Smart city communication via social media: analysing residents' and visitors' engagement

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Highlights

- Smart cities with the most social media followers had the lowest levels of engagement via social media.

- Instagram generated higher levels of user engagement for smart cities.

- Most common smart city social media posts were related to information about events.

- Social media is not used to offer smart services to visitors and residents.

- Smart cities are failing to capitalise on possibilities offered by social media.

Abstract

This research applies a unique conceptual model and methodology incorporating popularity, commitment, and virality to measure the social media engagement with residents and visitors of smart cities and how they communicate 'smart' elements and their brands. Digital content analysis was applied to a sample of ten Spanish smart cities (including Barcelona, Bilbao, Madrid, Seville and Valencia, among others), with measurable and quantifiable elements of engagement (e.g., likes, shares and comments). The smart cities analysed achieved acceptable, but rudimentary, levels of engagement via social media using Facebook, Twitter and Instagram. However, they displayed weaknesses related to their image and branding as well as the effectiveness with which they communicated their smart characteristics. The main implication of this research is that these Spanish smart cities have considerable scope to improve their use of social media to enhance their communications and branding. Greater emphasis is required on delivering emotional (affective) messages and a higher priority needs to be given to business and business event travellers and those visiting friends and relatives.

Keywords

1. Introduction

The concept of smart cities revolves traditionally around technologies leading to sustainable economic development and improved quality of life (Caragliu *et al.*, 2011). It is "a framework for policies supporting technological and ecological urban transitions" (Vanolo, 2014, p. 894). Arguably, information and communication technologies (ICTs) have become a key social and business tool for cities to enhance innovation (Harrison *et al.*, 2010) and to improve the management of urban services. More specifically, Yigitcanlar *et al.* (2018) identify in the literature three types of drivers for smart cities - community, technology, policy - and six desired outcomes – productivity, sustainability, accessibility, wellbeing, liveability and governance. However, the strategic priorities of smart cities remain contested topics in academic discourse. Part of this may reflect the complexity of urban planning factors involved with often disparate stakeholder priorities (e.g., global corporations, local governments, residents and local businesses) and their implementation in practice (Kummitha & Crutzen, 2017) with a myriad of nuances (Calzada & Cobo, 2015). Indeed, there are those who argue that the amalgamation of technology (i.e., digital intelligence) and knowledge (i.e., human intelligence) can lead to more effective urban development approaches (Angelidou, 2015). Conversely, others suggest that place brand growth remains a greater contributor to the competitiveness of cities than technological

advancements *per se* (Valdez *et al.*, 2018). These debates demonstrate the technological, human and institutional dimensions of smart cities first posited by Pardo & Taewoo (2012). However, the smart city concept continues to elude a single universally accepted definition with terms such as digital, connected, wired, learning, and even green or sustainable often applied in the smart city paradigm (Cocchia, 2014).

The term *smart* is linked to cities and tourism destinations to encompass all initiatives by critical local decision-makers, including innovative technologies in management processes, leading to enhanced effectiveness and a better quality of life for local stakeholders, as well as enhancing the tourism experience and services (Gretzel *et al.*, 2015). The smart tourism destination concept emerged largely as a subset of smart cities (Boes *et al.*, 2016), generally placing more emphasis on the use of smart approaches to improve the visitor economy (Boes *et al.*, 2016) and enhance the overall experience of residents and visitors (Gretzel *et al.*, 2016; Romão *et al.*, 2018). In this environment, interactions between residents, visitors and other stakeholders have greater emphasis in smart cities and smart tourism destinations than in other city concepts (Boes, *et al.*, 2016). This is particularly applicable to how residents and tourists engage with city brands which often involves the use of social media (Bonson *et al.*, 2015; Braun *et al.*, 2013), regardless of whether the cities are smart or not.

Social media offer cities efficient platforms for promotion and increasing the interaction with key stakeholders (Zhou & Wang, 2014) as well as the creation of positive place images (Boes *et al.*, 2016; Molinillo *et al.*, 2018). However, research has shown that for a social media approach to be effective, it needs to generate engagement among users (Bonson *et al.*, 2014; Brodie *et al.*, 2011, 2013; Gummerus *et al.*, 2012; Martínez-López *et al.*, 2017), particularly when dealing with local communities (Zeng

& Gerritsen, 2014). Although engagement has been studied in greater depth in place branding, satisfaction and place attachment (Sáez-Martín *et al*., 2014), particularly in a non-smart city context (Hanna & Rowley, 2011; Kavaratzis, 2012), smart city research on visitor and resident engagement through social media remains nascent (Cabiddu *et al.*, 2014; Harrigan *et al.*, 2017). Hence, although smart cities devote significant resources to optimizing the utilization of social media channels, there is very little research available on how and for what purposes they do this.

Therefore, the main aim of this research is to analyse the engagement attained by smart cities with visitors and residents through social media by applying a digital content analysis method. The data were collected using three official social media channels (Facebook, Twitter and Instagram) for ten smart cities in Spain. The findings address an important gap in the literature and contribute to a better understanding of the process of engagement via social media.

2. Background

2.1. Engagement with place brands

Place branding has emerged as a strategic process aimed at improving the economies of cities, including the management of physical and virtual identities (Govers & Go, 2009; Kavaratzis & Ashworth, 2010). This has rendered the branding of places an essential element of urban and tourism planning, as studies have shown that people tend to associate memories to specific places (Kavaratzis & Kalandides, 2015). City brands allow visitors to identify and differentiate tourism destinations, generate positive images, and foster visitor loyalty (Költringer & Dickinger, 2015).

