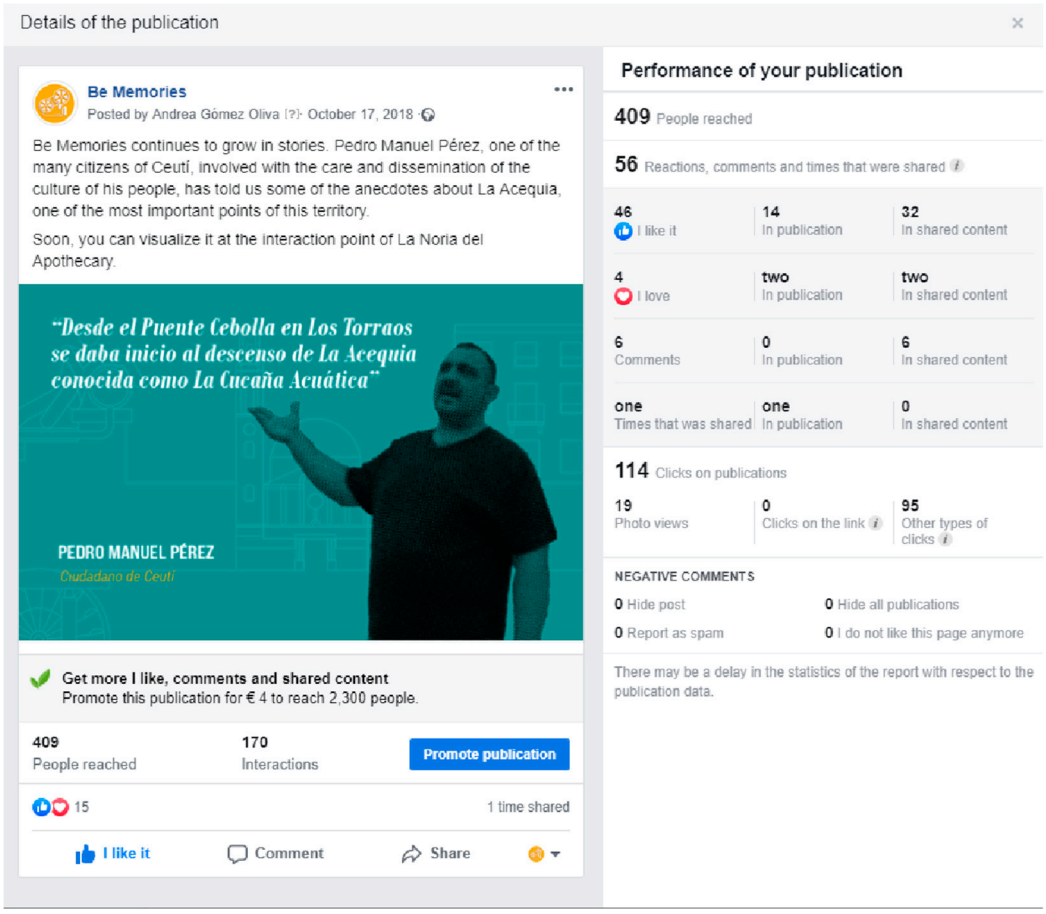

Figure 9. Facebook post with impact.

4.5. Data Obtained during the Trial

Since the test deployment was based on 15 Outdoor Museum POIs, which were selected to install the Smart Spots, the content of the 15 Smart POIs was generated in collaboration with the residents. This co-creation of content was successfully achieved thanks to the project page created on Facebook and the help of the city managers. From this, a trial of the solution was launched during the local festivities of Ceutí (6–19 August), which was also supported by a campaign to disseminate the project through the Facebook page, flyers, and posters. Therefore, as a pilot study, the analysis of the results was performed with the data obtained from the local festivities based on the data collected from the main Smart POI deployed in the city council square, where outdoor activities take place, such as the San Roque Proclamation and local games. This Smart POI showed a trailer of all the recorded video-interviews (https://bememories.hopu.eu/#/login) that make up Be Memories. During the analysis time, the proposed Web-App accessed through Smart POIs was evaluated using Google Analytics to know how many people watched the short-time videos, as explained below.

