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Geo-Crowdsourcing Contributions for Cultural Mapping

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ABSTRACT
Over the years, cultural mapping methods have been used in several applications and contexts, for diverse cultural assets and to create new conditions for the development of local and regional resources. These methods were inspired by the development of big urban centres and regions, which have been the great engine of cultural mapping growth. The main objectives of the present paper are to provide a literature review on cultural mapping methodologies and to develop exploratory research on crowdsource tools on creative tourism which were applied to one Portuguese municipality in 2017. The research was supported by the implementation and integration of geographic information systems (GIS) and web mapping, which will become part of the solution for the growth of less developed territories and to make more interactive tourist activities. Web mapping's contribution to enhance crowd participation was measured via analysis of 12 digital photos shared through crowdsourcing. The originality of this research lies in the attempt to develop a new model for creative tourism, trying to extend the implementation of Web Mapping crowdsourcing to deprived low density territories. Results show how public participation can be amplified for the tourism market by crowdsourcing tools. These tools look very promising since they can help several members of the public at different ages to contribute to territorial knowledge, engage in activities, and collaborate through digital tools. It is a step to fulfil the lack of studies in this subject and it contributes to the way we think about future studies.

Keywords: web mapping, crowdsourcing, creative tourism, visitors' perceptions

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1. INTRODUCTION

In recent decades cultural tourists have become more demanding regarding the quality of existing tourist destinations' offers. They now require more direct contact with the culture of the community or territory through creative activities. Consequently, existing tourist destinations, mainly small cities, and rural areas, need to attract more visitors, enhance value and promote tourism resources, and create more innovative, differentiating, and authentic tourist products. Tourism is a main driving force to improve innovation. Yet filling the research gap can demonstrate how tourism innovation can be efficiently put into practice (Ali & Frew, 2014; Hjalager, 2006). Thus, it is necessary to develop creative and innovative projects to contribute to the development of creative cultural tourist destinations where some technologies can help in this endeavour (Kim & Canina, 2015; No & Kim, 2015). Technology is important for the development of a smart tourism ecosystem, particularly when creating new business models (Gretzel, Werthner, Koo, & Lamsfus, 2015; Werthner, Koo, Gretzel, & Lamsfus, 2015).

Creative tourism is a new segment of tourism aiming to create more attractive destinations through genuine and authentic activities in which the visitor can emerge and co-create. This approach to tourism will develop, enhance, and promote existing tourist resources and destinations through activities, initiatives, and creative and innovative projects carried out by institutions linked to culture and creativity.

Visual tools as an alternative for qualitative studies have largely increased in recent years (Hao, Wu, Morrison, & Wang, 2016). At the same time, content analysis of shared geotagged photos is experiencing an upward trend in tourism research (Hao et al., 2016), and more research is needed to amplify its potential for research and planning activities. Methods that use photography for data collection are also growing as photos can "overcome linguistic barriers between the researcher and the researched" (Gotschi, Freyer, & Delve, 2012, p. 229). Participatory Photo Mapping, which is one way to integrate digital photos and participatory research (Dennis, Gaulocher, Carpiano, & Brown, 2009), can be useful for researchers, policymakers, practitioners, and community stakeholders as an alternative to the traditional survey methodology. The proliferation of mobile devices contributes to mobile social network development (Kim, Lee, & Contractor, 2019; Lee, 2016), particularly Instagram (Dorsch, 2018). In addition to social network development, more studies are needed to understand the role of geolocation technologies in the promotion and motivation of visitors to cooperate in these activities.

The main objective of creative tourism is to provide visitors with a new experience and expose them to different cultures (Richards, 2003). According to Richards (2011), the concept of creativity has been intensely discussed, with a variety of definitions as the meaning varies according to the considered societies, people, and cultures (Klausen, 2010). The CREATOUR project (Creative Tourism Destination Development in Small Cities and Rural Areas), implemented to better understand creative tourism, started in 2016 and will end in April 2020. It is funded by the joint activities of the Portugal 2020 Program, COMPETE2020, PORLisboa, PORAlgarve, and the Portuguese Foundation for Science, Research and Technology. Cultural mapping, one of the dimensions of this project, is used to map initiatives in low density territories and develop exploratory research on crowdsourcing photos. Crowdsource mapping is an emergent technology that has been tested in the tourism context and during creative initiatives.

The present paper aims to share the results of exploratory research on crowdsource tools on creative tourism and discuss cultural mapping methodologies. Primary data were collected in 2017 from a case study located in the northwest region of continental Portugal: the municipality of Amares.