In parallel, brand engagement has emerged as an important element of strategic brand management (Brodie *et al.*, 2011, 2013; Gummerus *et al.*, 2012). Although the definition and characterization of this concept remain contested by scholars (Pansari & Kumar, 2017), research by Van Doorn *et al.* (2010) suggests that engagement may be considered a manifestation of participatory consumer behaviour concerning specific brands. Vivek *et al.* (2012) define customer engagement as "the intensity of an individual's participation in and connection with an organization's offerings and/or organizational activities initiated by either the customer or the organization" (p. 127). As such, engagement could be interpreted as consumer behaviour relative to a brand (Brodie *et al.*, 2013) or even active participation in the co-development of that brand (Vivek *et al.*, 2012). More specifically, brand engagement via social media encourages higher levels of participation and interaction among users (Oh *et al.*, 2017), through comments, shares or likes (Wang *et al.*, 2017). Hollebeek (2011) argues that there are four distinct stages in the development of brand engagement, namely: behavioural, cognitive, emotional, and social engagement. A positive level of engagement between customers and a brand typically results in higher market share and better levels of customer satisfaction (Pansari & Kumar, 2017). This research seeks a better understanding of the engagement of visitors and residents with the place brands of smart cities, and this issue is explored next.

2.2. Resident and visitor engagement with cities through social media

Residents and visitors are key stakeholders of cities. Their engagement is crucial to the success of any city branding strategy (Kavaratzis, 2012; Zenker *et al.*, 2017). In this research, engagement is understood as the degree to which residents and visitors participate in a city's official social media sites through interaction with other users and

local governments. The engagement process is generally enhanced by mechanisms for user participation such as likes, replies, comments, shares, tweets, re- tweets and other forms of user-generated content (UGC) like photos and videos (Agostino, 2013).

Afzalan *et al.* (2017) found that the use of different online tools by local governments to achieve greater participation and engagement by stakeholders is nothing new for smart city initiatives. Social media channels are often used by cities to disseminate communications more effectively. Although this is by no means limited to smart cities, interaction with residents and visitors is inherent to the concept of smart cities and smart destinations (Boes et al., 2016; Meijer & Bolívar, 2016). Moreover, as city-focused social media sites grow in attractiveness and trust among users, this tends to encourage others to participate and, in the case of destinations, enhances their visitor economies (Park *et al.*, 2015). However, brand engagement from stakeholders via social media has received much less attention in the literature on smart cities (Agostino, 2013; Bonsón *et al.*, 2015) and smart tourism destinations (Cabiddu *et al.*, 2014; Harrigan *et al.*, 2017).

The engagement of residents with local governments through social media can be mutually beneficial (Aladwani, 2015) and remains a cornerstone of place branding processes (Kavaratzis, 2012). Indeed, social media can be a key facilitating mechanism to residents acting as ambassadors for a place brand (Braun *et al.*, 2013). Furthermore, resident participation may also take the form of interaction with other residents and visitors, the dissemination of local information, suggestions and participation in local consultation processes. Ultimately, much of this may result in the effective co-creation of place brands. This relationship between cities and their residents is key to the success

of place brands and merits larger levels of investment by local governments (Hospers, 2010). However, unlike visitors, residents tend to have a more positive attitude towards their cities' brands with higher levels of brand complexity (Zenker *et al.*, 2017). In fact, resident participation is key to place branding strategies since social media have grown in importance as a source of information for visitors (Uchinaka *et al.*, 2019). Similarly, resident participation in urban planning processes through social media tends to increase their levels of sustainable engagement in urban development projects (Lalicic and Önder, 2018). In fact, research by Bonsón *et al.* (2015) into resident participation through social media in Western Europe found the most successful topics were housing, public works and urban planning issues. However, a recent study focusing on residents in southern Spain discovered that the social media content generating the highest levels of resident participation in terms of "favourites", "replies" and "retweets" corresponded to news about sport, cultural events and city marketing campaigns (Bonson *et al.*, 2019).

In southern Europe, as elsewhere across the European Union, one-way communications using "likes", "shares" and "retweets" tend to dominate social media interactions. By contrast, two-way communications (e.g., comments) requiring higher levels of engagement tend to be much less frequent (Bonson *et al.*, 2014; Gálvez-Rodríguez *et al.*, 2018). Furthermore, meaningful social media content from local governments has been linked to higher levels of resident engagement with local strategic decision makers (Aladwani & Dwivedi, 2018). Similarly, higher levels of trust in local policy makers and a city's brand are also positively connected to residents' engagement with social media channels managed by local governments (Park *et al.*, 2015).

Visitor research in Italy by Mariani *et al.* (2016) found that the use of visual content and a moderate number of posts tended to increase visitor engagement with cities via their Facebook sites. Similarly, Leung & Bai (2013) suggested positive perceptions of social media among visitors generally lead to higher levels of engagement with destinations' social media sites. However, user engagement research carried out by Hays *et al.* (2013) with Facebook and Twitter accounts of national tourism authorities found that levels of engagement varied considerably. Moreover, they concluded that user engagement levels depended heavily on the effectiveness of destination management organisations (DMOs) in integrating social media activities as a vital strategic element of their marketing. Furthermore, Harrigan *et al.* (2017) found tourists who engage with social media brands tend to display higher levels of loyalty. This engagement with destinations was earlier conceptualized by Cabiddu *et al.* (2014), who identified three levels of visitor engagement in tourism through social media – persistent (e.g., maintaining an ongoing dialogue), customized (e.g., interacting with consumers on a more personal level based on market intelligence data), and triggered (e.g., instigating encounters based on customer-initiated events). However, Uşakli *et al.* (2017) found the use of social media by European destinations tended to often result in low levels of customer service due to an overreliance on unimaginative traditional marketing approaches.