Google Analytics was installed in the progressive Web-App to know how many users visited the Smart POIs because the video is only available through the Be Memories communication channel. The report confirmed that during the first 15 days (the trial period), more than 400 users connected with the main Smart POI and saw the video-interviews, achieving 30 visualizations per day. This number evolved to 5051 visualizations in May 2019, with week peaks higher than 240 users connected (Figures 10 and 11). During the trial period, the Be Memories progressive Web-App obtained more than 26 good comments and no bad comments. The video received 160 likes and five users contacted the project through the Facebook page to participate in the video-interviews. Furthermore, 90% of the users connected during the 15 first days were Spanish people, including Region of Murcia residents, such as those from Molina de Segura and Cartagena, and residents from other Spanish cities, such as Madrid, Barcelona, Valencia, and Sevilla (Figure 12).

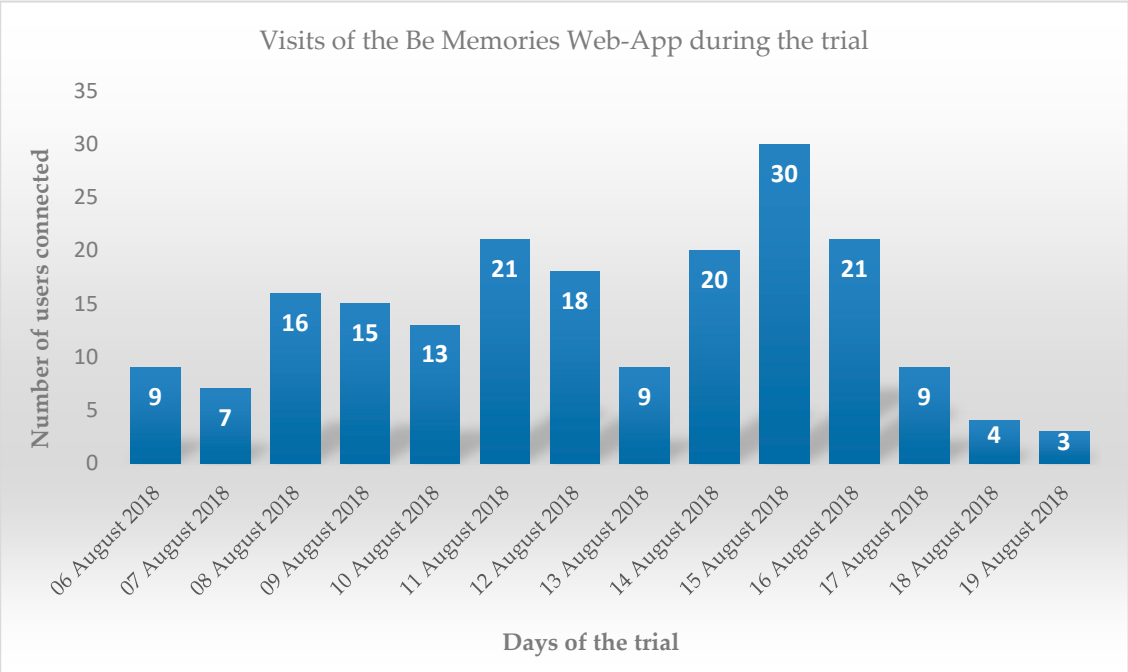

Figure 10. Visits of the progressive Web-App during the test (own elaboration based on the results of Google Analytics).