Crowdsourcing tools were used to interact with *Encontrarte Amares* visitors using public information from the ArcGIS Online platform, which tracks social media activity in real time. A web mapping application was envisaged to facilitate the location of the events in space (GIS) and time (schedule) while simultaneously collecting visitors' vision and perception of the events by allowing them to upload a picture that researchers can analyse later.

This paper is structured in four sections. The first section addresses the literature review of the concept and evolution of cultural mapping as well as the main international studies, the relationship between cultural mapping and creative tourism, and the cultural mapping process. The second section presents research methods, while the results are discussed in the third section. The article concludes with the main final considerations in the fourth section.

2. LITERATURE REVIEW

2.1. Definition of Cultural Mapping and Main International Studies

Ali and Frew (2014) asserted that information and communication technologies present an innovative approach to creating sustainable tourism development based on a management perspective of local destinations. Specific attention

is focused on how tourism destinations use the various forms of technology to address the positive and negative impacts of tourism.

Cultural mapping is an interdisciplinary methodology (Redaelli, 2019) and a process of collecting, recording, analysing, and synthesizing information to describe the cultural resources, networks, links, and patterns of usage of a given community or group (Creative Cities Network, 2010; Freitas, 2016). It consists of an exercise and an autonomous resource or part of cultural planning and assessment needs. It maps projects that can involve community creativity and practice-based artistic interventions through artistic forms (Evans & Foord, 2008).

Duxbury, Garrett-Petts, and MacLennan (2015b) identified five main mapping trajectories: community empowerment and counter-mapping (a map-making process whereby communities make their own maps as alternatives to formal ones) (Peluso, 1995), policy, municipal governance, mapping as an artistic practice, and academic inquiry. Traditional cultural mapping methodologies focus on tangible resources (Duxbury, 2016). Meanwhile, UNESCO (2011) has recognized that intangible culture is also a relevant component; intangible culture is not only manifested as heritage and tradition, but also has a contemporary element. The intangible cultural heritage must be recognized when communities, groups, or individuals create, maintain, and transmit it (Jeannotte, 2016). The intangible cultural heritage is considered "a main spring of cultural diversity and a guarantee of sustainable development" that is being "constantly recreated by communities and groups in response to their environment, their interaction with nature and their history" (UNESCO, 2003, p. 1).

Cultural mapping is a way of devising initiatives in creative tourism. There are two types of cultural mapping: (a) asset mapping, which provides information about identities and records of tangible cultural resources using GIS, and (b) community identity mapping, for exploring intangible cultural resources based on inhabitants' stories, traditions, and sense of place in low density areas (Evans, 2015).

This process is relevant to inform planning, increase community awareness, and support cultural sector development and individuals' communication (Hu, Zhao, & Huang, 2015; Smith, Men, & Al-Sinan, 2015; Zha, Yang, Yan, Liu, & Huang, 2018). Informing innovation planning deals with future planning and decision-making, creating scenarios and sustainable bridges. Increasing community awareness supports the marketing and promotion of these assets to both residents and visitors/tourists. Finally, cultural sector development strengthens networks and collaboration across a wide range of cultural groups and activities (Duxbury, Garrett-Petts, & MacLennan, 2015a; Gibson, Brennan-Horley, & Warren, 2010).

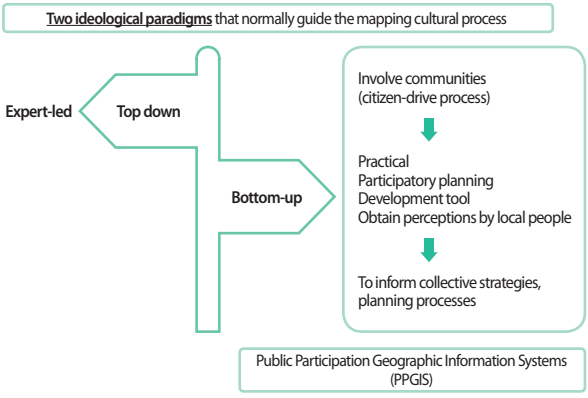

Fig. 1. Two ideological paradigms in the mapping cultural process. PPGIS, public participation geographic information systems. Authors' own elaboration taking into consideration Bonsón et al. (2015), Duxbury et al. (2015b), and Plieninger et al. (2013).