2.3. Measuring social media user engagement

The use of online metrics for the analysis of user engagement through social media is a topic that remains mostly under-researched (Oh *et al.*, 2017). Bijmolt *et al.* (2010) evaluated several analytical models (e.g., parametric and non-parametric, probability, data mining, etc.) for measuring engagement and concluded that there are

critical barriers to the implementation of engagement methodologies in practice. These include barriers related to data and tools (e.g., data quality, data ownership, complexity of existing models and ownership of modelling tools) as well as the use of the data itself (e.g., the usability of the results and integration in company processes). Table 1 outlines some of the most common methodologies used in the measurement of consumer engagement through social media.

Table 1. Methodologies used in the measurement of engagement.

Focus	Methodology	Subject of study	Authors
Social Media	Online surveys	Social media users	Paek *et al.* (2013)
Social Media	In-depth interviews	Executives and managers	Jiang *et al.* (2016)
Social Media	Case studies	Consumers	Panagiotopoulos *et al.* (2015)
Social Media	Content analysis of DMO social media sites	DMOs	Usakli *et al.* (2017)
Social Media	Content analysis	Facebook users	Wang *et al.* (2017)
Social Media	Content analysis	Facebook users	Wattanacharoensil & Schuckert (2015)
Social Media	Case studies	Hotel customers	Cabiddu *et al.* (2014)
Social Media	Web API (Application Programming Interface)	Social media channels (information of consumer behaviour)	Oh *et al.* (2017)
Social Media	Online survey	MTurk users	Harrigan *et al.* (2017)
Social Media	Online surveys	Brand communities	Brodie *et al.* (2013)
Social Media	Content analysis	Consumers	Malhotra *et al.* (2013)
Social Media	In-depth interviews and focus groups	Millennials	Smith & Gallicano (2015)
Social Media	Text mining and content analysis	Facebook and Twitter profiles	He *et al.* (2013)
Social Media	Content analysis and semi-structured interviews	Official social media sites of international tourism destinations	Hays *et al.* (2013)
Social media	Content analysis	Consumers	Hoffman & Fodor (2010)
Tourists' engagement with the destination	Surveys	Hotel and airline customers	So *et al.* (2014)
Residents' engagement with tourism policies	Surveys	Local residents	Presenza *et al.* (2013)
Local residents' engagement with local government	Content analysis	Local residents	Bonson *et al.* (2014)

Engagement with brands through social media tends to be researched via consumer surveys, with standard approaches including Likert scales (e.g., Brodie *et al.*, 2011, 2013; Martínez-López *et al.*, 2017). However, qualitative techniques have also been employed, including in-depth interviews (Jiang *et al.*, 2016) and case studies (Panagiotopoulos *et al.*, 2015). Other studies (Oh *et al.,* 2017; Wang *et al.,* 2017) have applied different metrics to measure brand engagement through social media using content analysis (e.g. likes, comments, followers) (Table 1).

In general terms, methodologies involving surveys or in-depth interviews tend to be complex and expensive to implement, particularly when the intention is to measure engagement longitudinally over lengthy periods of time. However, digital content analysis of social media delivers a wide range of indicators to evaluate engagement in a more effective way for smart city scholars as well as managers. Various authors have pointed out that "likes", "comments" and "shares" used in social media are manifestations of behavioral engagement by users (e.g. Bonson *et al.*, 2014, 2015; Oh *et al.*, 2017; Wang *et al.*, 2017). When users of social media sites utilise these options with increasing frequency, this has been associated with more active relationships with other users as well as with the social media brands (Oh *et al.*, 2017). Similarly, this has been interpreted as an indication of users' engagement and interest in the contents of online posts as well as a willingness to establish a line of communication (Wang *et al.*, 2017).

2.4. Smart cities in Spain

Spain is the seventh most populated country in Europe with over 46 million inhabitants. The geographical distribution of population is very heterogeneous with over 8,000 municipalities among which approximately 60% have a population of less than

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1,000, while less than 2% of municipalities have a population in excess of 50,000 and concentrate 50% of the country's population (INE, 2018a).

Since 2009, Spain has been one of the world's leading countries in the implementation of the smart city concept (IDC, 2011). Cooperation between the public and private sectors with the help of European Union funding for urban innovation has helped to foster a growing number of initiatives, including the Spanish Network of Smart Cities founded in 2012, the creation of a National Strategic Plan for Smart Cities in 2015 and the National Strategic Plan for Smart Territories (2017), which is also responsible for the promotion of Smart Tourism Destinations (Ministerio de Economía y Empresa, 2017). However,, and consistent with the contested international interpretations of what a smart city should be, no consensus has been reached yet in Spain with regards to an agreed definition of the smart city concept. Yet, perhaps one of the most widely accepted definitions is that of the National Strategic Plan for Smart Cities, which sees a smart city as "a holistic vision of any city that uses ICTs for the improvement of the quality of life and accessibility of its residents, whilst ensuring continuous sustainable development at economic, social and environmental levels" (ONTSI, 2015, p. 13). A review of definitions of the smart city concept in Spain (PwC and IE Business School, 2015) showed that there were four key factors they tended to have in common, namely: (1) a holistic or global vision of the multiple aspects of a city; (2) a means of improving the attractiveness of the city to key external stakeholders as well as the quality of life of residents; (3) a stakeholder relationship model (e.g., resident participation, effective stakeholder communication, shared economy); and (4) the use of technology as a disruptive factor (e.g., real-time capture, processing and sharing of big data). Moreover, further studies (ONTSI, 2015) have shown that the

interpretation of the smart city concept in Spain includes going beyond these factors to include initiatives related to the economy, people, governance, mobility, and the environment.

