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Progress in Wireless Technologies in Hospitality and Tourism

Abstract

Purpose

This article is a critical review of the progression of wireless technologies in tourism and hospitality since 2000. Wireless technologies are a set of ICTs involving radio transmission (such as mobile or satellite technologies) that are extensively used in tourism and hospitality but which have not yet been studied comprehensively.

Design/methodology/approach

This study is a mixed methods review combining a quantitative and qualitative approach and including a systematic review of the academic literature since 2000.

Findings

Contrary to the prevailing focus of study on mobile technologies, we open the field to other technologies (such as Zigbee or Bluetooth), and in particular highlight the large role played by satellite technology in tourism and how this is reflected in the literature. In literature reviews linking tourism and ICTs we find that excluding some journals may leave out notable aspects for any systematic analysis. Moreover our study highlights the importance of wireless technologies in a sensor-based convergence between the physical and digital worlds.

Originality/value

Our contribution is mainly twofold: firstly, we develop the literature on tourism with a better understanding of the role played by these technologies in supporting tourism and hospitality, by updating sources and research work; secondly, we take a holistic, all-encompassing approach, providing a truly comprehensive view of the literature on tourism and ICTs, in which wireless technologies have always been approached with fragmented or limited scope, lacking a all-round view.

Keywords: Wireless technologies, Tourism, Hospitality, IoT, Mobile, Satellite

1. INTRODUCTION

This paper is a review of the progression of wireless technologies in tourism and hospitality since 2000. Wireless technologies are a set of information and communications technologies (ICTs) involving radio transmission (such as by mobile or satellite), extensively used for communications, equipment networking and interoperability between organizations and functions (Buhalis & Law, 2008). Although they are gaining prominence in the world of tourism, their use in the field has not yet been studied comprehensively.

Regarding the development of ICTs, researchers have paid most attention to exploring tourist behaviour (Zhao *et al.* 2018). Connectivity has become a crucial technological issue for tourists (Tanti & Buhalis, 2017). Yet linking up the ecosystem of connectivity is a challenging task as there is no standard among practitioners, and the stages of ICT development and implementation across EU Member States vary (Buhalis & Leung, 2018). Further to mobile communications, wireless technologies are some of the newest means of guaranteeing the required seamless connectivity: short-range wireless communications technologies such as radio frequency identification (RFID) and near-field communication (NFC) (Kim & Kim, 2017) promote ubiquitous connectivity and real-time synchronization so as to create new travel experiences. And the use of beacons located on top of traditional physical signage turns signs into digital visitor guides when connected to tourists' devices via Bluetooth. Tourists are now hyperconnected and multichannel. They are connected via their mobile devices and also via a host of sensors, wearables and apparatus based on wireless technologies at all stages of their journeys (Xiang *et al.* 2015). So it is worth exploring this range of technologies configuring the hyperconnected tourist, including but not confined to smartphones.

This study provides answers to some basic research questions: How has research on tourism and hospitality evolved in recent years when dealing with these technologies? How does the literature reflect the new trends, topics and phenomena that have appeared in digital tourism as a result of wireless solutions? Our paper provides scholars and practitioners with a view of the main recent changes in tourism research linked to these technologies, analyzing strategic drivers in the trends.

This approach is moreover justified by the need to take as comprehensive a view as possible, for as Kim *et al.* (2018, p.56) state in their “review of reviews” of the academic literature on tourism, “future research endeavours could address the gap created by the uneven distribution of subjects covered by review studies in our disciplines.”

2. BRIEF LITERATURE REVIEW

The literature deals mostly with mobile technologies, which have undergone huge growth in recent years and attract more interest than wireless technologies in general. The mobile field has been closely analyzed and has recently been the subject of specific literature reviews. Reviews have been conducted by Kim and Law (2015), Liang *et al.* (2017) and more recently Law *et al.* (2018), who include only papers published in hospitality and tourism journals in 2016-2017 and therefore lack a holistic or panoramic view; and in methodological terms they mix different technologies under the “mobile” umbrella in a piecemeal way. In all events, given the large number of papers analyzing this technology, the overview in these reviews is a good picture of research and findings linking mobile technologies and tourism. However, there are cases in which the novelties in these technologies are better reflected in non-tourism journals.

