Citizen reactions to municipalities' Instagram communication

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A R T I C L E   I N F O

A B S T R A C T

In this paper, we explore how local governments are using Instagram as a communication tool to engage with their citizens, using data from the municipalities of Andalusia (Spain). We seek to identify the determinants of local government use of Instagram, the determinants of activity in this channel and the determinants of citizen reactions in order to understand the influence of media types (picture, video or album) used in municipality posts, and to understand content type (what the post is about). Instaloader, an open source intelligence (OSINT) tool for Instagram, was applied. It made it possible to automatically extract all posts of the analysed municipalities (14,742 posts). These were later automatically analysed using R, an open source software. It was determined that of the 29 Andalusian local governments with the highest populations, only those that maintain an account on Instagram, totalling 17 municipalities (58.62%), would be part of the final analysis. Our findings demonstrate that when local governments have a high level of debt, they do not maintain and actively use Instagram accounts. We also found that quality of posts' content is more important than quantity of followers, since there is no significant relationship between citizen reactions and the number of inhabitants of a municipality or the number of followers (audience), while there is a significant negative relationship between the number of posts (activity) and reactions. Our results also highlight that the level of reactions can be stimulated by certain media and content types.

1. Introduction

Over the last decade, we have been witnessing an impressive growth of social media (SM) usage not only in private, but also in the public sector (Bonsón, Royo, & Ratkai, 2015; Gruzd, Lannigan, & Quigley, 2018). Public administration bodies and, in particular, local governments have realised the benefits of SM use, including greater coverage, extended services and the possibility of obtaining feedback on governmental issues from citizens (Golbeck, Grimes, & Rogers, 2010).

This paper addresses how municipalities use Instagram to engage with their citizens, because as a SM application, Instagram has not yet been widely examined in public administration literature. Although previous research (Bonsón & Bednárová, 2015; Cho, Phillips, Hageman, & Patten, 2009) has shown that visual content is more engaging than simple text, so entities not only in the private but also the public sector are focusing on the visual SM trend, Instagram being a pioneer in this regard (Schmidbauer, Rösch, & Stieler, 2018).

Instagram is an image- and video-based SM platform, whereby posts

can use text-based captions with hashtags and comments (Gruzd et al., 2018) to support or express a message by means of the photo, album or video published. This research focuses on analysing Instagram because it is the fastest growing SM in active monthly users (Statista, 2019) and the third largest SM platform in the number of total users in the world, right behind Facebook and YouTube (We Are Social, and Hootsuite's, 2019).

Instagram was initially created as a visual mobile-based application (McNely, 2012; Selva-Ruiz & Caro-Castaño, 2017; TreceBits, 2018). The growing popularity of this platform has been supported by the proliferation of smartphones, which allow the easy capture and sharing of images and videos (Towner & Muñoz, 2018). Recently, Instagram has extended its presence to computer desktops as well. However, in comparison to its peers such as Facebook and Twitter, which facilitate full access to all of their features from both desktop- and mobile-based apps, the functionality of Instagram is still more efficient on smartphones (Motyka, 2016).

Therefore, the benefits of mobile-based information exchange for civic and political engagement (Campbell & Kwak, 2010), together with

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the aforementioned attraction of visual content, makes Instagram an adequate SM to encourage citizen interactions.

Moreover, while other SM as Twitter is a more "formal" news platform that supports high levels of two-way communication between the government and citizens, Instagram represents a more "informal" narrative concept that promotes clicktivist-type responses (Gruzd et al., 2018). Thus, in the current study, we analysed on Instagram the first of the three levels that Mergel (2013b) identifies in the process of adoption of SM by local governments. This is the representation strategy, which operates through indicators such as likes and comments, and analysed citizens' reactions to it.

In this way, this study measures the impact of Instagram use by local governments (municipalities) in the region of Andalusia (Spain) on citizen reactions, as well as the effect of different media and content types on that reactions. In this paper, we therefore aim to answer the following research questions: (RQ1) To what extent do municipalities use Instagram as a communication channel to engage with their citizens, and what motivates its use? (RQ2) What variables affect the Instagram activity of municipalities? (RQ3) What variables affect citizen reactions on Instagram?

This research focuses on analysing the Instagram practices of the 29 main Andalusian municipalities. The importance of the chosen region lies in the fact that the use of Instagram will depend on the characteristics of the local community, since according to Friedland (2001), the local media systems maintain substantial autonomy. This region was chosen as the sample based on two factors: population and SM usage.

In the Europe, 65% of Europeans regularly use SM, while the Spanish average is even slightly higher at 68% (European Commission, 2018). In terms of Instagram, 33.4% of the total Spanish population are users of this platform (NapoleonCat, 2019). In addition, Spain has become one of the largest producers of Instagram Stories in the world, with a remarkable 150% more Story content than the global average (Krieger, 2017).

SM use in Spain is led by Andalusia (Fundación Orange, 2014; Fundación Telefónica, 2016) and three Andalusian cities – Seville, Granada and Malaga – are among the five Spanish cities with the highest number of profiles registered on SM by number of inhabitants (The Social Media Family, 2018). And It should be noted that Andalusia has set a world benchmark in mobile technology, since it has the largest 5G platform in Europe (Vodafone, 2019). And is that, Andalusia is a region characterized by seeking modernisation and change (Cruz Artacho & Acosta, 2014).

The Andalusian population represents 18% of the total Spanish population, making it the most populated region, and more than half of Andalusians reside in these 29 municipalities (INE, 2017).

For the purposes of our study, both quantitative and qualitative data were collected. Quantitative data in the analysis represent Instagram metrics (i.e. comments, likes) to measure the level of citizen reactions. Qualitative data, on the other hand, stem from identifying content and media types to understand the reactions. Previous research (Bonsón, Perea, & Bednárová, 2019; Hernández Sampieri, Fernández Collado, & del Baptista Lucio, 2010) has also pointed out the effectiveness of applying this type of mixed methodology. The rigorousness of the study is guaranteed by a robust analysis that considers all the municipalities' posts since they first joined Instagram.

This study provides a general overview of Instagram usage by Andalusian local governments and offers insights into the correlations related to municipality characteristics and Instagram metrics such as published posts, number of followers and the citizen reactions (i.e. comments, likes). It follows a similar approach and uses the same municipality sample to that of Bonsón et al. (2019) on Twitter. To the best of our knowledge, this is the first study to address this issue on Instagram, being this its main contribution. This study will therefore both fill a gap in the literature and may also help local governments integrate academic research into the municipality's communication strategy. As a result, this study might offer implications for both research and practice.