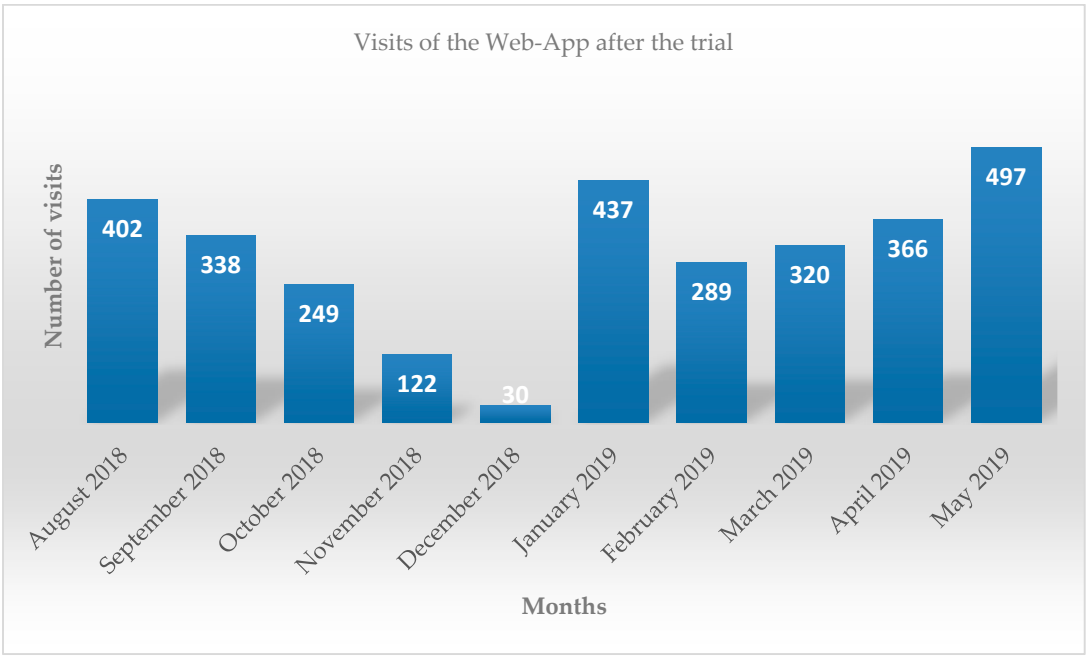

Figure 11. Visits of the progressive Web-App after the test (own elaboration based on the results of Google Analytics).

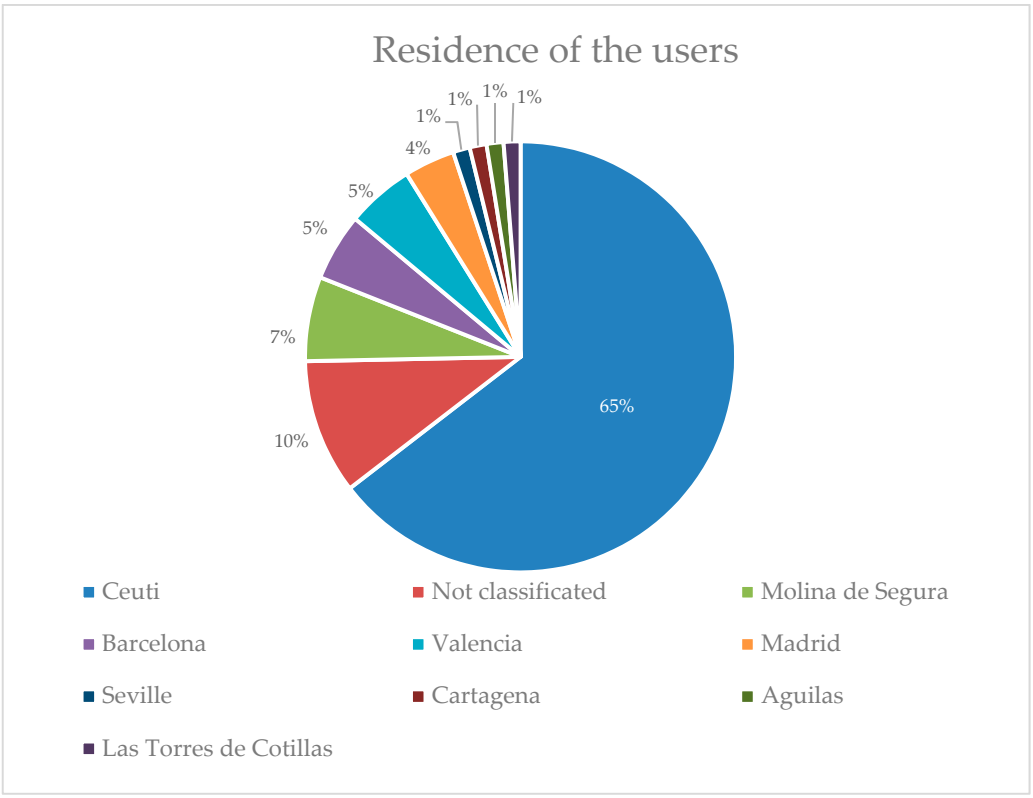

Figure 12. Residence of the users during the trial (own elaboration based on the Google Analytics data).