There is a growing interest in satellite technologies (e.g. Wu & Chen, 2016), and in recent years we have witnessed the development and deployment of the Internet of Things (IoT) as applied to tourism (Kaur & Kaur, 2016), short-range wireless communication technologies, such as radio-frequency identification (RFID) and near-field communication (NFC) (Kim & Kim, 2017) promote ubiquitous connectivity and real-time synchronization for the creation of new user experiences. And the use of beacons located on top of traditional physical signage turns signs into digital visitor guides when connected to tourists’ devices via Bluetooth or WiFi.

Interest in WiFi is diffuse, as this is a generic technology geared to connectivity regardless of the type of data transmitted and so is less specifically applicable, as occurs with sensor-based or more short-range technologies. The literature focuses chiefly on discussing its role in connectivity in tourism-related facilities such as airports (Binh Nghiem-Phu & Suter, 2018), buses (Bagloee *et al.*, 2017), car parks or coffee shops (Sanusi & Palen, 2008), trains (Carteni *et al.* 2017) and museums and cultural heritage environments (Borrero *et al.* 2015). And given their wide availability, economic models such as social login have also recently been studied (Tanti & Buhalis, 2017).

Television is a clear example of studies being more focused on the content transmitted than on the technology as an enabler. Thus studies on the influence in tourism of images,

series or films and the message they convey are numerous: soap operas from Korea (Oh, 2014), TV shows in Ukraine (Salahodjaev, 2016), India (Tessitore *et al.* 2014) or UK series (Iwashita, 2008; O'Connor *et al.* 2008), medical and cosmetic tourism (Lazar & Deneuve, 2013), artistic tourism (Lim & Bendle, 2012) or religious travel (Terzidou *et al.* 2018) are the most widely studied examples. We found even meta-analysis and a degree of theoretical development emerging from about 2008.

3. METHODOLOGY

This study's main aim is to explore the inroads made in the literature by wireless technologies in tourism and hospitality in the period 2000-2018. Our study is a mixed methods review (Kim *et al.* 2018) combining a quantitative and qualitative research approach and including a systematic literature review.

In pursuing our study objectives we followed the recommendations of Aguinis *et al.* (2018) for methodological improvement of study transparency, and the steps, decisions and value judgements made. The process followed is summarized in table 1 below.

Table 1. Process for identifying journals, papers and content to include in a literature review study

Source: adapted from Aguinis *et al.* (2018)

In methodological terms, we use a systematic approach to cover all "wireless" technologies: we review the radio spectrum from very low frequencies (VLF 3-30 kHz) to super-high frequencies (SHF 3-30 GHz) so as to provide a broad picture of all wireless technologies and their applications in tourism (ITU-R, 2015). Thus our paper includes all the implications for hospitality and tourism of broadcast techniques, RFID and wearables, beacons, radio, NFC, television, Bluetooth, microwaves, Zigbee (as well as other technologies involved in the Internet of Things and the "smart" phenomenon), along with mobile and satellite communications, as set out in table 2.

Table 2. Wireless technologies considered

Source: Prepared by authors. Based on International Telecommunication Union Recommendation V.431 (ITU-R, 2015). Low frequency (LF), Medium frequency (MF), High frequency (HF), Very high frequency (VHF), Ultra high frequency (UHF), Super high frequency (SHF), Extremely high frequency (EHF).

We used the Web of Science (WoS) core collection database as our sole information source, in June 2018. The following parameters were taken into account: a timescale from 2000 to 2018; all types of journal; all research fields, countries and regions: tourism, hospitality, marketing, economics, business, management, psychology, sociology, technology, etc.; only full-length papers in English were considered, and other publications such as book chapters, research notes and conference papers were excluded from the analysis; subject search for each of the technologies referred to in table 2 together with the term “tourism*”; the process was repeated with the term “hospitality*”. The search yielded 974 papers in total.

After compiling our first sample we did a manual search in each of the 974 studies so as to identify those directly linked to our subject. By reading the article title, keywords and abstract and in some cases the whole paper, we made a first selection and categorized the studies with the following indicators: “related”, “unrelated”, “maybe” and “duplicate”. The decision to include a paper as “related” was based primarily on direct relevance to the topic of wireless technologies in tourism and hospitality. Those classified under “maybe” were revisited by the three study authors so as to rule them in or out of the final list of “related” papers and to avoid missing any significant information. The product of this second selection phase was 124 journals and 220 papers “related” to the subject of study.