The main smart city initiatives developed in Spain have taken place in towns and cities with a population in excess of 50,000, with Malaga and Santander as key examples. Today, the Spanish Network of Smart Cities includes more than 100 towns and cities, with Madrid and Barcelona among the top 15 in Europe in the *Cities in Motion* ranking (IESE, 2017). In tourism, 2018 saw the creation of the Network of Smart Tourism Destinations with more than 70 municipalities and other entities involved. The aim of this network is to provide sustainable leadership to the development of the tourism sector through innovation and technology (Red de Destinos Turísticos Inteligentes, 2019).

3. Research methodology

The conceptual model for this research is illustrated in Figure 1, where the variables measuring visitor and resident engagement represent the core of the model. The three broader concepts addressed are smart city, city branding and social media.
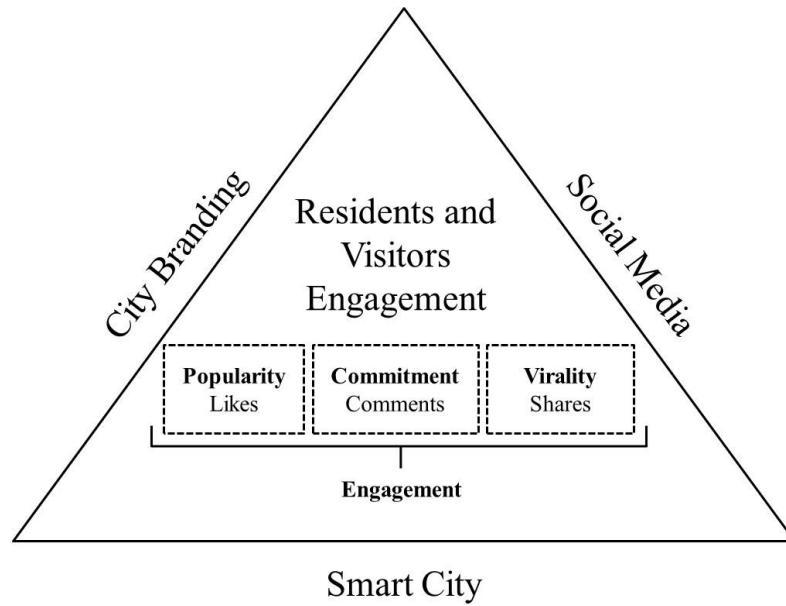
Figure 1. Proposed conceptual model for measuring resident and visitor engagement in smart cities.

This research builds on a methodology developed originally by Bonson & Ratkai (2013), which was applied to the measurement of local stakeholder engagement using content analysis of Facebook sites. These authors suggested that "likes", "shares" and "comments" are indicators of three specific dimensions of engagement in social media, namely: popularity, commitment and virality respectively. Popularity (P) can be defined as the attractiveness and notoriety of user messages, namely:

$$P = ((\text{Total number of likes/total number of posts})/(\text{number of followers})) * 1{,}000$$

Commitment (C) reflects a deeper level of involvement with fellow users and the brand itself as it generates additional online content:

$$C = ((\text{Total number of comments/total number of posts})/(\text{number of followers})) * 1{,}000$$

Finally, the virality (V) of posts reflects users' interest in the brand and its contents shared via social media:

$$V = ((\text{Total number of posts shared/total number of posts})/(\text{number of followers})) * 1{,}000$$

Overall, engagement (E) is calculated as the sum of the above three dimensions, i.e. $E = P + C + V$. In addition, different qualitative characteristics of the messages posted on social media were analysed as part of this study, including the overall tone of the message, its format (text, photos, videos, web links), as well as overall themes, in line with earlier research by Wang *et al.* (2017).

One of the advantages of this method is that it avoids some of the methodological difficulties reported by Bijmolt *et al.* (2010) when measuring engagement as users' direct participation in the research is not required. The data used in this research were readily available in the public domain and could be classed as intrinsically objective as they were based on user behaviour rather than subjective opinions. Therefore, the methodology allowed for the first stage of the engagement process to be analysed, following Hollebeek's (2011) conceptual outline, focusing on behavioural engagement but without encroaching on other stages more related to emotions.

The methodology was applied to three social media platforms:-Facebook, Twitter and Instagram. These media enable high levels of interaction with residents and visitors (Oliveira & Panyik, 2014) and have the most significant number of users for

this social media typology in the Western world (Martínez-López *et al.*, 2016). In addition to analysing more than one social media platform, this study captured differences in users' behaviour due to the characteristics of each platform (Baloglu & McCleary, 1999; Molinillo *et al.*, 2018).

The data were collected from the official social media sites of ten smart cities in Spain. These included A Coruña, Barcelona, Bilbao, Las Palmas de Gran Canaria, Madrid, Malaga, Palma de Mallorca, Santander, Seville and Valencia. These cities were deemed the best smart cities in Spain in a survey where residents rated their host cities' levels of 'smartness' with regards to their effectiveness in managing urban issues (PwC and IE Business School, 2015). The cities selected vary in size: eight are among the largest in Spain and two of these have more than 2.5 million inhabitants – Madrid and Barcelona. A further six have populations of less than 800,000 and the remaining two are smaller than 250,000 – A Coruña and Santander. Additionally, all cities chosen are among the most visited, though their attractiveness to tourists varies from seven million arrivals annually (Madrid and Barcelona) to less than 500,000 arrivals (A Coruña, Las Palmas de Gran Canaria and Santander). All these smart cities use two different social media sites in each case – one to communicate with visitors and another to communicate with residents. Official city social media sites targeting residents tend to include posts with information on training courses, sport activities, environmental issues, transport and local government initiatives (e.g., https://twitter.com/malaga and https://www.facebook.com/ayuntamientodemadrid/). In official city social media sites targeting visitors, the information contained in posts focuses generally on cultural activities, which could be of interest both to residents and tourists (e.g., https://twitter.com/turismodemalaga, and

). This research focused on official social

media sites for visitors as they tend to target a much more diverse audience that includes

residents as well as visitors. Table 2 outlines the social media sites analysed in this

research.