5. Discussion

Due to the last results about the two weeks of the trial, the research has provided lessons learned based on the advantage and problems of Be Memories in Ceutí. As another indicator of success, different national territories have shown interest in replicating Be Memories with their residents. A Spanish town called Mula (http://mula.es/web/) showed interest in deploying Be

Memories in its territory, and Cartagena Puerto de Culturas (Cartagena Puerto de Culturas: https://www.cartagenapuertodeculturas.com/), as a cultural organization of the maritime city of Cartagena, wants to adapt the solution from its museum offer. These indicators are promising because one of the main research objectives was to build a scalable solution to solve the problems of different territories to disseminate their culture among the new digital visitor. In addition, the impact of the tool at the European level was highlighted. On the one hand, Be Memories won the open call to participate in the ICT Flame project to deploy the same solution in the Millennium Square in the City of Bristol, using the technological advantages of the project platform to improve the video reproduction during the user experience (ICT Flame web https://www.ict-flame.eu/news/winners-1st-flame-open-call-announced/). This opportunity will allow Be Memories to be tested with other user profiles in a territory with more inhabitants. On the other hand, the tool is the basis of the ERASMUS+KA2 project, called Walk a Story (Walk a Story web: http://www.walkastory.com/site_dnm/), which is constituted of partners from Poland, Denmark, Turkey, Croatia, and Romania. The ERASMUS+KA2 project aims to find a methodology to discover and record the local stories of old people among intergenerational walks in order to build tourist content to disseminate through Smart POIs based on the cooperation of local communities. In addition, Be Memories won the label of the European Commission for the European Year of Cultural Heritage (EYCH).

In accordance with the needs involved in the creation of a tourism tool that fits the pillars of sustainable tourism, smart cities, and smart tourism destinations, the results obtained with the Be Memories trial satisfactorily cover the main factors presented in the state-of-the-art:

- Tool for sustainable tourism. According to the pillars exposed by UNWTO [2], Be Memories is a tool that does not exert an ecological impact in the environment where it has been installed, not making use of natural resources in the short and long term. Regarding the economic aspect, Be Memories is ethical and egalitarian in terms of the diversity of local communities, transforming them into essential active agents for the operation of the tool (creation of content), thereby reducing the economic investment that local managers and technicians have to make in the creation and publication of contents, which is one of the main problems of small and medium municipalities in Spain. Therefore, Be Memories supports integration of the environment, including the natural (rural areas) and urban environment, with the culture (intangible heritage) and the human factors (local communities with different ideologies and cultures), creating a triangle that is supported to generate a representative and sustainable tourist tool of the municipality. Thanks to the integration of local communities, who contribute their knowledge on and traditions of the locality, Be Memories has a positive impact on the intangible cultural heritage of this territory and in turn diffuses and transmits these traditions and intangible cultural heritage to other local communities of different ages, social classes, and ideologies, as well as to visitors who are not resident in the municipality, revaluing these traditions and cultures as a strong cultural attraction. At the same time, the diffusion of these traditions and local culture through the use of new technologies, from different points of view, has supported the feeling of solidarity and mutual respect in the municipality and this vision has been transmitted abroad, creating tourism content for the visitor who supports all these values. Thereby, the tourist actors, artists, and local businesses have been involved with the communities to create an ecosystem of solidarity and respect, working together to create all this content. In summary, Be Memories enhances the local potential through the involvement of the territory's ecosystem: commerce, the city council, and communities, enriching the municipality with the use of new technologies to transform it into a sustainable and smart tourism destination;
- Tool for smart cities and smart tourism destinations. As detailed in the state-of-the-art, smart cities have their origins in the idea of sustainability and in turn, a smart tourism destination must be based on the pillars of these cities, making use of the opportunities of ICTs. Nam and Pardo [25] indicate that everything proposed for a smart territory must work on three main pillars: technological, institutional, and human. Therefore, Be Memories is the result of the search

for a system that uses the currently existing technologies to create a tool for the visitor (use of Smart POIs) that takes into account the institutional needs, while the social infrastructure of the territory participates and nurtures itself (communities that create content). The concept of a smart tourism destination requires new strategies to improve its tourist offer for both visitors and residents. To achieve this goal, the state-of-the-art shows that the use of technological tools helps destinations to transform their processes and systems into a new sustainable, smart, practical, and attractive approach. Therefore, Be Memories is a possible way for small and medium tourism destinations to transform their processes in accordance with current innovation trends by using technological tools and local resources to build a sustainable dissemination channel for their culture. Be Memories can contribute to the sustainable tourism development of smart tourism destinations as presented in the three main aspects of the UNWTO Guidebook for sustainable tourism [13]: economic, environmental, and socio-cultural:

- Economic sustainability: The contribution of technological tools, such as Be Memories, can attract new digital tourist's eager for online content, which will result in higher revenues for the local tourism industry and, therefore, in more jobs for the local community;
- Environmental sustainability: Firstly, Be Memories has no impact on the local environment, thus being a sustainable environmental tool in the short and long term, as described in the point of sustainable tourism. In addition, the Smart Spot devices contribute to automatic data collection to build indicators of the environmental impact of the tourist activity in the smart destination, alerting local authorities of the load capacity of tourism in terms of impact on the territory. This includes factors such as air quality, light pollution, noise pollution, deterioration of the natural environment, among others. Similarly, with this type of application, environmental education content about the smart tourism destination itself can be generated. Thereby, future generations can be actively involved in the conservation and sustainability of the destination;
- Sociocultural sustainability: Be Memories respects and enhances the existing cultures in the tourism destination, as well as the promotion of relationships between people with different socioeconomic statuses and cultures that are not always similar. In this article, the cultural factor is the one that has more relation with the presented research. For the cultural sustainability of a tourism destination to take place, its history, customs, celebrations, beliefs, and traditions, among other aspects that shape its own and differential identity, must be taken into account in the tourist development of the territory, and they also must acquire special relevance; that is, to preserve the intangible cultural heritage of the host community integrated into the tourism destination. In this research, a progressive Web-App has been developed, accessed through Smart POIs, which promotes the cultural sustainability of the tourism destination and which focuses on the protection and conservation of intangible cultural heritage through the creation of videos that contain experiences, memories, and curiosities of the residents about tourist POIs of the destination. The POIs chosen are different from those found in traditional tourist guides and in guided tours by professionals in the sector. Thereby, the intangible cultural heritage is transmitted to visitors and remain in the collective memory for a longer period of time, taking advantage of the opportunities generated by the new ICTs.

Regarding the main needs detected through interviews with local managers and technicians, as well as in previous studies analyzed, Be Memories has covered these objectives as follows:

- Build a sustainable and smart tourism destination: Based on the definition provided in the state-of-the-art section, a sustainable smart tourism destination is a territory of interest for visitors, effectively managed due to the opportunities of ICTs [35]. Be Memories is a tool that has helped Ceutí to position itself as an innovative territory, where intangible heritage and ICTs are combined

to offer new tourist communication and dissemination channels to new visitors, promoting and protecting its main attraction: cultural heritage. After the installation of Be Memories in Ceutí, the town has been present in different national media and events, placing it on the visitors´ maps (https://www.laopiniondemurcia.es/especiales/fitur-region-murcia/2019/01/Ceutí-vista-europa-n1571_16_46437.html). This is reflected in the number of visitors that have come to the tourism office of the city council, as it has increased in the last year, according to the information obtained from the interviews conducted with the city's stakeholders. The success of Be Memories in Ceutí is also due to the fact that it helps the tourism managers to offer a new more agile approach to tell stories related to the tourism destination (Smart POI channel) that are more attractive (local stories) and involve less time (co-creation of content) for visitors when they require information about POIs;