Once the research team had read and analyzed the 220 studies, these were classified by the following criteria:

1. Code assigned to the paper (1 to 220)
2. Type of technology (beacons, Bluetooth, microwaves, mobile, NFC, radio, RFID, satellite, television, WiFi or Zigbee)
3. Title of the paper
4. DOI of the paper
5. Authors of the paper
6. Research topics (adapted from Kim et al., 2018): Business management (BM), Business operations (BO), Consumer behaviour (CB), CSR, the environment and sustainability (CS), Distribution (DS), Education (ED), Economics and finance (EF), Human resources (HR), Marketing communication (MC), Marketing strategy (MS), Study of specific regions: countries, cities (RG), Theories (TH), Types of tourism: cultural, rural (TP)
7. Type of study analysis: quantitative or qualitative
8. Journal title
9. Field of journal: tourism/hospitality or other
10. Publication date

11. Publication year
12. Period: 2000-2004, 2005-2009, 2010-2014, 2015-2018
13. Journal volume
14. Issue number
15. Special issue: yes/no
16. Start page
17. End page
18. Total number of paper citations
19. Average yearly citations

In this third phase, after reading the 220 papers selected as “related”, we excluded 35 which seemed not to be truly related to the field, as most of these dealt with research areas directly linked to questions of technology with little or nothing to do with applications in tourism and hospitality, such as in archaeology, medicine or geography, or because tourism was just one application of the technology among others and with no particular significance or salience. The final paper selection process yielded 185 articles from 118 journals.

Figure 1 shows the trend over time (2000-2018) in the number of publications considered. We see growing interest for the subject of tourism and wireless technologies as from 2012-2013, when the number of publications on these technologies rose very sharply. The year 2018 is also likely to end with such a rising trend.