Fig. 1 highlights the two main ideological paradigms that normally guide the cultural mapping process: One is a top-down paradigm (i.e., led by experts) while the other is community-based (bottom-up) (Reed, Fraser, & Dougill, 2006). The distinction between these two types of paradigms lies in a set of characteristics that will define a line between a scientific reduction approach that uses quantitative indicators and an approach based on qualitative criteria linked to the social sciences. In the top-down approach, experts use indicators to quantify the multiple dimensions of reality being addressed, but concerns with stakeholders are not normally considered in this approach. It is driven by a concern for efficiency, results, and instrumentality (Freitas, 2016).

The bottom-up approach is based on a participatory philosophy incorporating many characteristics which emphasize the importance of understanding the local context to set goals and priorities. Top-down approaches are generally referred to as being management led, with a primary focus on increasing output efficiencies, whereas bottom-up approaches are more decentralized and focus on addressing the specific concerns of local communities and assessing the impacts of policy measures on these concerns. Bottom-up approaches are more integrated with several sectors, examining the processes, results, and impacts. It is guided by holistic perspectives and encompasses the purposes of empowerment and participation. Social computing is rising and is affecting both tourism demand and supply (Sigala & Christou, 2014).

Following this approach, mapping is a practical tool for the community to ensure sustainability. However, bottom-up approaches often have no influence because politicians ignore

their results, especially if they do not converge with macro-level approaches and development models. Given their complexity, bottom-up approaches experience more difficulty in mapping contexts altogether and tend to focus on the local level whereas top-down approaches can generalize from a set of indicators and capture larger dimensions of the reality of the territory (Bonsón, Royo, & Ratkai, 2015; Duxbury et al., 2015a; Freitas, 2016; Plieninger, Dijks, Oteros-Rozas, & Bieling, 2013).

Over the centuries, stories and oral maps have been closely connected. Cartographers used the stories of travellers and explorers to fill in the blanks on maps or develop base maps (Caquard, 2013). In fact, maps were used to represent or describe space while map elements enabled a personalization of the description of geographic information. It is essential to portray this knowledge of the world to share information about what the world of people was like and what limitations and boundaries existed (Caquard & Cartwright, 2014).

In its modern form, cultural mapping was first used by geographers in the Canadian and Alaskan Arctic during the 1960s to help indigenous peoples express their knowledge of natural and cultural resources and describe this knowledge on maps, often linked to GIS (Crawhall, 2009). Recent maps use new spatial representation technologies to locate and trace personal, collective, or a bit of both types of stories. Users (individual or sometimes collective) can easily add annotations related to their individual experiences on the map. The maps are useful not only for cartographic expressions, but also for illustrating our memories through annotations or comments (Caquard & Cartwright, 2014).

Mapping personal stories with online cartography is a popular activity because of the substantial number of Google Maps users who retrace individuals' journeys. The story maps of individuals who have experienced tragic life events, such as forced migration and accidents, can serve many purposes beyond simply locating a chain of events (Caquard & Cartwright, 2014). At the individual level, mapping can serve as a therapeutic and curative process (Coulis, 2010), whereas at the collective level, maps can leave cartographic traits, making these experiences more visible and more tangible. The cartography of these stories can be a form of itinerary sketch maps (Del Biaggio, 2013), ranging from artistic representations of more personal and emotional dimensions to traffic situations (Fischer, Houbey, Moreau, & Mekdjian, Amilhat-Szary, 2013). In addition, technology increasingly affects everyday life (Edensor, 2001) and requires new thoughts to understand the links between technology's contributions to place development and emotions measurements.

Since the 2000s, cultural mapping and planning have been widely adopted and applied in the strategic development of cultural activities, facilities, and resources for existing and new communities. These have produced more systematic approaches to capturing cultural goods, particularly in response to regeneration, notable events, population growth, and diversity (Evans, 2015). In fact, nowadays researchers' work cannot forget the dimensions of affect and emotions (Griffiths, 2015, p. 13). In this case, technology—particularly the so-called on-screen tourism—is understood as a dynamic phenomenon that permits the creation of new opportunities, interpretations, and meanings to transform a place (Lundberg, Ziakas, & Morgan, 2018).

Today's maps are flexible tools for the construction of knowledge as well as platforms that provide more dynamic information. According to MacEachren and Kraak (1997), a major shift towards a new emphasis on map utilization recognizes the difference between exploring the unknown and the known. This new form in the visualization of the unknown recognizes the private and specialized use of mapping. Therefore, mapping researchers need a broad set of search methods, particularly in terms of visitors' engagement. This article gives relevance to the qualitative options within the broader set of methods (Suchan & Brewer, 2000) that also include crowdsource participation for mapping and their use.