- Revalorize the intangible culture: According to previous projects developed by the City Council of Ceutí, such as iBrave [64], an essential goal of this project (Be Memories) is to enhance the intangible cultural heritage of Ceutí abroad to make it the main tourist attraction and in turn, promote the entire outdoor museum. In addition, research on the UNWTO Chapter for Sustainable Tourism has been considered [2]. Be Memories took this into account from the start as the main goal of the project. Thanks to the profile of the communities of this territory, which are very involved with the actions of Ceutí and its cultural heritage, this content could be generated and used in the tool. The participation of the city council managers and technicians was very important for carrying out the interviews and locating those people who had something to say that could be of interest and respectful to the visitors, such as popular stories and anecdotes that occurred in the territory, which could not be located in the books and were transmitted, until now, from mouth to mouth. Fifteen interviews were recorded, where residents were interviewed and the camera recorded the entire interview. In this way, in post-production, the content of greatest interest could be segmented, making final videos of approximately 1 min that could be easily consumed by the visitors. Among those stories, old workers of the factories of preserves of Ceutí, who narrate what it was like to be the economic pillar in their houses more than 40 years ago; an artist who painted a mural of Ceutí at the beginning of his career, exposing the reasons for this mural; or the town's chronicler, who opened the ethnographic museum, telling the listeners how that process was, can be seen. In turn, distributing these stories in video format through the Smart POI has improved the "from mouth to mouth" process, used so far to disseminate this intangible heritage, revaluing it within its own territory and making it visible to non-resident visitors;
- Engaged residents: Another relevant aspect of the Be Memories deployment is that the participation of residents has been promoted and supported, since different communities have worked together to create the content of Be Memories under the idea of showing their local culture [65]. Based on the UNWTO chapter to build sustainable tourism destinations, the integration and acceptation of the local network is one of the more important aspects when building sustainable tourism activities [2]. So far, more than five residents have recorded new videos for the next update of the content of Be Memories, which shows the positive impact that Be Memories has had on the population. Similarly, it should be noted that some disruptive contemporary pieces of art like "Allegory of Life" (http://www.Ceutíturistico.es/al/es/plazanueva.html) have been explained by the artists themselves through Be Memories, improving the local acceptance of the most innovative pieces of art. The aspect of co-creating content for Be Memories is one of the main pillars of the resulting solution. This content creation approach, in conjunction with resident participation through videos introducing local stories, is a strategy based on the smart cities and smart tourism guidelines. In this case, Ceutí has great potential, by having a strong local culture and pride in its local environment, which works as an attraction for visitors; therefore, the city council's managers seek to improve and renew their POIs with a low investment. This purpose has been achieved when deploying Be Memories in Ceutí. In addition, the co-created content improves the resident's collaboration by joining different types of communities to record interviews. As one of the main

lessons learned during the project, the cooperation with local residents must be impartial, that is, without any political and ideological involvement, showing all aspects of the town and including all the communities interested in these activities. In this way, open collaboration with all of them will allow the content of Be Memories to be attractive, inclusive, and representative of the local culture. Considering city managers, this content update approach allows them to reduce the time spent on this type of activity, which makes it more sustainable for small- and medium-sized cities with fewer resources. That is, the city council only needs to verify the content uploaded by the resident and promote activities for the creation of content, involving three objectives with the same activity: improving the resident network, generating the visitor's information, and developing good advertisement of the local communities;

- Innovation based on the visitors profile (necessity of new attractive tools): Similarly, according to the results of the surveys conducted in this research, it is detected that both the resident and the target visitor of Ceutí do not use native applications for going sightseeing since they prefer to search for information on a web browser. In addition, research on the new visitor's profile, composed of Millennials, the Z generation, and the Hashtag generation, describes the role of the new technologies and mobile tourism concept as the main channel for offering the tourism content to visitors [47,53]. Therefore, Be Memories is designed according to this finding by being a tool that can be accessed from the web browser without the need to download a native application, offering an experience similar to websites. Another advantage of Be Memories is that it does not use the Internet connection of the visitor's smartphone since the Smart Spots provide a Wi-Fi network from where the content of the application can be consumed. Another perspective, the integration of ICTs into small- and medium-sized cities and territories, leads to two major problems: there is a small population group with little capacity for technological tools and limited knowledge of technological concepts, and a sector of users has vintage smartphones that can pose problems. However, changing the focus of the content for visitors is necessary because their new profile requires new experiences and tools to revalue the territories. Therefore, Ceutí's strategy of using local knowledge to create a new attraction for visitors is a good practice for places where the local culture is strong in empowered local communities that have lived and grown in the territory. This approach supposes an advance in the cultural POIs of Ceutí when showing them in the media with its new contents. In addition, this type of content is very useful for cities and towns where the main visitors are people from the same region and country. On the one hand, anecdotes and local stories that include areas of the town and local, regional, or national knowledge are more attractive for users linked to the area because they have prior knowledge to enjoy the content and feel more interested in this type of information. On the other hand, the stories of artists and information provided by the residents about the process of creating pieces of art that the visitor can simultaneously observe are better for people who do not reside in Ceutí, such as the case of Torregar, a Mural painter who participated in introducing his mural and art studio;
- Digitalize the intangible heritage: According to other European projects such as Brandenburg [67], Ceutí needs to digitalize its intangible heritage, so Be Memories has built a digital documentation of local folklore to use it as a tourism content to explain the outdoor museum at the same time as digitalizing the intangible heritage so that it survives over time.