Figure 1. Trend in papers published/year

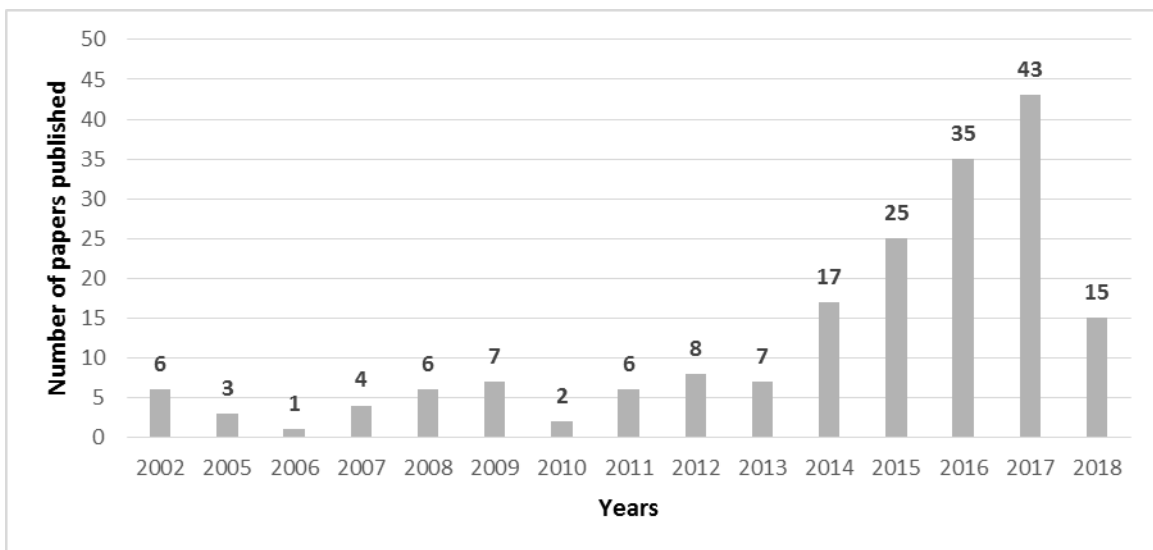


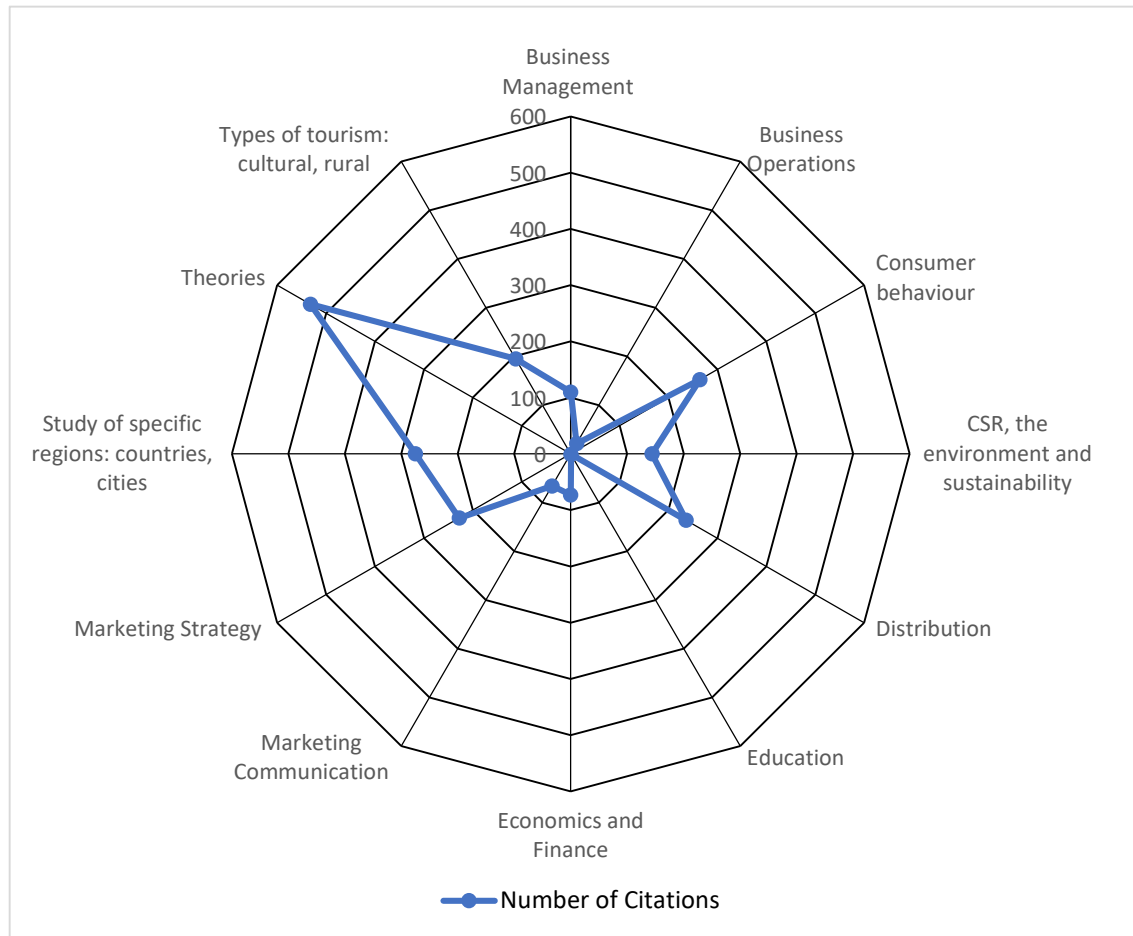
Table 3 shows the first 25 journals (organized by percentage of related papers) used in the final selected sample that have published papers on wireless technology linked to tourism and hospitality, including tourism and hospitality journals and journals in other fields. *Tourism Management*, *Journal of Hospitality and Tourism Technology* and *Information Technology & Tourism* are the three that have shown most interest in research linked to our subject. Of the selected journals, 77% are not devoted to the field of tourism and hospitality, thus showing the importance of considering journals outside our field in ascertaining trends in applied wireless technologies in tourism.

Table 3. Top 25 journals in the sample

Note: T/H= Tourism or Hospitality; Other: other fields

Regarding the impact by number of citations of our study sample, those linked to theoretical studies (TH), the study of specific regions (countries, cities, etc.) (RG), consumer behaviour (CB), distribution (DS) and marketing strategies (MS) are, in that order, those which have had most impact in the academic sphere.

Figure 2. Impact by number of citations (2000-2018), by research topic



4. EMPIRICAL ANALYSIS

4.1 Overview and trends in wireless technologies in tourism

Below we set out the main findings of our analysis with the selected papers, allowing us to give an overview of studies on tourism linked to wireless technologies and the trends in them over time.