In recent investigations, cartographers have repeatedly sought "the best map" to present information to a large audience. Yet instead of a large audience, mapping researchers can now study, for example, small groups of scientists using domain-specific knowledge to form new mappings of their data. The process is very interactive, and the maps produced are temporary. In addition, from these new points of view, researchers have developed hypotheses or understood the unknowns of representations of their data (MacEachren, 1995) as the Internet transforms the world (Neidhardt & Werthner, 2018).

In the literature, studies have used maps to better understand how a narrative is placed in geography and how geography has informed or influenced an author or how the narrative has "blocked" a landscape. The maps are used not only to decipher and geolocate features on the ground, but also to tell stories. The power of narrative maps has been widely explored by writers and filmmakers (Remoaldo, Ribeiro, Lopes, & Silva, 2017). These "inner maps" (Ryan, 2003) appear in movies and novels and ground the story in real places to help the public follow the plot. The narrative power of maps has also been exploited by journalists, scholars, and activists and applied to support tools in their investigations to assist in developing arguments about places. In other words, the potential for maps to decipher and tell stories is virtually unlimited (Caquard & Cartwright, 2014).

Table 1. International studies about cultural mapping methodologies

Research topic	Year	Author(s)	Title of article or chapter	Main objective of research	Area of application in the territory (urban and rural areas/country)
Qualitative GIS	2000	(Suchan & Brewer, 2000)	"Qualitative methods for research on mapmaking and map use"	Discusses a number of qualitative methods for creating maps and for their use.	Urban and rural area/ USA
	2010	(Gibson, Brennan-Horley, & Warren, 2010)	"Geographic Information Technologies for cultural research: Cultural mapping and the prospects of colliding epistemologies"	Discusses the potential of the application of geographic information technologies in cultural research.	Urban areas/Australia
	2014	(Presner, Shepard, & Kawano, 2014)	"HyperCities: Thick mapping in the digital humanities"	The authors put into practice the theory of digital humanities to trace the proliferation of cultural records of places around the world.	Urban areas/USA, UK, France, Italy, and Germany
	2015	(Kellett & Panofsky, 2015)	"Cultural mapping and the digital sphere: Place and space"	It examines various Canadian cultural works and the technological advances that facilitate these interdisciplinary collaborations.	Urban areas/Canada
Intangible and emotional mapping	2012	(Shakeela & Weaver, 2012)	"Resident reactions to a tourism incident: Mapping a Maldivian emoscape"	The dynamics of the enclave are suggested as an explanation for the paradox of the great resident defence of tourism in a destination that includes the dynamics of the periphery of classic pleasure.	Rural area/Maldivian
	2013	(Graybill, 2013)	"Mapping an emotional topography of an ecological homeland: The case of Sakhalin Island, Russia"	It explores and analyses the narratives about the emotions expressed about ecologies and resources from the point of view of the natives.	Urban and rural area/ Russia
	2016	(Longley & Duxbury, 2016)	"Introduction: Mapping cultural intangibles"	Talks about cultural mapping.	Urban and rural area/ country not specified
	2017	(Pánek & Benediktsson, 2017)	"Emotional mapping and its participatory potential: Opinions about cycling conditions in Reykjavík, Iceland"	"It presents a case study from Reykjavík, Iceland, where a simple 'emotional mapping' platform was used to enable cyclists to express their emotional reactions on routes and places."	Urban and rural area/ Iceland
Participative cultural mapping approaches	2007	(Perkins, 2007)	"Community mapping"	It takes a contextual approach through five contrasting case studies to assess the significant shift in community mapping.	Urban and rural area/ England
	2009	(Dodge, Perkins, & Kitchin, 2009)	"Mapping modes, methods and moments. A manifesto for map studies"	It outlines routes and methods that can help people map in a different and more productive way that is more efficient, democratic, sustainable, ethical, or even fun.	Urban and rural area/ country not specified
	2015	(Romeiro, 2015)	"Mapping the intangibilities of the historic centre of Porto: ParticipA(C) TION (and its challenges) in cultural mapping projects"	It highlights the projects of cultural mapping as a strategy for urban development.	Urban area/Portugal
	2016	(Duxbury, 2016)	"Cultural mapping – towards more participative and pluralist cultural policies and planning?"	"It gives an overview of this emerging field, indicates some of the objectives and problems with which researchers are currently involved, and offers questions and suggestions to guide efforts to establish closer links with policy and cultural planning domains."	Urban and rural area/ country not specified
Cultural mapping in rural areas	2005	(Harrington & Stevenson, 2005)	"Islands in the Salish Sea: A community atlas"	Mapping communities.	Rural area/Islands
	2013	(Love, 2013)	"Treasure hunts in rural Japan: Place making at the limits of sustainability"	It describes community mapping, two of which emerged as a folk technique of sustainable development in early 20th century Japan.	Rural area/Japan
	2015	(Ashton, Gibson, & Gibson, 2015)	"By-roads and hidden treasures: Mapping cultural assets in regional Australia"	It brings together project researchers, cultural critics, and creative industry arts figures to talk about culture and its connection to the community, particularly in isolated circumstances.	Rural area/Australia
	2016	(Roberts, 2016)	"Deep mapping and spatial anthropology"	Exploring the topic of deep mapping.	Rural area/country not specified
Augmented reality and mapping	2013	(Kaplan, 2013)	"Mapping ararat: Augmented reality, virtual tourism, and Grand Island's Jewish ghosts"	Mapping Ararat is a project that uses augmented reality to create an imaginary scenario from which it transforms Grand Island, New York, into Ararat, a city of refuge for the Jews.	Urban area/USA
	2013	(Freeman, 2013)	"Border memorial: Frontera de los Muertos"	Frontera de los Muertos is a public art project of augmented reality and memorial dedicated to the thousands of migrant workers who have died along the American frontier in recent years. This project enables people to see the extent of the loss of life by marking each location where the human remains have been retrieved with an object or virtual magnification.	Rural area/México
	2015	(Förster & Metzger, 2015)	"Time window Weimar": Students map their town's history through augmented reality"	It presents an application that locates the age of modernity in the urban space through visible evidences and intangible histories.	Urban area/Germany
	2015	(Sullivan & Wendrich, 2015)	"Time, aggregation, and analysis: Designing effective digital cultural mapping projects"	It talks about the importance of the development of projects of digital cultural mapping.	Urban area/Egypt
Cultural mapping in a tourism context	2012	(Rossetto, 2012)	"Embodying the map: Tourism practices in Berlin"	The case study of the German capital is used to represent the concept that tourists can experience a flirtatious, intentional, and enriching encounter with the habitation of their destinations rather than passively represent cartographic representations.	Urban area/Germany
	2014	(Dhami, Deng, Burns, & Pierskalla, 2014)	"Identifying and mapping forest-based ecotourism areas in West Virginia – Incorporating visitors' preferences"	Map and identify forest-based ecotourism areas in West Virginia, including visitor preferences.	Rural area/USA
	2015	(Scherf, 2015)	"Beyond the brochure: An unmapped journey into deep mapping"	Discuss travel and deep mapping.	Rural area/Canada
	2016	(Chua, Servillo, Marcheggiani, & Moere, 2016)	"Mapping Cilento: Using geotagged social media data to characterize tourist flows in southern Italy"	It describes an approach to analyse geotagged social media data from Twitter to characterize the temporal, spatial, and demographic characteristics of tourist flows in Cilento, a tourist attraction in southern Italy.	Urban and rural area/Italy