The rest of the article is organized as follows: section 2 presents a brief overview of previous studies related to the use of SM, and Instagram in particular, in the public sector and it present the variables to be study. Section 3 outlines the research methods. Section 4 presents the findings of this study, regarding both the Andalusian municipalities' behaviour on Instagram and the citizen reactions to their local governments on Instagram. The obtained findings are discussed in section 5, and the relevant conclusions are drawn in section 6. Finally, the main limitations and avenues for future research are discussed in section 7.

2. Literature review

The literature review covers three fundamental aspects—the use of social networks by municipalities, Instagram and the main explanatory variables to be used—to answer the research questions posed in the introduction section.

2.1. Municipalities' use of social media

The report on e-governance in municipalities worldwide carried out by Holzer and Manoharan (2019), which evaluated local governments on five categories (privacy and security, usability, content, services and citizen engagement), concluded that citizen engagement scored the lowest among the five categories.

Therefore, the local governments must use more appropriately the tools that provide them with greater citizen engagement. With special attention to SM, since they have potential to provide support to citizens interacting with the public sphere (Eltantawy & Wiest, 2011). Several authors have indicated the relevance of SM as a key tool to encourage citizen engagement by facilitating for communication, discussion and coordination of public and social activities (Bonsón, Royo, & Ratkai, 2017; Criado, Sandoval-Almazan, & Gil-Garcia, 2013; Gil de Zúñiga, Jung, & Valenzuela, 2012; Marie Warren, Sulaiman, & Ismawati Jaafar, 2014; Sáez Martín, Haro de Rosario, & Caba Pérez, 2015).

Although there are many SM platforms with different functionalities (Shane-Simpson, Manago, Gaggi, & Gillespie-Lynch, 2018), participation/engagement is a common characteristic of all of them, such as openness, conversation, connectivity and community (Chan-Olmsted, Cho, & Lee, 2013; Mayfield, 2008; Zheng & Zheng, 2014).

The concept of "engagement" in the public sector is a broad term which implies both civic and political participation (Skoric, Zhu, Goh, & Pang, 2016). However, some previous research (Kaun & Uldam, 2018; Knowles, 2018; Park & Gil de Zúñiga, 2019) analysed the concept of civic engagement. Adler and Goggin (2005) have defined engagement as a citizen's participation in community life with the objective of improving conditions for others or helping shape the future of the community. It is a key component, especially in local governments, for the optimal functioning of governance (Siebers, Gradus, & Grotens, 2019).

However, to achieve citizen engagement, a process must be followed. According to Mergel (2013b), the adoption of SM in local governments involves the following stages: 1) representation, 2) engagement and 3) networking. These three dimensions of social governance range from the lowest degree of online presence to more complex forms of networking (Mergel, 2016), starting with the interaction, going through the feedback or contribution, and reaching a dialogue (Nurmandi et al., 2018). Representation is considered a "push strategy" through which local governments merely disseminate information in order to increase the transparency of municipal issues. Engagement can be described as a "pull strategy" that aims to increase the interaction between citizens and local government; tactics related to this strategy include calls to participate in opinion polls, requests for submission of ideas and comments, and invitations to co-create or co-design the content or services. The last stage of SM adoption in local governments, networking, is built on the interactive features of SM; it is used by government agencies to facilitate ongoing dialogue with citizens and to encourage them to share content on their networks.

As numerous previous studies (DePaula & Dincelli, 2016; Gesuele, Metallo, & Agrifoglio, 2016; Mergel, 2013b; Mossberger, Wu, & Crawford, 2013) have shown, representation is the strategy most adopted by local authorities. Because despite the fact that SM can be optimally operated as new local discussion forums (Haro-de-Rosario, Sáez-Martín, & del Carmen Caba-Pérez, 2018), the reality is that the citizen engagement with local governments in SM are rather limited, as SM are mostly used to inform citizens rather than to promote e-participation (Silva, Tavares, Silva, & Lameiras, 2019).

Therefore, concerted efforts must be made to promote SM engagement with citizens, as citizens are considered to be the stakeholders of the municipalities. Nevertheless, "the stakeholders of the municipalities" is a broad term. Thus, we distinguish between primary, contractual or direct participants (politicians and citizens) and complementary, contextual or indirect participants (institutions, media, future generations...) (Melle Hernández, 2007; Moraga, Garrido, & Sanhueza, 2014). Yet most of the stakeholders of the municipalities are citizens (Corrêa Gomes, 2004). Citizens, unlike individuals or groups in the private sector, do not voluntarily choose to be "clients" of the particular municipality, but that consideration such is automatically applied to them (Canel, 2014).

2.2. Academic studies on Instagram

We must emphasize, like other authors (Zolkepli, Hasno, Nadiah, & Mukhiar, 2015), the importance of Instagram as an optimal tool to encourage citizens' reactions. In the area of public administration, Gruzd et al. (2018) concluded that Instagram posts were more engaging in terms of number of likes and replies than Twitter posts.

Additionally, Instagram is gaining popularity among politicians faster than any other SM platform (Straus, 2018). The particular features of this SM meant that Instagram played a much more important role than Facebook in the Russian manipulation of US voters in the 2016 elections (Diresta et al., 2018). This indicates the relevance of Instagram as a SM platform for interacting with citizens.

Academic studies on Instagram are quite scarce, in comparison to the abundant international academic research on the use of Facebook or Twitter. By examining the literature in Instagram, we have obtained several remarkable conclusions:

i. Studies on the use of Instagram tend to focus on aspects of user personality, leaving the scope of public administration unexplored (Alhabash & Ma, 2017; Choi & Sung, 2018; B. Kim & Kim, 2018; Lee, Lee, Moon, & Sung, 2015; Moon, Lee, Lee, Choi, & Sung, 2016; Paramboukis, Skues, & Wise, 2016; Phua, Jin, & Kim, J. (Jay)., 2017; Pittman & Reich, 2016; Sheldon & Bryant, 2016). It turns out that the Instagram literature is almost non-existent when focused on its use by governments, beyond studies related to the use of Instagram during political campaigns under the umbrella of political communication (Russmann & Svensson, 2017; Schmidbauer et al., 2018; Towner & Muñoz, 2018; Turnbull-Dugarte, 2019).