Table 4: Study type by series of years (the last section is just 4 years)

In table 4 we distribute the various empirical studies by category and year. We find a large extent of theorising on the use of wireless technologies in tourism especially as of 2015, when the number of studies looking at such theories rose sharply, up to a total of 37 over the years. It is also worth noting specific analyses on particular regions, countries and cities, whose numbers shot up as of 2010, as well as studies on marketing and consumer behaviour. Finally there are also many on the topic of business management.

Accordingly we see a certain trend towards theorising as the academic corpus grows, allowing researchers to better define the theories formulated. In line with our review, research on tourism using wireless technologies can be divided into two categories. First is a generation of studies focused on methodological dimensions and specific case studies. Second are papers making use of that background to build a more comprehensive theoretical picture and also to study previously unexplored aspects of tourism. In relation to new technological advances, these theoretical studies revisit fundamental questions of technology in tourism and consumer behaviour, and also look at the multiple interactions of various technologies with an integrative approach (e.g. Buhalis & Leung, 2018, in their study of smart hospitality – interconnectivity and interoperability towards an ecosystem).

Figure 3: Number of papers by type

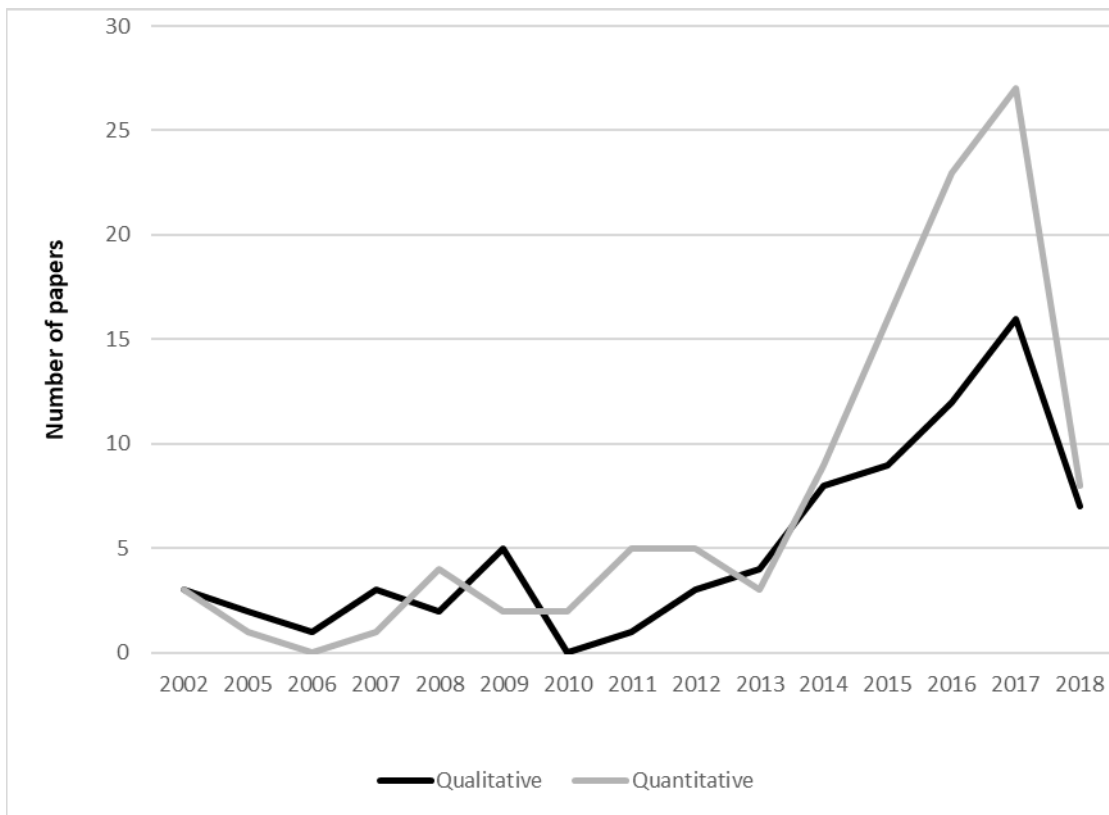


Figure 3 shows the trend in papers published with quantitative or qualitative approaches since 2013, with a sharp rise in quantitative studies. Thus beyond exploratory or descriptive work we find statistical analyses or quantitative studies backing up their conclusions with numerical data. This is a significant development and shows the

maturity of tourism-related studies on wireless technologies, with a shift towards in-depth analysis of more concrete aspects.