GIS, geographic information systems.

The cartographic view is obtained from two perspectives. In the first, maps are used to represent the spatial structures of the stories, and the resulting associated cartographic projects are used to locate the elements of all kind of stories (fictional or factual). We also address mapping of indigenous oral stories, the cartographic representation of places of fiction that appear in novels, and the mapping of a tragic event with deep emotional dimensions. Meanwhile, the second perspective refers to the narrative power of the map. This narrative is associated with geolocated photos. There is a need to map the community so that one can appreciate the power of the application of the narratives and improve the entire mapping process (Caquard & Cartwright, 2014).

Several studies have explored cultural mapping methodologies, examining qualitative GIS (Gibson et al., 2010; Kellett & Panofsky, 2015; Presner, Shepard, & Kawano, 2014; Suchan & Brewer, 2000), intangible and emotional mapping (Graybill, 2013; Longley & Duxbury, 2016; Pánek & Benediktsson, 2017; Shakeela & Weaver, 2012), participative cultural mapping (Dodge, Perkins, & Kitchin, 2009; Duxbury, 2016; Perkins, 2007; Romeiro, 2015), cultural mapping in rural areas (Ashton, Gibson, & Gibson, 2015; Harrington & Stevenson, 2005; Love, 2013; Roberts, 2016), augmented reality (Förster & Metzger, 2015; Freeman, 2013; Kaplan, 2013; Sullivan & Wendrich, 2015), and cultural mapping in a tourism context (Chua, Servillo, Marcheggiani, & Moere, 2016; Dhami, Deng, Burns, & Pierskalla, 2014; Rossetto, 2012; Scherf, 2015) (Table 1).