A research gap therefore exists concerning Instagram as a platform for citizen reactions, which in itself requires analysis that goes beyond the perception of the platform as a tool only for political campaigns. Previous studies indicate a gap in literature regarding the qualitative aspects of SM usage by local governments and the implications of this usage on government-to-citizen relationships (Bonsón, Torres, Royo, & Flores, 2012; Norris & Reddick, 2013). By applying potent computing techniques together with the automated tools, we are able to study the phenomenon of citizen reactions, define its status-quo and explore it from a citizen's point of view.

ii. The most common samples used in analyses of Instagram are composed of university individuals (Alhabash & Ma, 2017; Phua, Jin,

& Kim, J. (Jay, 2017; Phua, Jin, & Kim, J. (Jay)., 2017; Pittman & Reich, 2016; Sheldon & Bryant, 2016).

Despite the fact that the research will focus on young people, since it is true that the use of Instagram varies according to age differences (Jang, Han, Shih, & Lee, 2015), it appears that gender is the best predictor for understanding the use of Instagram (Sheldon & Bryant, 2016). Women between 18 and 30 years old are the most likely to be active on Instagram, and they are also the most common users on this platform (Djafarova & Rushworth, 2017; We are social & Hootsuite, 2020).

iii. Previous literature has mainly investigated the cases of the United States and the Canada (Alhabash & Ma, 2017; Gruzd et al., 2018; B. Kim & Kim, 2018; Lalancette & Raynauld, 2019; Phua, Jin, & Kim, J. (Jay, 2017, Phua, Jin, & Kim, J. (Jay)., 2017; Pittman & Reich, 2016; Schmidbauer et al., 2018; Towner & Muñoz, 2018). Therefore, there is a lack of literature exploring this phenomenon in other regions, such as Europe.

There is a lack of research analysing citizen reactions on Instagram in regions other than the United States and Canada, which are the cases where the previous literature has mainly investigated. Other regions, such as Europe, still require exploration, which is one of the primarily motivators of our research. It must be taken into account that the latest trends show that the transformation in SM usage is no longer led by the United States, but rather that regions such as EMEA (Europe, Middle East and Africa) or Latin America are gaining importance (ReasonWhy, 2018). An opportunity thus emerges for academics and practitioners to redirect their attention and explore the practices of SM use in these new emerging regions and identify cultural patterns.

iv. The number of comparative studies with other SM are in the majority as opposed to the exclusive research of Instagram (Blank & Lutz, 2017; Calderón, López, & Peña, 2017; Jeri-Yabar et al., 2019; Krallman, Pelletier, & Adams, 2016; Thelwall & Vis, 2017; Waterloo, Baumgartner, Peter, & Valkenburg, 2018).

Every year, the marketing agency We Are Social and the SM management platform Hootsuite jointly publish a report on the evolution of the digital world; their latest report is Digital, 2020. They indicate that even though Facebook continues to be the most used SM network, highly-visual SM like Instagram and Snapchat, and especially the short video platform TikTok (Anderson, 2020; Chen, He, Mao, Chung, & Maharjan, 2019), have recently experienced a rise in popularity (Marengo, Longobardi, Fabris, & Settanni, 2018). All three of the aforementioned SM surpass Twitter in monthly active users.

However, in academic publications Facebook and Twitter are still the most studied SM (Blank & Lutz, 2017). For this reason, when studying the case of Instagram, it is compared with both platforms. These three platforms, although they share similarities, have different characteristics and are designed for different purposes, which leads to different groups of users. In essence, people use Facebook to stay in touch with friends, Twitter to follow news and trending topics, and Instagram to easily filter and upload visual images (Phua, Jin, & Kim, J. (Jay, 2017). As Table 1 shows, there are differences and certain similarities in features and functions between Facebook, Twitter and Instagram.

One of the fundamental characteristics of these networks is the platforms on which they are based. Facebook is both image-based and text-based social media, while Twitter is only text-based and Instagram only image-based (Pittman & Reich, 2016).

About the social capital derived from SM use, Phua, Jin, and Kim, J. (Jay). (2017) concluded that Twitter users had the highest bridging social capital, followed by Instagram users, while Facebook users had the highest bonding social capital, followed by Snapchat users. The contact network of Facebook is more closed because its users connect with real life friends and family, while Twitter has a very open contact

Table 1
Comparison in features and functions among main social media in the previous literature.

Features / Functions	Social media			References
	Facebook	Twitter	Instagram	
FEATURES				
Platform base	Text and image	Text	Image	(Pittman & Reich, 2016)
Social Capital	Bonding social capital (high)	Bridging social capital (very high)	Bridging social capital (high)	(Phua, Jin, & Kim, 2017)
Contact network	To connect with ours real life friends and family.	To connect with people, we don't know in real life, including celebrities and other public figures.	To connect with others, we don't know in real life, but to a lesser degree than Twitter.	
Profile pictures	With other persons	Not relevant	Selfie	(Thelwall & Vis, 2017)
Motivates users to hashtag	Amusing	Organizing, Confirming, Trendgaging, Reaching	Organizing, Summarizing	(Rauschnabel et al., 2019)
Advertising	Generate negative emotions		Generate entertainment compared to other platforms	(Voorveld et al., 2018)
Gender and age	Adult male	Young male	Young women	(Shane-Simpson et al., 2018)
Trusted	Low	Medium	High	
FUNCTIONS				
Use motivations	Convenience, Entertainment, Passing time	Entertainment,Convenience,Medium appeal		(Alhabash & Ma, 2017)
Social influence	Weak	Medium	Strong	(Arora et al., 2019)
Social commerce purchase intention	Medium	Low	High	(Kircova et al., 2018)
Expressing emotions	Neutral	Negative	Positive	(Waterloo et al., 2018)
Crisis communication	No effective	Effective	No effective	(Triantafillidou & Yannas, 2020)

network because its users connect with people they do not know in real life, including celebrities and other public figures. Instagram has an open contact network because its users also connect with people they do not know in real life, but to a lesser degree than Twitter.

The profile picture of users on Twitter is not relevant, while on Facebook and Instagram it is, but in different ways. On Facebook, accompanied photos predominate, and on Instagram, selfies photos are the norm (Thelwall & Vis, 2017).