Regarding the generation of Smart POIs, it is necessary to emphasize that the Be Memories design principles are focused on promoting the physical visit to the POIs; for that reason, specific content for a POI is delivered and available only when people are near the POI; that is, Smart POIs build a local network around 20 m from the POI to create this geo-target. Thereby, POIs are promoted in their location since Smart POIs allow an augmented version of the POI based on media content and additional meta-information to be provided. This content is unique since the videos are not available on social networks or public channels, such as YouTube, so it is not feasible to consume them before attending the POI and consequently, it does not replace the POI's visit. As mentioned, to access the content of Be Memories, it is necessary to be in front of a POI.

According to a previous project called TreSight (TreSight video presentation: https://vimeo.com/131875612TreSight video presentation: https://vimeo.com/131875612) [56], the comparison indicates that the use of smartphones, as the only device required to enjoy a tourist experience, has better results when motivating participation. Moreover, the Open Data trends, which are addressed by Trento's project, will be the next step to be incorporated into Be Memories, as a system to recommend and personalize the user experience. At the same way, the research of Smart Wine Route Ribera del Duero presents a strong idea of smart routes, but the need to download an application to experience the route could be a problem for users, as the analysis of surveys shows. For that reason, the use of progressive Web-Apps could be a good solution for this problem, such as that which Be Memories proposes.

6. Conclusions and Next Steps

The pillars of sustainability (economic, environmental, and sociocultural) are the focus of the new strategies of cities. The importance of the term influences the development of smart cities and smart tourism destinations because both are based on the idea of building strategies with sustainable and smart approaches to improve the city, using the available resources and opportunities.

During the research on the main fields, it can be observed that there is a growing need for new ICT solutions for smart tourism destinations because the new digital visitors use the new technologies to plan and enjoy travels and visits. According to a previous project and research on technological tools for tourism, several findings have been highlighted to develop the first artifact of the project:

- The use of wearables and audio-guides supposes a problem for the visitors as external devices. It is advisable to develop tools to use with the user's smartphone, as the main device for visitor interaction;
- Big Data allows the user experience to be personalized, such as the case of TreSight [7];
- The creation of smart routes is a good way to offer cultural POIs, such as the case of the Smart Wine Route [57];
- The smartphone-oriented solutions should be of interest to the tourism business, tourist agents, and local managers because the smartphone is the best channel through which to engage visitors.

For that reason, this research presents an artifact that uses the opportunities of ICTs to provide a sustainable and smart solution for smart tourism destinations. The tool is composed of a device called a Smart Spot [8], which transforms the POIs of a city into Smart POIs. These smart areas allow the user's to connect through the smartphone, receiving information about the POI without the need to download a native application. The Smart POIs interact with the users through Wi-Fi (captive portal) and Bluetooth and GPS (Physical Web).

To test the artifact in a real environment, the research has adapted the solution to Ceutí, analyzing the product value. To build the final prototype, the needs and interests of Ceutí have been studied. The results of the research are:

- They need to promote the municipality between the region and country to be interesting for the new digital tourism/visitors through new approaches, tools, and activities;
- The residents have an important role in the town, so the project worked with the different communities of the town to enhance the image of the local culture for the residents and external visitors. For that reason, the Ceutí culture has to be digitized, adapting it to the new younger visitors as part of the final prototype;
- The main profile of the Ceutí culture and tourist offer is the visitor who spends a day (Sunday), goes sightseeing, and enjoys the local gastronomy. As one-day visitors, they usually live near Ceutí (in the Region of Murcia and adjacent cities/towns);
- The foreigners who visit Ceutí represent a small group and they usually go to the caravan park of the municipality. In addition, the second foreign source of visitors are emigrants who went to other countries years ago and return to visit their family on holidays;

- The strong tourism seasons in Ceutí are the winter and autumn, but in the summer, the number of visitors increases due to the local festivities being one of the main attractive events for regional people in the interior regional area (without coasts).

Furthermore, after the study carried out the design and validated the first artifact of Be Memories, the research also emphasized the opportunities of intangible heritage and communities' potential, as mentioned in previous town projects, such as SPAHCO [65] and iBrave [64].