The qualitative GIS studies relate to quantitative data, GIS, and culture. Between 2000 and 2015, the studies have increasingly developed these themes. Qualitative GIS investigations were directed to urban areas. Meanwhile, the studies on the mapping of the immaterial and emotional are more directed to the two types of areas, rural and urban, because they work with inimitable resources, cultures, traditions, and local communities. Although this theme addresses urban and rural areas, the focus is on rural areas, where there are still very old traditions that are lost in time. For this reason, the authors have done studies on the mapping of intangible heritage in rural areas. Studies on the participatory cultural mapping approach use mapping techniques to analyse territories and their local communities in rural and urban areas.

Table 1 shows that the studies on cultural mapping in rural areas try to show what exists at the cultural and patrimonial levels. Some local traditions in rural areas have been losing relevance, and the studies carried out can support these territories. Cultural mapping studies in the context of tourism are important because they can help identify the resources of the site, support visitors when they move to their destination, and help define strategies by parts of the territory planners. Yet very few studies of cultural mapping methodologies have been conducted in Portugal (Table 1). As such, this area needs more studies to define new methodologies for urban and rural areas.

Of the studies developed around the world concerning cultural mapping and technology approaches, none have focused on new geospatial technologies. Emergent crowdsourcing tools have been recognized as crucial for new forms of interaction between visitors and organizers. This exploratory research discussed how crowdsourcing tools can be used in creative tourism niches.

According to Evans and Foord (2008), cultural mapping, as an exercise and autonomous resource or as part of a process of cultural planning, needs more research and assessment. The current article responds to this political challenge by presenting a flexible approach to capture community cultural goods, needs, and aspirations. It is supported by a set of techniques for mapping projects that can engage community creativity, resistance movements, and art-based interventions in practice in art forms (Evans, 2015).

2.2. Cultural Mapping Methodologies (Web-Mapping Crowdsourcing) and Application to Creative Tourism

In this sense, the use and sharing of geolocated entities are changing very fast, particularly with the development of web applications, which allows for the creation of new forms of acquired data from cultural resource types and sub-types, primarily by capturing individual perspectives. Although GIS and web-mapping applications are growing faster and allow for the representation of the complex reality simplifying reading formats, it can provide good support for local communities,

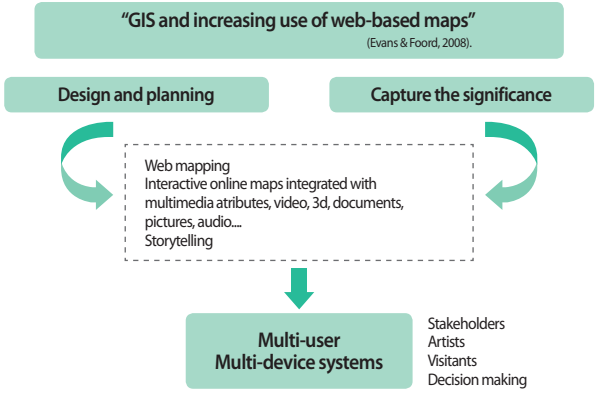

Fig. 2. Methodology used in the elaboration of a web map. GIS, geographic information systems. Authors elaboration taking into account several authors ideas Evans and Foord (2008), Duxbury et al. (2015b), and Aguirre-Munizaga et al. (2018).

governments, and visitors. Indeed, new research approaches are needed to identify such opportunities.

The application of GIS to map and visualize complex and interrelated data can be a powerful technical tool for planning (Ribeiro, Remoaldo, & Gutiérrez, 2014) and, more recently, for cultural planning. This can operate on a large scale or at local scales. According to Batty, Dodge, Jiang, and Hudson-Smith (1998), urban design is small enough for many urban users to feel its impact. It is quite broad in its influence on the affected hence the public always has a vision of how this can be better performed. It is much less abstract than the urban planning on larger and more populist scales when compared to architectural design, which is far from those without artistic and engineering training (Evans & Foord, 2008).

In an increasingly global society, where the availability and speed of information are increasing, and technology development plays a key role, more research is needed (Aguirre-Munizaga et al., 2018; Pereira, Otón, Cotos, & Remoaldo, 2018). There is an increasing and perfect relationship between geographic information and new forms of access to information such as through web mapping or virtual reality in tourism (Graham, 2016; Ribeiro et al., 2018).