The use of hashtags also varies; hashtags are most used on Twitter, followed by Instagram and finally Facebook, where most of the hashtags are private and not public as on Twitter and Instagram. Hashtags are used on Twitter to organise, confirm, trend gauge and reach, while on Instagram hashtags are used for organising and summarising, and on Facebook they are used for amusement (Rauschnabel, Sheldon, & Herzfeldt, 2019).

Advertising exists on all three platforms, but there is not perceived in the same way. While on Facebook and Twitter it generates negative emotions, on Instagram it generates entertainment (Voorveld, van Noort, Muntinga, & Bronner, 2018).

Finally, the users who use each SM platform the most are different and have different levels of trust in the platforms (Shane-Simpson et al., 2018). Facebook generates low trust and its most active users are adult males. Twitter has medium levels of trust and young adults are its most active users. On Instagram, trust is high, and its primary users are young women.

The functions of the platforms mentioned are also diverse. Facebook is used first for convenience, then for entertainment, and then to pass the time, while Twitter and Instagram are used mainly for entertainment, then for convenience, and lastly for medium appeal (Alhabash & Ma, 2017). Regarding social influence, Instagram is the most influential SM platform, followed by Twitter and then Facebook (Arora, Bansal, Kandpal, Aswani, & Dwivedi, 2019). Instagram is also the platform that generates the most social commerce purchase intentions, followed by Facebook and then Twitter (Kircova, Yaman, & Köse, 2018). Different emotions are usually expressed on each SM platform: neutral emotions on Facebook, negative emotions on Twitter and positive emotions on Instagram During crisis situations, communication is not effective on Facebook or Instagram; it is only effective on Twitter (Triantafillidou & Yannas, 2020).

2.3. Analytical framework variables

This article aims to empirically identify the determinants of Instagram usage by Andalusian local governments, the determinants of activity in this channel and the determinants of citizen reactions.

To this end, two operational phases can be identified. The first phase will identify the possible determinants of the activity of Andalusian city governments on Instagram and the reactions of their citizens. The second operational phase concerns the assessment of the previously identified determinants, which are structured around the characteristics of the municipality and the Instagram profile accounts. This second phase will be resolved throughout the paper.

The identification of possible determinants is based on the variables that academics have previously studied for each question posed. These are conceptually presented, together with their information source, in Table 2.

The use of Instagram (RQ1) is understood as the adoption of and active presence on the platform; this data has been obtained by observing Instagram. The variables that have been selected to assess Instagram's use are population, geolocation, political leanings' and public debt.

Activity (RQ2) is the number of posts made on each account; this data has been obtained from the Instagram profiles of the municipalities. Population is the variable chosen to assess impact on usage.

Citizen reaction (RQ3) is citizen's engagement in the most basic SM adoption stage in local governments, the "representation" dimension, which is indicated by likes and comments. Citizen reaction is calculated by the metric proposed by Bonsón and Ratkai (2013). Because of the extensive previous findings on citizen reaction, the variables that have been selected to assess whether they affect it are population, activity, audience, media types and content types.

Due to the limited literature that exists on Instagram in the public sphere, the identification of these variables has based on previous findings related to another SM. Therefore, we have tried to translate the previous findings from other SM to analyse whether the same thing occurs on Instagram, considering that personality traits moderate the

Table 2
Variables' definition and measurement

Characteristics	Concept	Description	Source	Research Questions
Municipality	Geolocation	The geographic location (coastal or inland) of the municipality.	Website of municipalities themselves	RQ1
	Political leanings'	The ideology (left-wing or right-wing) of the political party that governs in the municipality.		
	Public debt	The amount of money that the municipality owes to outside debtors.	Instituto de Estadística y Cartografía de Andalucía (IECA)	
	Population	Number of inhabitants of each municipality.		RQ1, RQ2, RQ3
Instagram profile accounts	Activity	Number of posts of each account.	Instagram profile of municipalities themselves	RQ2, RQ3
	Audience	Number of followers of each account.		RQ3
	Media type	The way (multimedia content) in which the posts are published. There are three types: Picture, Album and Video.	Instagram's own features	
	Content type	The content that is disclosed in the posts. There are seven types: Cultural and Marketing, Transport and Public Works, Security and Health, Employment and Education, Sport, Environment, and Other. (see Table 2)	Based on Bonsón, Perea and Bednárová (2018), an adjustment of the list of other authors (Bonsón and Bednárová., 2015; Martí, Royo, and Acerete., 2012), which was preliminarily defined by Torres and Pina (2001).	

influence of SM on discussion network heterogeneity and civic participation (Y. Kim, Hsu, & Gil de Zúñiga, 2013), and that each Internet user has an average of 5.54 SM accounts (Mander, 2015).

SM is increasingly playing an important role in promoting tourism (Madondo, 2016). Although, as some authors highlight, the most tourism-oriented municipalities recognise the added value of this promotion trend, their SM exploitation is still very limited and largely experimental (Hays, Page, & Buhalis, 2013; Perakakis, Trihas, Venitourakis, Mastorakis, & Kopanakis, 2016), considering that the main attraction of Andalusia for tourists is the type of tourism known as "sun and beach" (Bruna & Duque, 2019). Moreover, in Andalusia, two out of every three tourist accommodations are concentrated on the coast (Junta de Anadalucia, 2016). Previous studies show that the governments' geographic position may influence their adoption of SM (Metallo & Gesuele, 2016). Therefore, one of the variables chosen to explain the use of Instagram is the geolocation of the municipalities, which can be either coastal or inland.

The political ideology of the ruling party in the municipality may also generate an active presence on SM platforms (Bonsón et al., 2012). Some studies find that left-wing governments are more transparent than right-wing ones (García-Sánchez, Frías-Aceituno, & Rodríguez-Domínguez, 2013; Guillamón, Bastida, & Benito, 2011), so they may be more willing to use SM. In contrast, other studies have found that the use of Facebook by municipalities does not depend on whether the local governments are left- or right-wing (Guillamón, Ríos, Gesuele, & Metallo, 2016). Therefore, political leaning is an additional variable used to verify whether it affects the use of Instagram.