Table 2. Analysed smart cities' official social media sites

City	Network	URL
A Coruña	Web	http://www.turismocoruna.com/web/
	Facebook	https://www.facebook.com/turismocoruna
	Twitter	https://twitter.com/CorunaTurismo
	Instagram	https://www.instagram.com/corunaturismo/
Barcelona	Web	http://www.barcelonaturisme.com/wv3/es/
	Facebook	https://www.facebook.com/visitbarcelona
	Twitter	https://twitter.com/VisitBCN_ES
	Instagram	https://www.instagram.com/visitbarcelona/
Bilbao	Web	http://www.bilbaoturismo.net/BilbaoTurismo/es/turistas
	Facebook	https://www.facebook.com/BilbaoTurismo/
	Twitter	https://twitter.com/bilbaoturismo
	Instagram	https://www.instagram.com/bilbaoturismo/
Las Palmas de Gran Canaria	Web	http://lpavisit.com/es/
	Facebook	https://www.facebook.com/LPAvisit
	Twitter	https://twitter.com/LpaVisit
	Instagram	https://www.instagram.com/ig_lpavisit/
Madrid	Web	http://www.esmadrid.com/
	Facebook	https://www.facebook.com/visitamadridoficial
	Twitter	https://twitter.com/Visita_Madrid
	Instagram	https://www.instagram.com/visita_madrid/
Malaga	Web	http://www.malagaturismo.com/
	Facebook	https://www.facebook.com/MalagaTurismoOficial/
	Twitter	https://twitter.com/turismodemalaga
	Instagram	https://www.instagram.com/malagaturismo/
Palma de Mallorca	Web	http://www.palmavirtual.es/es/
	Facebook	https://www.facebook.com/passionforpalmademallorca
	Twitter	https://twitter.com/passionforpalma
	Instagram	https://www.instagram.com/passionforpalma/
Santander	Web	http://santanderspain.info/
	Facebook	https://www.facebook.com/TurismoSDR/
	Twitter	https://twitter.com/TurismoSDR
	Instagram	https://www.instagram.com/TurismoSDR/
Seville	Web	http://www.visitasevilla.es/es
	Facebook	https://www.facebook.com/Sevilla
	Twitter	https://twitter.com/sevillaciudad
	Instagram	https://www.instagram.com/sevillaciudad/
Valencia	Web	http://www.visitvalencia.com/es/home

Facebook	https://www.facebook.com/turismovalencia
Twitter	https://twitter.com/Valenciaturismo
Instagram	https://instagram.com/visit_valencia

The data were gathered manually by three researchers in April 2017 and complemented by the use of social media measurement tools (www.fanpagekarma.com and www.twitonomy.com), which granted access to hashtags, keywords, types of content shared, frequency, and other parameters for different types of social media. A total of 437 Facebook posts, 1,040 Twitter messages and 141 Instagram posts were analysed as part of this research.

Qualitative information on these social media sites was also analysed. This information was obtained through a manual search of the announcements posted by these ten smart cities with residents and visitors as their target recipients. This process involved downloading posts and compiling the data manually to check for potential discrepancies, which may have skewed the analysis. Then, discrepancies were dealt with through several iterations of the data. The contents were then classified into themes and categories with similar characteristics using spreadsheet software. Similarly, key words were identified, and their frequency of occurrence recorded. Most of the data obtained was on city facilities and services as well as issues related to the cities' brand images.

4. Results

4.1. Social media use

The smart cities analysed in this study were found to have similar ways of communicating via social media. Facebook and Twitter were the official social media sites most commonly mentioned in the cities' official websites, while Instagram was also used by most of the cities, though it was not mentioned in all the cities' official websites. Although social media were used differently by cities to fit their

communication strategies, Facebook was the most widely used channel, though in some cities Twitter dominated instead (e.g., Seville), while in others the use of Twitter was almost irrelevant compared to Instagram (e.g., Barcelona).

Facebook sites had the largest number of followers in each city (Table 3). Malaga enjoyed the highest follower ratios with respect to city size (population) and annual visitor numbers with values of 21.10 and 8.99, respectively. The lowest ratio value for residents was for Bilbao (0.69) with the lowest for visitors obtained by Palma de Mallorca (0.24). The sampled cities posted 1.5 messages per day, with text prevailing as the preferred format with photos and web links. Information about events and heritage sites tended to dominate. It was unusual to find posts in languages other than Spanish, although it was typical for contents from other websites and companies to be incorporated. Words (mainly in Spanish) such as "tourism", "park" and "museum" were included most frequently, as well as hashtags related to celebrations, events, city names, and tourist attractions (e.g. #saboramalaga [#tasteofmalaga], #barcelonashoppingdays) (Figure 2). Of these, the ones that resulted in most interactions were those linked to more emotional or informal issues, such as #plansfortheweekend or #felizviernes [#happyfriday]. Cities posted most of their messages from Monday to Friday.