Moreover, through meetings with the city council and an analysis of the target public, the research defined the following conclusions:

- Original content, created by the communities of residents, is more attractive for the new digital visitor (Millennials, Z Generation, and #Generation);
- Intangible heritage has a high value as a cultural offer for cities and towns to build a local brand;
- Communities of residents have a high interest in participating in and collaborating with their municipality;
- Most visitors to Ceutí are inhabitants from the Region of Murcia;
- The main reason for adults visiting Ceutí is sightseeing;
- The younger visitors are not interested in the local gastronomy;
- The main tool used by respondents during their visits is the browser on their smartphones (Google Chrome and Safari). Most of them do not download tourism apps.

Therefore, according to these results, the first artifact was evolved into a final prototype to test in Ceutí and was named Be Memories. The prototype has been tested in Ceutí with 15 Smart POIs deployed, connected to the local Wi-Fi and lighting of Ceutí's outdoor museum. They were configured to send, through Wi-Fi, and complementarily by Bluetooth and GPS, a URL of a progressive Web-App that contains short video-interviews, where the residents tell stories about the cultural POIs of the town. These videos were seed content to test Be Memories and to motivate new participation. At the same time, a dissemination campaign of Be Memories was conducted through a Facebook page and posters/flyers distributed between local commerce and walls.

The analysis of the trial results was based on the data obtained of the main Smart POI located in the city council square during the local festivities (from 6 to 19 August). The results showed that the solution has great potential because user participation was high. More than 400 users accessed the Be Memories Web-App and they saw the video-interviews, achieving 30 users per day. In addition to this, other national cities, such as Mula and Cartagena, and at the international level, such as Bristol, have shown interest in deploying Be Memories. At the same time, the tool received the European Cultural Heritage Year label by the European Commission as a solution that enhances the intangible heritage of cities. Thereby, Be Memories achieved the objective proposed in this work: to build a scalable innovative communication channel that provides agile experiences and disseminates the culture of a city through the communities' participation (sustainable cycle of content).

Through Be Memories, Ceutí is growing as a smart tourism destination and its tourist offer is appearing in different regional and national media and events, promoting the town from the power of intangible heritage and new technologies. The number of visitants who ask for information in the tourism office has augmented due to the Be Memories deployment. This tool has helped the local guides (residents as "museum friends" and professionals) to show the different POIs among the visitants, providing a new innovative method which empowers the value of the town. The co-creation aspect of the tool has improved the communication between the different ideological communities. In addition, the Be Memories project supposes a development based on the sustainability of tourism. For that reason, it has increased the sociocultural value of the town through the community's cooperation and dissemination of the cultural value between visitors and residents. Furthermore, the project also covers the other two pillars of sustainability. The economic sector, as a more complex line of study, is difficult to improve in a short period, but Be Memories has augmented the number of visitors who search for activities and POIs in Ceutí. Lastly, according to the environmental aspect of sustainable

smart tourism destinations, the deployment of digital tools reduces the use of natural resources with the help of ICTs. In addition, the infrastructure of Smart Spots, as IoT devices, presents infrastructure to measure and control environmental parameters, such as the air quality, particle matter, and noise, reducing the cost and time required to control them [8].

The next steps of Be Memories are promising. As a technological tool, the HyRA algorithm [59,60] will be included in the tool to personalize new routes for the users. In addition, Open Data about the city and environment will improve the recommendations through artificial intelligence. Regarding the user experience, Be Memories will be tested with the Bristol residents and visitors through the ICT Flame. The project will analyze the user experience to understand the strengths and weaknesses of Be Memories in new areas. Lastly, with the partners of the Walk a Story project, Be Memories will develop a sustainable methodology to obtain new resident stories through healthy local activities.

Author Contributions: A.G.-O. managed pilot research and the writing was managed by A.G.-O., M.C.P.-M., and A.J.J. A.G.-O. provided her knowledge about the user experience, cultural heritage, and smart tourism destination and smart cities domains, and wrote the main state-of-the-art, results, communication campaigns, discussion, and conclusions. J.A.-U. co-developed the research on the technological concepts as a smart city, smart tourism destination, and new targets, as well as innovative tools due to her experience in the ICT area, and reviewed the editing of the paper. M.C.P.-M. provided knowledge on the survey analysis and sustainable tourism, writing the results of the Ceutí visitor's profile, as well as part of the state-of-the-art, results, and discussion. A.J.J. worked on the paper due to his experience in the global smart cities and smart tourism destination area, working on the trial management and the results and discussion section.

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