Previous studies demonstrate that governments' financial conditions may influence their adoption of SM (Criado, Rojas-Martín, & Gil-Garcia, 2017). Some literature has studied the relationship between public debt and e-disclosure (Cárcaba & García-García, 2010). The literature suggests that higher public debt is associated with higher disclosure (Ingram & DeJong, 1987; Zimmerman, 1977) through different media, including SM. Therefore, governments with higher levels of debt make politicians disclose voluntary information on SM as a way of demonstrating their ability to honour their obligations. However, the same does not happen in the case of Facebook: its use is lower when the level of local government debt is high (Guillamón et al., 2016). Thus, we propose public debt as one of variables for understanding the use of Instagram.

Several studies (Pina, Torres, & Royo, 2009, 2010; Schedler & Summermatter, 2007) have pointed out that technological innovations such as e-government practices tend to be adopted more rapidly by larger local municipalities. The studies carried out by Bonsón et al. (2017) focusing particularly on SM usage by municipalities support the statement that municipality size matters and that larger cities appear to have a greater likelihood of using SM as a communication channel with citizens. Moreover, the costs of preparing and disclosing information on SM are considered to be fixed, so that these costs become lower in larger municipalities, since they benefit from economies of scale (Guillamón et al., 2016). The number of inhabitants was chosen as one of the metrics for municipality size and was identified as one of the variables for understanding use of and activity on Instagram.

Nevertheless, a large number of inhabitants does not guarantee higher citizen engagement (Bonsón et al., 2017). Some authors postulate that this might be due to the sense of belonging, which is stronger in small municipalities where citizens feel more a part of the community, which in turn leads to higher reactions. This phenomenon is observed in SM interactions as well. However, in larger municipalities people have fewer face-to-face contacts and use more web applications as communication tools (Guillamón et al., 2016). Thus, the population, as one of the metrics for municipality size, also was chosen as one of variables for understand citizen reactions.

Mergel (2013a) points out that if a public administration entity seeks to improve the level of reactions, it must constantly encourage citizens to actively participate on the municipality's SM platforms. Münchener Kreis (2013) and Zavattaro and Sementelli (2014) note that a one-way communication model does not boost interaction and does not lead to engaged citizens. Nevertheless, the recent evidence (Mergel, 2013a; Zafiropoulos, Antoniadis, & Vrana, 2014) shows that in public administration this model still persists.

Although Bonsón et al. (2017) did not find any relationship between the activity on the public administration SM account and citizen reactions, public sector use of the social platform Instagram has not yet been analysed. Given its specific feature – a visual content – the activity on this platform might lead to different outputs, as several studies (Cho et al., 2009; Davison, 2007) have found that visual content is more engaging. Thus, the municipalities' activity was also identified as one of variables for explaining citizen reactions.

Some previous studies on SM and citizen reactions in the public sector found no relationship between audience size (number of followers) and citizen reactions (Bonsón et al., 2017; Ma, 2013). A pattern similar to the municipality's size might therefore be observed. Indeed,

several authors have sought to explain this phenomenon by stating that greater reactions on SM with fewer followers is caused by individuals' perception that their opinion is important, so they feel more encouraged to express themselves and communicate via these platforms (Ma, 2013). Therefore, understanding the number of followers of the account as the size of the audience was another variable for understanding citizen reactions.

Instagram allows diverse visual content to be published. Its multimedia content is represented by four media types: picture, video, story or album (Facebook for developers, 2019). Previous studies have noted the significance of SM for information disclosure and argued that visual content is a more powerful communication tool that enhances the potency of a given message (Davison, 2007; Graves, Flesher, & Jordan, 1996).

Media analysis of Facebook posts by local governments has been done by Bonsón et al. (2015) and Hofmann, Beverungen, Räckers, and Becker (2013), and both studies confirm that posts with pictures tend to increase the citizen interaction in terms of likes and comments, in comparison to plain text posts. Similar studies on Twitter (Zavattaro, French, & Mohanty, 2015) have also claimed that messages with an additional layer of richness – such as images and photos – tend to draw a greater response from citizens. According to Bonsón and Bednárová (2018), the video format is a powerful medium because it combines sight, sound, motion and emotion to reach the senses of the audience. Considering the added layer of richness, the video medium provides in comparison to traditional tools, it may be more engaging than other media types. We therefore intention to explore whether different media types – depending on their degree of richness – led to different levels of citizen reactions on Instagram.

Previous research (Feroz Khan, Young Yoon, Kim, & Woo Park, 2014; Graham & Avery, 2013; Halpern & Katz, 2012) postulated that certain content type can generate higher/lower citizen reactions, however, there is no evidence on how it works on public sector Instagram accounts. Thus, for the purposes of our study, the content type has been classified into seven different categories (see methodology section). Furthermore, we aimed to find out whether there is a relationship between the number of likes and comments, which were considered proxies for citizen reactions, and the content type of the posts.

According to Hofmann et al. (2013), there is not any specific content type that would automatically lead to more engaged audience. Yet, several studies have found patterns according to which a particular content type such as cultural activities, sports, public transport or promotional publications for the city, region or country generated higher levels of citizen participation (Bonsón et al., 2015; Bonsón & Bednárová, 2018). The final variable that we identified for understanding the use of Instagram was content type.

3. Methodology

3.1. Sampling and Data Collection

Our sample consisted of the 29 largest Andalusian municipalities ranked by number of citizens based on the statistics published yearly by the *Instituto de Estadística y Cartografía de Andalucía* (IECA). These municipalities included those with a population exceeding 50,000 inhabitants. Andalusia has 785 municipalities, but the 29 municipalities chosen to represent more than 50% of the Andalusian population. For this reason, we have selected these municipalities as a sample for our analysis.

The data for further analysis were retrieved from the municipalities' verified Instagram accounts. The account information was collected by either following the Instagram icon link on the municipality's official website or by searching the Instagram platform to identify the verified municipality account. For the 29 municipalities, 17 verified Instagram accounts were identified. The period of analysis was from the moment they joined Instagram until August 31, 2018 and included all their posts

on any local issue (sporting events, popular festivals, elections, etc.) until that date.

The data collection took place in September 2018 using Instaloader, a Python library for downloading pictures (or videos) along with their captions and other metadata from Instagram, which automated the collection process (Graf, 2017). When Instaloader runs to download the posts of an Instagram account, it returns a folder with the user's profile name as an output. This folder contains files for each post, including a JPG file for the image, a TXT file for the caption of each of the posts and a JSON file with the metadata. The latter were the raw material for our study.

Before starting the metadata analysis, data were processed to facilitate their further analysis. This was done by first merging all of the JSON files into a common file using Python and then using another Python code to convert the resulting single JSON file into a CSV file (Fig. 1).