Table 3. Rate of followers per 100 residents and 100 visitors

Cities	Residents[1]	Visitors[2]	Facebook			Twitter			Instagram		
			Followers	Rate per 100 residents	Rate per 100 visitors	Followers	Rate per 100 residents	Rate per 100 visitors	Followers	Rate per 100 residents	Rate per 100 visitors
A Coruña	244,850	485,459	22,362	9.13	4.61	15,888	6.49	3.27	5,552	2.27	1.14
Barcelona	1,620,343	7,656,747	82,292	5.08	1.07	1,977	0.12	0.03	37,456	2.31	0.49
Bilbao	345,821	923,562	2,388	0.69	0.26	585	0.17	0.06	245	0.07	0.03

Las Palmas de Gran Canaria	378,517	392,634	17,868	4.72	4.55	9,121	2.41	2.32	2,249	0.59	0.57
Madrid	3,223,334	9,409,386	166,314	5.16	1.77	42,236	1.31	0.45	12,917	0.40	0.14
Malaga	571,026	1,339,808	120,490	21.10	8.99	20,838	3.65	1.56	1,256	0.22	0.09
Palma de Mallorca	409,661	1,990,094	4,833	1.18	0.24	14,868	3.63	0.75	477	0.12	0.02
Santander	172,044	454,180	2,868	1.67	0.63	2,226	1.29	0.49	1,683	0.98	0.37
Seville	688,711	2,615,697	87,273	12.67	3.34	91,202	13.24	3.49	14,200	2.06	0.54
Valencia	791,413	1,799,574	45,894	5.80	2.55	26,740	3.38	1.49	4,694	0.59	0.26
Average	*844,572*	*2,706,714.,1*	*55,258*	*6.54*	*2.04*	*22,568*	*2.67*	*0.83*	*8,702.9*	*1.03*	*0.32*

Note. 1: Source INE (2018a). 2: Source INE (2018b).
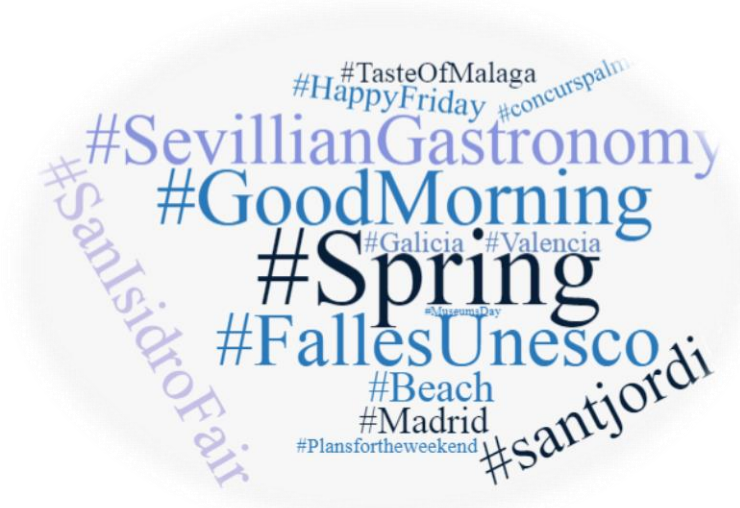
Figure 2. Hashtags used by cities with the most user reactions on Facebook.

Twitter registered a lower number of followers than Facebook for most official city sites analysed, with two exceptions – Palma de Mallorca and Seville (Table 3). Seville's Twitter site had the highest ratio for followers with respect to its residents (13.24) and visitors (3.49). Barcelona had the lowest ratio values for both categories – 0.12 and 0.03, respectively. Cities averaged three tweets per day, with text as the

preferred format, along with hashtags, and often with web links and photos. The type of content found was similar to Facebook, although adapted to the peculiarities of Twitter. The number of posts (tweets) was higher than on Facebook, with more information on events and often sharing (re-tweeting) tweets made by users of the site and organisations. The hashtags used were of a similar nature to those in Facebook, though with more emphasis on the name of the city and keywords beyond specific events. Additionally, tweets by cities were more frequent towards the end of the working week.

The number of Instagram followers was the lowest for all cities across the three social networks analysed except for Barcelona, where it was far higher than for Twitter (Table 3). Barcelona had the highest ratio value of followers with respect to residents (2.31) and A Coruña had the highest with respect to visitors (1.14). In general, Instagram was used less often than Facebook and Twitter, with a lower number of overall posts and daily posts (0.7 per day). Despite this and the fact that Instagram sites had fewer followers, the levels of interaction were considerably higher. Regarding content, images prevailed accompanied by text and web links. Moreover, images uploaded on Instagram carried more emotional messages. Hashtag use in Instagram tended to focus on the name of places and the characteristics of places (e.g. #visitvalencia, #galicia) entwined with messages of a more emotional nature, which emphasised the attractiveness of the cities (e.g., #beautifulcities, #valenciaenamora [#valenciamakesyoufallinlove]). The average number of messages per day was like that for Facebook and Twitter, though Sunday tended to be the day with the highest number of images shared.

4.2. User engagement

Table 4 shows the results obtained for popularity, commitment, virality and engagement on Facebook, Twitter and Instagram. Popularity levels, based on the number of "likes" received from users browsing through content posted by cities, were considerably different across cities and platforms. These differences may have been more closely related to the content of their sites as there was no direct relationship between the number of social media followers and the number of "likes". Thus, the higher or lower levels of followers observed are not an indicator of the level of popularity achieved by cities.

Table 4. Average popularity (P), commitment (C), virality (V) and engagement (E) index values.