Figure 4: Number of articles by technology

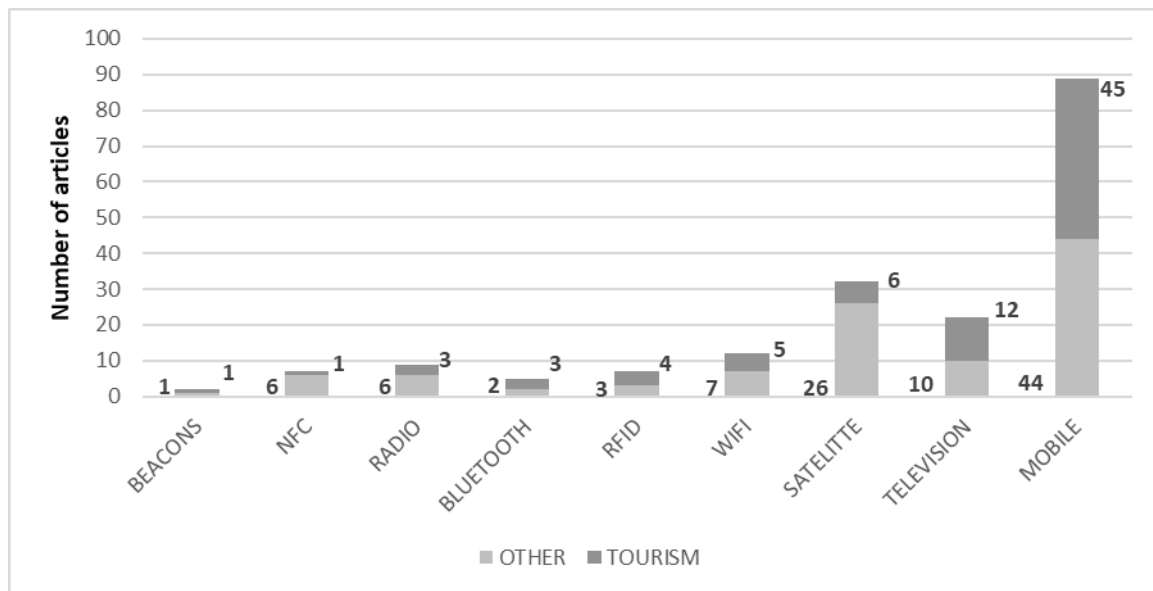


Figure 4 shows a breakdown of papers analyzed by technology. We separate beacon applications from Bluetooth and WiFi, as these devices may function with both technologies. We thought it appropriate to highlight their specific emergence in the sphere of wireless technologies as applied to tourism. By contrast we find no research linking tourism and microwave devices, whereas there are many studies given over to mobile technologies. Also notable is the emergence of satellite technology as the second-ranking area of study. This is a novelty, as satellite applications are normally studied less widely than other technologies in tourism. Figure 4 shows details of technologies and of whether they were studied in journals on tourism or in other fields: it is well worth noting the abundance of satellite-related papers not appearing in tourism journals, in which little attention is given to satellite technology, whereas this has been a focus of interest for journals in other fields. This is a significant finding. The role being played increasingly by satellite applications as tools in tourism should be better covered and recognized by journals in the sector.

A similar divergence is observed when classifying papers by study type: tourist consumer behaviour is more widely studied in journals outside the tourism sector. This leads us to reflect on the scope of literature reviews often based only on tourism journals and which may be leaving out of the analysis a range of tourism-related papers published in journals of other kinds. Examining the bias resulting from this exclusion may be a possible future line of research.

We also found that a large number of papers look at technology as an enabler or facilitator while others are chiefly concerned with the contents and data with which technologies are used. The clearest case is television, where among the pre-selected papers there were many studies on the influence on tourism of imagery, series or films and of the message they convey. Those in which the content in itself took precedence over the technology were ruled out of our analysis.

5. DISCUSSION AND CONCLUSIONS

5.1 Conclusions

Despite the dominance of the mobile field, other wireless technologies are gaining attention from researchers. The most widely analyzed and recurrent technology in the literature is mobile telephony, as is unsurprising given that mobiles have established themselves as the most popular devices for accessing the internet, with 52% of users worldwide, as opposed to 43% using laptops or desktops (*We are social & Hootsuite*, 2018). This high degree of penetration across the world population is probably the reason for the greater volume of research related to mobile technology. Other wireless technologies are gradually increasing their presence in the literature: in the papers analyzed, comprehensive technological solutions are proposed for smart cities as well as new uses for exhibitions and events, e-payments and systematic platforms, envisaged with practical applications. The role that satellite applications are playing in the field of tourism emerges not directly from tourism journals but rather from publications in other fields, normally technological ones.