After processing the data from the Instagram, the activity was measured by counting the total number of posts on each municipality Instagram account. Similarly, the number of followers was obtained to measure the audience. As shown in Table 3, citizen reactions were measured by using an adaptation of the Facebook metrics developed by Bonsón and Ratkai (2013) where only the metrics of popularity and commitment for the analysis of likes and comments respectively were considered. Both of these types of Instagram interactions are considered proxies for citizen reactions.

The virality metric cannot be used due to Instagram's own characteristics. Unlike Facebook with its "share" button and Twitter with its "retweet" function, reposting is not an official feature of Instagram. The platform does not allow you to repost or regram another Instagram user's photo to share it with your followers. Although it is true that the application allows you to repost publications on Instagram Stories, it is not possible to do so in the platform's feed (Molina, 2019). For this you need to use an external app or to take a screenshot of the original photo and republish it manually, always citing the original user (Romero, 2018). Some of these functions are not instantaneous, as they are on Facebook and Twitter. None of the methods in which the repost/regram are performed leaves a record of how many times a post has been shared.

3.2. Content Analysis

This study also sought to identify whether content category and media type led to higher citizen reactions. The media types were identified using the 'type' column from the database; if this contained the term 'GraphImage', the post is a picture; if it contained the term 'GraphVideo', the post is a video; and if it contained the term 'GraphSidecar', the post is an album. We only classified and coded according to these three categories of media type on Instagram (picture, video and album), because the story category was discarded as it disappears after 24 hours, unless it is added as a highlight (Instagram Help Center, 2019), from which our Instagram scraping tool is not yet able to get metadata.

Holsti (1969) defines content analysis as a multipurpose research method which helps to investigate a wide spectrum of problems where specific characteristic of messages is being systematically and objectively identified. Numerous studies on SM (Bonsón & Bednárová, 2018; Martí, Royo, & Acerete, 2012; Torres & Pina, 2001) have applied content analysis to compare and analyses published content. Seven categories were used for coding.

This classification of content types is based on local service lists developed by Torres and Pina (2001) and later adapted by Martí et al. (2012) and Bonsón et al. (2015). Bonsón et al. (2019) refined the classification framework according to the most frequent words that appear in the posts. Hence, some categories have been omitted or merged with another category.

For example, "public transport" and "public works and town planning" were merged into the common category "Transport and Public
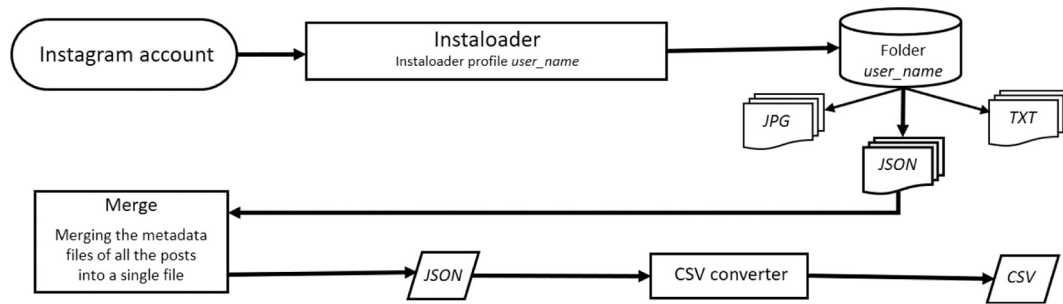
Fig. 1. Flowchart of data scraping

Table 3
Metrics for citizen reactions (Bonsón y Ratkai, 2013).

Metrics	Code	Calculation
Popularity	P1	Number of posts liked / total posts
	P2	Total number of likes / total posts
	P3	(P2 / number of followers) × 1000
Commitment	C1	Number of posts commented / total posts
	C2	Total number of comments / total posts
	C3	(C2 / number of followers) × 1000
Reactions	R	P3 + C3

Works", because they share many related keywords. The same happens with "education" and "employment and training schemes", which were added into "Employment and Education", and with "citizen protection and security" and "health" that moved to "Security and Health".

In contrast, the "Environment" content remained an individual category due to its importance, and the "cultural and sports activities" content was separated into two categories due to its individual relevance, creating the "Sport" category on the one hand and "Cultural and Marketing" on the other. The "cultural" content and the "marketing/city promotion/tourism" were grouped into one category, because it was very difficult to differentiate both categories, as many of the cultural events are also tourist attractions, and most of the city promotion occurs through monuments or local festivities.

Finally, the content types that have barely been mentioned in Instagram posts of local municipalities, such as "attention to the citizen", "social services", "housing", "governance issues", "financial reporting", "atmospheric information", and "landscape", among others, have been catalogued as "other" content type.

Table 4 shows the content types that were identified and coded for the post content analysis.

For the purposes of this study, the whole process of content analysis consisted of four steps (as shown in Fig. 1 and Fig. 2): (1) sampling, (2) coding, (3) content analysing and (4) consolidating the results.

Sampling: In total, we analysed 14,742 posts, which represented

Table 4
Content types.

Content type	Post content	Code
Cultural and Marketing	Cultural activities and events. Traditional holidays. City promotion. Tourism.	1
Transport and Public Works	Public and private transport. Works in the city. Town planning.	2
Security and Health	Citizen protection and security. Health services.	3
Employment and Education	Employment and training schemes. Education.	4
Sport	Sporting activities and events.	5
Environment	Environmental concern. Public cleaning services.	6
Other	Minority contents: attention to the citizen, social services, housing, governance issues, financial reporting, atmospheric information, landscape, among others.	7

100% of the total posts published by the studied municipalities from the time they joined Instagram until August 2018.

Coding: Firstly, the preliminary categories of the content type were defined based on the Torres and Pina (2001) list which was later adjusted by other authors (Bonsón et al., 2015; Martí et al., 2012). Secondly, in the same way that Bonsón et al. (2019), the list was adapted based on the most frequent words identified in the posts of the local governments by using the R library "tm" (Feinerer, Hornik, & Meyer, 2017). We used various function to transform the posts and find the most frequent words they contain (Fig. 2). The content types for frequent words were catalogued, associated, and modified when needed. At this stage, the content of the posts was automatically tabulated based on the categories presented in Table 4. In addition, a dictionary was created for each category using the words appearing most frequently for that category (Fig. 2); the dictionary contained the words that identify each type of content. The creation of the dictionaries used a function of the base package of R, *grepl* (R Core Team, 2018). At this point, the areas of possible ambiguity were identified together with any necessary adjustments in terms of classification descriptions and categorization of frequent words. The subjectivity was reduced due to the automated process of classification. Yet, if a post belongs to more than one category, an overlap bias might have occurred. All the adjustments were integrated into the content analysis framework to establish the final coding.