Destination	Facebook					Twitter					Instagram				
	No. of followers	P index	C Index	V index	E index	No. of followers	P index	C Index	V index	E index	No. of followers	P index	C Index	V index	E index
A Coruña	22,362	4.66	0.03	1.02	5.71	15,888	0.30	0.01	0.23	0.54	5,552	49.88	0.51	0.19	50.59
Barcelona	82,292	7.59	0.24	1.34	9.17	1,977	2.30	0.02	1.47	3.78	37,456	57.70	1.04	0.66	59.40
Bilbao	2,388	7.35	0.20	1.61	9.17	585	4.84	0.22	2.58	7.65	245	76.07	2.60	0.37	79.03
Las Palmas de Gran Canaria	17,868	4.23	0.11	1.68	6.02	9,121	0.77	0.00	0.38	1.15	2,249	37.25	0.41	0.06	37.72
Madrid	166,314	2.05	0.04	0.48	2.57	42,236	0.29	0.00	0.20	0.49	12,917	27.00	0.52	0.14	27.65
Malaga	120,490	12.39	0.30	2.96	15.65	20,838	0.65	0.02	0.55	1.22	1,256	-	-	-	-
Palma de Mallorca	4,833	0.70	0.01	0.02	0.73	14,868	0.24	0.01	0.13	0.38	477	-	-	-	-
Santander	2,868	10.53	0.31	9.87	20.71	2,226	2.57	0.17	2.43	5.17	1,683	67.57	0.94	0.19	67.71
Seville	87,273	2.07	0.04	0.39	2.50	91,202	0.13	0.00	0.11	0.25	14,200	-	-	-	-
Valencia	45,894	7.94	0.16	2.49	10.59	26,740	0.33	0.01	0.26	0.60	4,694	31.76	0.85	0.40	33.01
Average	*55,258*	*5.95*	*0.14*	*2.19*	*8.28*	*22,568*	*1.22*	*0.05*	*0.83*	*2.12*	*8,702.9*	*49.60*	*0.98*	*0.29*	*50.73*

For commitment, the results showed the lowest values of all four indexes computed, as these values relied on users uploading comments related to the contents posted by cities. No relationship was observed between the number of followers and the commitment index. In fact, this index was found to have low values in both cases, regardless of the number of social media followers cities had. Thus, it would appear that the contents posted influence users' level of interaction.

The virality index values, based on the sharing of content posted by cities on their social media sites, were not the same in the three social media channels although cities tended to share similar content. The data collected from Twitter indicated that cities with less social media followers tend to have content shared more often, though this relationship was not found in Facebook nor on Instagram.

Regarding the engagement index, the values obtained for the cities varied substantially depending on the social media channel. This may be due to the level of relevance of the contents of each social media site as well as the frequency of new posts. Some cities scored higher in Facebook and lower on Twitter (e.g., Malaga), while others scored higher on Twitter or Instagram (e.g., Bilbao, Barcelona). However, when the smart city adapted content specifically to the characteristics of each social media channel, its engagement index scores were found to be similar across all three platforms. Crucially, the findings showed that in some cases smart cities with the most followers had the lowest levels of engagement (e.g., Madrid). This may be because of potentially higher numbers of lurkers or users who use these social media sites solely to obtain information without any interaction. However, there were also cities with higher numbers of followers achieving high levels of engagement through specific social

media channels (e.g., Malaga on Facebook and Barcelona on Instagram). Other cities with very low numbers of followers in absolute as well as relative terms achieved high engagement levels because of how active those few followers were combined with very low levels of online lurking (e.g., Bilbao and Santander). Moreover, cities with the highest levels of posts on social media, regardless of the language (i.e., English, Spanish, Catalan, etc.) used in those posts and their contents, attained higher user engagement levels, even when participation was lower overall in terms of user numbers.

For the comparison of index values across the smart cities, an ANOVA (DMS and Games-Howell) analysis was performed. Results obtained indicate that there were no significant differences between the cities across any of the four indexes analysed (in all cases $p>0.05$). Yet, the post-hoc ANOVA analysis carried out in which each smart city was compared individually to the rest shows that one of the cities - Bilbao - had significantly different popularity values to others, while the remaining cities in the sample had very similar values to those of their peers. This may be due to their success with likes on Twitter and Instagram compared to their low follower numbers. For the commitment index, no significant differences could be found between the cities analysed, though in the virality analysis the city of Santander emerged as the one with significantly different values in Facebook to those of its peer group. The high virality index value for Santander was directly related to the high number of shared posts for that city. Furthermore, no significant differences were found in the engagement values obtained.

Finally, in the comparison carried out of social media platforms, the ANOVA analysis showed significant differences in commitment and engagement values (in both

cases p = 0.000), but that was not the case with the popularity or virality indexes. The post-hoc analysis (DMS and Games-Howell) showed that these differences are since Instagram renders values significantly different to those of Twitter and Facebook (these differences, however, are not apparent between the latter two social media platforms). Therefore, Instagram tends to generate higher levels of user engagement for cities due to the high commitment index values rendered by its posts, while popularity and virality levels were not statistically different to those observed for Facebook and Twitter. For Facebook and Twitter, the levels of engagement were quite similar across the board with Facebook achieving higher levels of commitment and popularity, and Twitter showing higher levels of virality.

5. Discussion and conclusions

Consumer engagement is a key determining factor in the success of a brand. This research investigated the engagement of visitors and residents with smart city brands through social media by applying a digital content analysis method.

The results of the analysis of ten Spanish smart cities' social media platforms show that their overall use by city management teams remains rather rudimentary with limited levels of success in terms of fostering resident and visitor engagement and interaction. The dissemination of information remained the prevailing purpose of social media communications by these smart cities. Similarly, social media were not used effectively to support the development of the images and brands of these smart cities. Moreover, given that brand image development tends to be a subtler process involving the development of emotional ties between visitors/residents and host cities, the uploading of photographs and posts with useful information did not seem to be

capitalised upon for this purpose by these cities. Instead, most of the digital content found on official social media posts by smart cities was of a rational nature, focusing on descriptions of activities offered and existing cultural heritage. These results reflect the findings of previous studies, which showed that beliefs or knowledge about a city's attributes are more effective in generating positive images than feelings towards that city (Molinillo *et al*., 2018). Curiously, given the rise of the smart agenda with regards to the conference, meetings and exhibitions sector, only a very limited effort was found among smart city social media posts in disseminating online content related to these activities serving corporate audiences.