Today's tourism industry is intrinsically related with social media, as it is very common for tourists to share their travel diaries using geotagged photos on online platforms (Facebook, Instagram, Flickr, and YouTube). Indeed, new research studies are emerging based on the large amount of multimedia data, such as photos and videos, being posted every day (Leung, Vu, & Rong, 2017). Researchers can interact with tourists via this important data source, without contacting them directly. Tourists' destination photos can share a great deal about their perceptions, patterns, and interests without any time, meteorological, or spatial restrictions. Ultimately, researchers and planners can access an original picture taken from tourists' perspectives (Leung et al., 2017).

Crowdsourcing can link GIS and geotagged photos. Due to the potential for planners or tourist event organizers, several studies have recently been implemented (García-Palomares, Gutiérrez, & Mínguez, 2015; Hardy et al., 2017; Leung et al., 2017; Lopes, Remoaldo, & Ribeiro, 2018; Önder, Koerbitz, & Hubmann-Haidvogel, 2016; Zheng, Zha, & Chua, 2012). Yet future research should explore other social media sites and analyse photos' contexts to understand tourists' interests and their activities at attractions; such research should focus more on each individual's perspective on specific activities (Leung et al., 2017; Werthner, Alzua-Sorzabal, et al., 2015). The current paper, in addition to being an exploratory research project, seeks to address these challenges.

3. METHODS

Considering the increasing prevalence of new crowdsourcing tools (Dorsch, 2018), we conducted exploratory research using primary qualitative source data. A web mapping application with crowdsourcing capabilities (geolocation) was developed for one Portuguese municipality (Amares in the northern region of Portugal), targeting creative tourism events.

A crowdsourcing map was prepared for the *Encontrarte Amares* event that occurred 27-30 July 2017 in the Amares municipality. In this annual event, artistic experimentation, the territory, and visitors share unique experiences. The events are spatially diverse within Amares, and organizers provided the researchers with a list of locations for 15 activities. The locations were geocoded by geographic coordinates and attributes, and a schedule (data, time, and type of activities) was added.

The web mapping methodology can be summarized in four steps: (a) gathering information gathering about the sites of *Encontrarte Amares* activities; (b) surveying and geocoding the places where different event activities take place; (c) creating an attribute database; and (d) putting the database on an online platform. This web mapping was prepared with ArcGIS online platform using the Public Information web application that tracks social media activity in real time. The web application included a tool through which the visitor could take pictures of the event and share them through the app. The event organizers used Facebook to share the tools with locals and visitors. Data for this research were collected from photos uploaded during the event to the application.

4. RESULTS AND DISCUSSION

The use of geotechnologies is rising in several contexts of society. Tourism is no exception, despite the lack of research concerning new tools such as crowdsourced web mapping. In fact, visitors do not have the training necessary to manipulate complex databases in GIS environments. Yet their contributions can be a very important tool for planning, and crowdsourced mapping can be a way to promote visitors' enrolment in a straightforward way (Pe-Than, Goh, & Lee, 2017).

Crowdsourcing can be understood as a set of techniques to create datasets from large groups of users who are not organized to share their content. Enabling users to generate their own content is not a new idea. It forms the basis of a large part of group psychology and problem solving (Hudson-Smith, Crooks, Gibin, Milton, & Batty, 2009), but using their contribution regarding a particular event to understand their perceptions

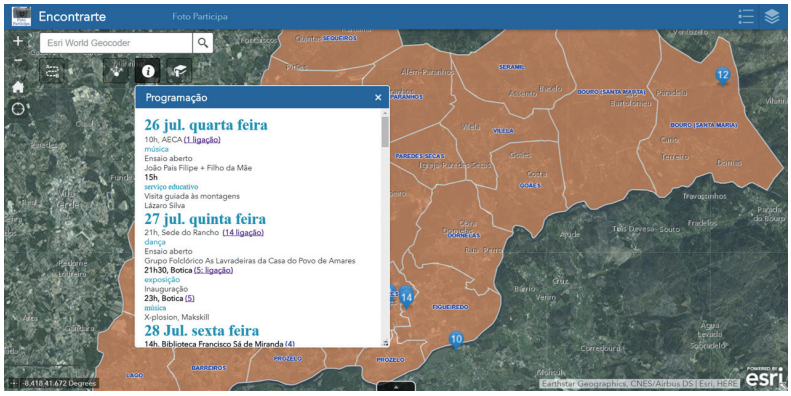

Fig. 3. Front page and event program schedule.