Content analysis: The R library "dplyr" (Wickham, Francois, Henry, & Muller, 2017) has been used to automatically analyse and classify the content of the posts as shown in Fig. 2.

Results consolidation: In this step, the results from the content analysis were consolidated and the statistical differences were calculated.

3.3. Measurement of variables

The selection analysed variables is based on some variables studied by Guillamón and al. (2016) for RQ1 and on both the variables studied by Bonsón, Bednárová, and Wei (2016), and Bonsón et al. (2019) for RQ2 and RQ3.

For RQ1, the dependent variable is the adoption and use of Instagram by municipalities, which we measured with dummy variables (0 = without an active presence on Instagram and 1 = with an active presence on Instagram). The independent variables are the geographic location of each municipality (geolocation), which we measured with dummy variables (0 = inland and 1 = coastal), the ideology of the political party that governs the municipality (political leanings), which we measured with dummy variables (0 = right-wing and 1 = left-wing), the public debt, that is the amount of money that the municipality owes to outside debtors and the number of inhabitants of each municipality (population). With these variables, we seek to explain the active use of Instagram by municipalities.

For RQ2, the dependent variable is the municipality's activity on Instagram, that is, the number of posts published by each account. Its independent variable in this analysis is the number of inhabitants of each municipality (population). On RQ3, the dependent variable, the
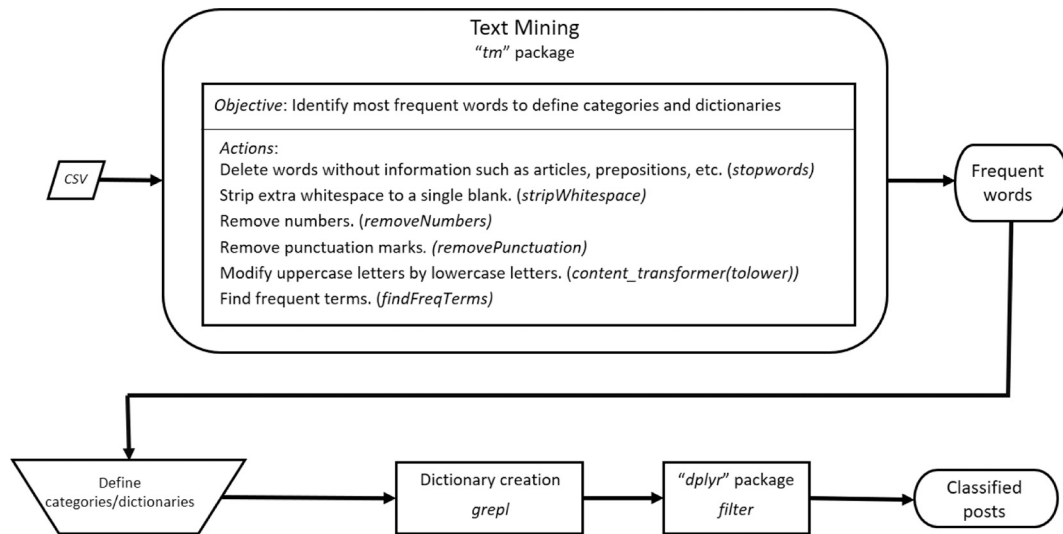
Fig. 2. Flowchart of content analysis

level of citizens' reactions against Instagram posts published by their municipalities, is measured by an adaptation of the metrics proposed by Bonsón and Ratkai (2013), obtaining a percentage for each municipality as a result.

Its independent variables in this study are both characteristics of the municipality and characteristics of the accounts of Instagram profiles, mainly to check whether there is a relationship with the level of reactions of citizens. Data about the number of inhabitants of each municipality (Population), the number of posts published by each account on Instagram (Activity), the number of followers (Audience) and the different media types and content types were collected. By these variables, we seek to explain the level of citizen reactions on Instagram.

3.4. Statistical Tests

After data collection, calculation of the citizens' reactions and identification of the media type and content type of each post, the analysis was carried out using the R software, both for descriptive analysis and to provide statistical measurements through, a generalized linear model (Binomial), the rank correlation (Spearman's rank correlation coefficient), the Multiple linear regression, the proportions of F (Welch's ANOVA) and Independence test.

The descriptive statistics, which include the maximum, minimum, mean, standard deviation and the percentage, were provided to characterize the sample and to describe the characteristics of Instagram profiles each municipality.

The first research question employs the binomial generalised linear model to identify what determines the adoption and active use of Instagram by local governments. The dependent variable for this question is the use of Instagram and the independent variables are the characteristics of the municipalities: geolocation (coastal vs. inland), political leanings (left-wing vs. right-wing), public debt and population (number of inhabitants). The objects of analysis are the municipalities. In this case, the initial sample consisted of 29 municipalities, and we determined whether they had an Instagram account. The binomial generalised linear model was applied since the dependent variable is the number of yes/no occurrences, where the response data, Y, is binary (taking on only values 0 and 1). This model is as follows:

$$Instagram\acute{s}\ use = \alpha + \beta1 Geolocation + \beta2 Political\ Lean + \beta3 Public\ debt + \beta4 Population + \epsilon$$

The second research question and part of the last employ a relationship analysis based on Spearman's correlation. The dependent variable for RQ2 is the activity of the accounts and the independent variable population of the municipality. For part of RQ3, the dependent variable is citizen commitment and the independent variables are population on the one hand, activity, on the other, and audience on the other hand. The objects of analysis of these research questions are the municipalities. The final sample consists of the 17 municipalities, that they are who have an Instagraḿs profile. A non-parametric correlation test was applied due to a non-normal distribution of the sample. The normality of the sample of the municipalities was checked by applying the Shapiro-Wilk Test, where a very low level of significance was detected ($p <= 0.05$); therefore, the sample follows a non-normal distribution.