As with the results obtained by Sáez-Martín *et al.* (2014) in their study of social media use by smart cities, even when the destinations displayed acceptable levels of engagement, they largely failed to capitalise on the full range of options offered by social media. It can be argued that users of smart city social media sites tended to interact mainly through "likes", followed by the sharing of the content of sites (e.g., retweets), but much less so through the posting of comments. There are several factors related to the engagement of users, type of content posted and the frequency of posts by smart cities, which appear to influence these differences. For instance, residents may be inclined to display their engagement with their home cities in a more rational way by participating in related social media sites, which could result in a higher number of posts commenting on information published by smart cities. In contrast, visitors may tend to react in a more emotional way by sharing content with others and showing their approval or interest via "likes". In the comparison carried out in this study across three social media platforms, Instagram generated the highest levels of engagement.

Only two of the smart cities analysed achieved conversations with social media site users either by answering user questions and suggestions, encouraging users to participate or sharing user-generated content, even when research has shown that this is crucial for success (Brodie *et al.*, 2011, 2013; Gummerus *et al.*, 2012). Instead, in most cases, these smart cities merely shared information via social media without any attempt to encourage user interaction. Importantly, most messages posted were directed at Spanish-speaking users, with little evidence found of content shared in other languages, such as English, German, French or Chinese. This may be related in part to the concept of 'warm city marketing' first put forward by Hospers (2010), which refers to an inward-looking approach to place marketing that focuses primarily on existing residents instead of targeting visitors.

The most common smart city posts were related to information about events taking place, amounting on average to 28% of all posts shared. However, despite the fact that the social media sites were leisure-focused, the information posted by the smart city management teams appeared to be aimed mainly at residents rather than visitors. Although residents play an important role in the overall visitor experience and place branding processes (Braun *et al.*, 2013), visitors should be also a priority target of information posted on social media by cities (Zenker *et al.*, 2017). Paradoxically, information potentially of interest to local stakeholders was often omitted. This included transport options, services offered by the city, citizen advice, etc. Furthermore, it was perhaps somewhat puzzling that despite their smart city status, these cities did not use social media to offer their smart services to residents or visitors, nor did they ever mention anywhere the fact that they were smart cities.

Different levels of success were observed with user engagement, followers, content, levels of interaction and preferred social media platforms. Hence, although all the places were deemed to be smart cities, there were other characteristics such as their rankings as destinations in tourism, brand images, population sizes, or idiosyncrasies related to their local communities and visitors, which may have influenced the results. Facebook and Twitter, for instance, were the social media platforms with the largest number of followers. However, Instagram achieved the highest levels of engagement. Yet, the destinations with most followers on social media did not necessarily enjoy higher levels of engagement, possibly due to the lurker effect. Moreover, no relationship was found between the magnitude of a city's resident population or its annual visitor numbers and its number of followers or their engagement via social media. This was consistent with the findings of earlier similar studies around the world (Agostino, 2013; Bonson *et al.*, 2015, 2019).

The diversity of social media strategies pursued by the cities makes it difficult to generalise the findings to infer common trends. For instance, the city with the smallest population (Santander) delivered the highest levels of user engagement on Facebook and some of the highest on Twitter and Instagram. Conversely, one of the cities with the highest numbers of visitors and residents (Barcelona) delivered one of the highest levels of engagement on Instagram but only achieved average results for Facebook and Twitter. Half way between these two cases, a medium-sized city (Bilbao) with the lowest number of social media followers obtained the highest levels of engagement on Twitter and Instagram. Therefore, it can be inferred that cities would be advised to consider whether it is best to target a high number of followers through social media

posts or whether it would be more effective to aim instead for higher levels of engagement.

Overall, despite most of these smart cities achieving acceptable levels of followers and engagement via their official social media sites, they largely failed to take advantage of all the possibilities offered. Notably, cities must provide greater support for destination image and brand development strategies. This recommendation also applies for those elements that make cities "smart", through sharing information on services offered to residents and visitors, such as WiFi connections, integrated transport, public services and online access to these services. This remains an opportunity for competitive differentiation from other cities. In addition, cities should enhance their levels of communication with all types of visitors by making better use of technology (Gretzel *et al.*, 2006). For example, the subject cities appear to focus on leisure activities and not as much on business tourism and business events. Moreover, the emphasis is on types of leisure events, which do little to differentiate the cities from competitors or promote their smart dimensions. Smart cities should use social media more effectively by offering solutions and products that enhance the quality and enjoyment of visitors' experiences. Importantly, smart cities must focus more actively on the engagement of residents and visitors via their official social media sites before, during and after visits, in person and virtually, by adopting a more holistic and emotional approach (Cabiddu *et al.*, 2014; Költringer & Dickinger, 2015). In doing so, cities will increase the return on investment for their social media efforts and have more beneficial relationships with residents and visitors.

Smart cities (and cities in general) can use the method applied in this research to

measure the performance of competing city social media sites. The development of key performance indicators (KPIs) for social media engagement should be a key element of this process to compare ongoing performance with a standard set of metrics, which render comparisons more meaningful.

5.1. Limitations and future research

This research has limitations, which must be acknowledged. First, the set of smart cities analysed all belong to a single country - Spain - and was somewhat limited in size. Further, similar research studies could adopt a more complex transnational or global approach with samples from different countries and continents. Second, the metrics used tended to focus on more behavioural aspects of engagement, even if various authors have stressed the complexity of constructs that include cognitive, emotional and social dimensions (Hollebeek, 2011: Vivek *et al.*, 2012). Additionally, the methodology adopted renders it difficult to explain major differences observed among cities. Instead, the use of techniques such as sentiment analysis and in-depth interviews would allow a better understanding of the actions adopted by social media users. Third, the analysis of social media sites carried out did not permit a differentiation between residents and visitors. The use of alternative data collection methods might allow different audiences to be identified and analysed separately.

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