The tourism industry's rapid evolution in the past 18 years thanks to technological development, pressure among competitors, and new habits in consumer behaviour is not sufficiently reflected in the academic literature in the field. In fact the tourism industry is ahead of academic research as regards the adoption of technological advances. The use of data in tourism research still faces some important challenges: quality of data, cost of data and privacy concerns (Li *et al.* 2018), aspects that are still not sufficiently reflected in the academic literature.

Contrary to the prevailing focus of studies on mobile technologies, with abundant research on smartphones and apps, we have opened the field to other technologies (such as Zigbee or Bluetooth) and in particular we have highlighted the large role played by satellite technology in tourism and how this appears in the literature. As mentioned, interest in the field has been reflected chiefly in non-tourism journals. This involves drawing attention to a research gap and is therefore a genuine contribution by this study. Moreover, by focussing on satellite technologies we have identified their widest and most

significant uses in the tourism sphere. Given that to date no literature review has looked at the relationship between tourism and satellite technology so closely, our study is an original contribution.

5.2 Theoretical implications

Wireless technologies are socially produced but can also act as agents influencing users by reconstituting social ties and redrawing social boundaries. Technology forms part of the social capital that is embedded in a network of actors acting collectively, and can modify that network's structure and operation (Bystrowska *et al.* 2017).

Thus we see that journals in the technological and ICT spheres reflect these technical changes more quickly, including their impact in the field of tourism because of their cross-cutting approach, whereas tourism journals take longer to pick up on such aspects. There is also a delay in their emergence in tourism literature reviews, where emphasis is placed on contributions from the sectoral literature. Where the aim is to detect trends, providing a view in the round, observing developments and mapping future progression, there is a risk of missing key aspects driven by technological change. On excluding research in non-tourism journals, it is easy to leave out aspects of vital importance to tourism. In line with Navio-Marco *et al.* (2018), we are, therefore, critical of approaches which, in order to narrow the scope of work for researchers, omit vital aspects in their findings. We advocate more holistic and all-encompassing methods.

In this paper we have offered a holistic overview of the linkage in research papers between tourism and hospitality and wireless technologies, avoiding the fragmentary approach taken to date to such technologies (using the radio spectrum to facilitate communications) and which are not confined to mere mobile communications, and which moreover cannot be included in the mobile category in a piecemeal way. We have sought to take an orderly approach so as to analyse them in a structured way, and at the same time we have conducted a more comprehensive overview. This approach is also justified by the need to provide as wide a view as possible, as, with Kim *et al.* (2018), we believe that future research endeavours could address the gap created in the academic literature of tourism by the uneven distribution of subjects covered by review studies in our disciplines.

5.3 Practical implications

These new trends and implications open new avenues of research, especially in the areas where we have found ourselves lacking in research to refer to: satellites, beacons, WiFi, Zigbee or Bluetooth as applied to tourism are still uncharted territories where the academic literature of tourism is concerned. Wireless technologies make possible a major

change: a convergence between the physical and digital worlds supported by sensors gathering data originating from mutual interactions between tourists and the environment. And strangely, despite the impact they have had on consumer behaviour and in the tourism industry itself, we believe they have still not been thoroughly researched.

The results of our research have interesting implications for management given that these technologies substantially increase the connections between tourists, and between tourists and their environment, and allow information and data to be obtained about them, increasing bidirectionality between supply and demand. Today, all the data that can be accessed through the technologies discussed in this study allow us to improve business intelligence, to better understand consumer behaviour and to improve organizational processes.

5.4 Limitations and future research

Our study has various limitations owing precisely to its copious bibliography and the choice not to exclude non-tourism journals, with the aim of not passing over any notable aspects linked to the technologies under study. The number of references dealt with made it difficult to refine our analysis, but it allowed us to detect some of the shortcomings resulting from excluding non-tourism journals at the outset. Moreover we focused only on English-language papers, neglecting those in other languages as well as book chapters and conference proceedings. Future studies might seek to integrate these, notwithstanding the volume of literature involved. New research initiatives should look into how these new technologies will enter the public mind in terms of technology take-up, and how companies may incorporate them into their operations.

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