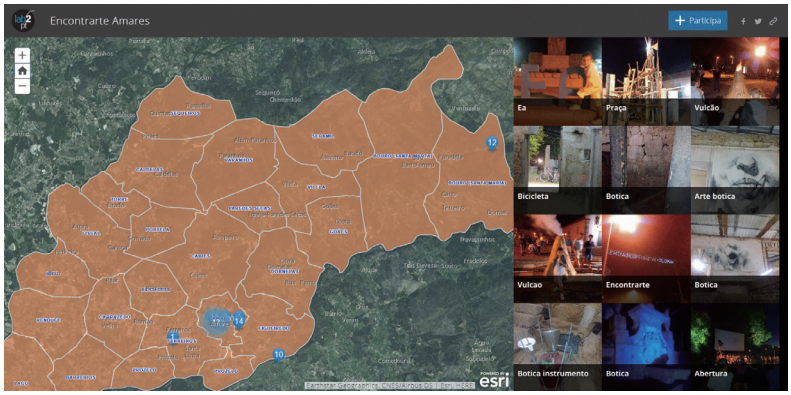

Fig. 4. Crowdsourcing tool with visitors' picture albums.

is very promising. This is relevant when we are talking about tourism geography, one of the fields offering more opportunities (De Choudhury et al., 2010; García-Palomares et al., 2015; Ruiz-Gómez, Navío-Marco, & Rodríguez-Hevía, 2018).

To test and enhance user-sourced data, a web map with a crowdsourced tool was developed for the *Encontrarte Amares* creative tourism event (Fig. 3). The front page of the app is a web map with information about events' locations and schedules that helped conciliate space and time dimensions. Visitors could use the map to locate and navigate this territory.

Collaborative geographic information systems have become an important research area, particularly in light of recent trends in geo-crowdsourcing (Akoumianakis, 2014; Sun & Li, 2016). Knowing that creative tourism events are directed to small groups of visitors (as it is a non-massified kind of tourism), we were able to make a more qualitative profile of the creative tourist who used the application. From our crowdsourcing research 12 pictures were uploaded to the *Encontrarte Amares* platform (Fig. 4).

Almost all the pictures focused on single elements, such as pictures, paintings, instruments, or buildings. Five were taken during the day while seven were taken at night; only three focused on groups of citizens. It is important to group the images according to their focus (human or natural environment, and if they focus on single elements or group elements), the period of the day, and the event during which they were taken, as well as if the individual taking the picture was a resident or visitor. As all images were geolocated, a spatial analysis could be implemented to identify clusters and individuals' perceptions. Planners could understand which physical or human elements were most valued. The picture's collected time was also recorded, providing information useful for a time analysis (Leung et al., 2017; Robinson, 2014).

This research shows the contributions of emergent geotechnologies on creative tourism activities. Despite the technology used, participants did not express difficulty using it. The emergent technology allows the creation of user-friendly and simple applications. In the meantime, it evidences research opportunities for the tourism industry that can help better understand visitors' perceptions, preferences, and perceived attractiveness of places.

5. CONCLUSIONS

The way geospatial information is produced and disseminated has faced great changes over the last years. Recently, geotechnologies have contributed to the enhancement of emerging crowdsourcing and augmented reality applications. This exploratory research exemplifies their capabilities in the tourism field. As an exploratory research effort, and using a new research approach, this study showed a very simple but at the same time powerful way to engaging individuals in collaborating and sharing their points of view on tourism events. Such an approach allows researchers and planners to analyse visitors' individual perceptions of events, and the data can be used for reframing and planning future events.

As an exploratory research project and a new research approach, this study showed a very simple yet powerful way of getting *Encontrarte Amares* 2017 participants to collaborate and share their views of the event (i.e., the type of objects and their favourite places). The *Encontrarte Amares* 2017 web mapping application enabled researchers and planners in the municipality to analyse visitors' individual perceptions of the events, and the results can be used to reshape and plan future events in the municipality.

Visitors have shown interest in engaging in technology and employing easy-to-use applications during the event. The main constraints for this research are related to the number of images collected in a crowdsourced manner due to the way the web-mapping application was explained to visitors and the lack of interest on the part of event participants to use the application. In addition, the promotion of tools was done through the social networks of the *Encontrarte Amares* 2017 event, which was clearly insufficient to attract visitors' participation.

Despite these limitations, this exploratory research served as a first step to bring these tools' capabilities into the context of creative tourism and promote the most attractive destinations for visitors. Future researchers should conduct more detailed studies on the use of new tools for cultural mapping (i.e., crowdsourced web mapping) by visitors in urban and rural areas and seek to better understand the profile of the visitor/user of the new technologies so that we can understand how they communicate with and disseminate the applications. In this way, planners and researchers will be able to analyse a significant number of photographs to complete the various bridges of participants' views of certain events in the tourism area.

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