However, to support the claim that activity and audience are negatively significant with respect to citizen reactions, a multiple linear regression was used where both activity and audience will be analysed together; therefore, by using more than one explanatory variable, there will be more information in the construction of the model and, consequently, more accurate estimates (Rojo, 2007). The accuracy of this model is adequate, given that the residuals are normal and that this is a homoscedastic model. The normality of the residuals was verified by applying the Shapiro–Wilk test, where a high level of significance was detected ($p > 0.05$); therefore, the residuals follow a normal distribution. The variances remain constant (homoscedasticity) since the score test for non-constant error variance was applied and a high level of significance was detected ($p > 0.05$). This model is as follows:

Citizen reactions $= \beta0 + \beta1 Activity + \beta2 Audience + \epsilon$

For the RQ3 research question, studied also the media type and content type. An analysis of variance with Welch's correction (Welch's ANOVA) was conducted. The dependent variables in this model were the citizen reactions (likes and comments) and the independent variables were, on the one hand, the media type, and, on the other hand, the content type. In this case, the objects of analysis were the posts where the final sample consisted of 14,742 items. As it was previously detected that the sample failed to meet both normality and the homogeneity of the variance assumptions, Welch's ANOVA was applied. The normality of the sample of the reactions (likes and comments) was tested by applying the Jarque-Bera Test. As it was a large sample where a very low level of significance was obtained ($p <= 0.01$), the sample follows a non-normal distribution. To test the homogeneity of the variances, both the Levene Test and the Bartlett Test were applied, where again, a very low level of significance was obtained ($p <= 0.01$), which implies that at least one of the groups (the different media or content types) has a different variance. Therefore, the condition of homoscedasticity was not

met, which means that it is a heteroscedastic sample. Thus, the option of using a nonparametric alternative, the Kruskal-Wallis test, was rejected, as one of its conditions is that the data are homogeneous in their variance. Thus, a non-paralytic heteroscedastic test, Welch's ANOVA, was applied (Keselman, Games, & Rogan, 1979; Kuzhabekova, 2011).

Lastly, for media types and content types, a permutation independence test was used to find out whether there are significant differences in citizen reactions (comments and likes) among different types of media or content. The permutation test of independence, for one-way data with an ordinal dependent variable, covers the designs used with the Mann–Whitney test, the Kruskal–Wallis test, the two-sample t-test, one-way ANOVA, one-way ANOVA with blocks, and ordinal regression equivalents (Mangiafico, 2016)

As the independence test is significant, a post-hoc analysis was performed to determine which media types or content types differ from other types in terms of citizen reactions (comments and likes) through pairwise permutation tests. Because this analysis produces multiple p-values, adjustments to the p-values were made to avoid inflating the possibility of making a type-I error (Mangiafico, 2016). In output of this test, types sharing the same letter are not significantly different.

4. Results

Before presenting the results, Table 5 is presented with the main metrics of the Instagram accounts of the 17 municipalities analysed to make it easier to follow the results obtained from the research questions presented below.

4.1. Descriptive statistics of research question about Instagram's use

RQ1. *: To what extent do municipalities use Instagram as a communication channel to engage with their citizens, and what motivates its use?*

Of the 29 largest Andalusian municipalities listed in IECA in 2017, 58.62% (17/29) used Instagram as a channel of communication. In other words, from our sample, 17 municipalities have an active presence on Instagram, while 12 municipalities have not yet adopted Instagram as a communication platform for their government.

Table 6 records the analysis of the variables to identify which variables explain the presence and active use of Instagram by municipalities. Where it has been obtained that the only variable that is related to the use of Instagram is the public debt of the municipalities. This is relationship is a significant negative relationship. The other variables—population, geolocation and political leanings—do not have any significant relationship that would allow them to explain this case.

As for the total number of inhabitants (population), the numbers of

followers (audience), the number of followers with respect to the population (penetration), the total number of tweets (activity total), the number of tweets per business day (daily activity) and the level of citizens' reactions, there were evident differences among the municipalities analysed (Table 7). The municipality with the most inhabitants has a population of 689,434 citizens, while the smallest has only 52,701 (average = 180,467; std. = 184,508). The account with the largest audience had 24,978 followers, while the account with the smallest audience had only 273 followers (average = 5,608; std. = 19,066). Similarly, the largest penetration was 8.43%, while the lowest was as scant as 0.21% (average = 2.53%; std. = 2.13%). The differences were also present in the level of Instagram activity, where the most active Instagram account had published 3,026 posts and the least active only 33 posts (average = 867; std. = 835). Regarding frequency of posting, the most active account per business day published six daily posts, while the least active published only 0.03 messages per day (average = 1, std. = 1.59). Citizens' reactions ranged from 8.10% to 48.62% (average =

Table 6

Instagrams use. Multivariate statistics – Generalised Linear Model (Binomial).

Independent variable	Dependent variable			
	Instagram's use			
	Estimate	Std. Error	Z value	Sig.
(Intercept)	2.652E-01	1.991E+00	0.133	0.8940
Geolocation (coastal vs. inland)	-3.214E-01	1.170E+00	-0.275	0.7835
Political sign (left-wing vs. right-wing)	-2.971E-02	1.071E+00	-0.028	0.9779
Public debt	-1.369E-02	6.611E-04	-2.071	0.0383*
Population (number of inhabitants)	1.310E-05	1.182E-05	1.109	0.2675
* Significant at p<0.05 (2-tailed)				

Table 7

Number of populations, followers, penetration, posts total, posts a day and citizens reactions.

	Maximum	Average	Minimum	Std. Deviation
Population	689,434	180,467	52,701	184,508
Audience	24,978	4,049	273	5,921
Penetration	8.43%	2.53%	0.21%	2.13%
Activity Total	3,026	867	33	835
Daily activity	4	1	0.02	1.14
Citizens Reactions	48.62	21.24	8.10	11.21

Table 5

Metrics of Instagram by each municipality ordered by citizen reactions

Municipalities	Population	Audience	Penetration	Activity	Daily activity	Citizen reactions
Estepona	66863	1304	1.95%	91	0.07	48.62
Córdoba	325916	1317	0.40%	92	0.61	42.97
Dos Hermanas	132551	273	0.21%	33	0.02	31.52
Granada	232770	1508	0.65%	227	1.14	26.55
Alcalá de Guadaíra	75106	1140	1.52%	126	0.56	26.29
El Puerto de Santa María	88430	7456	8.43%	1251	0.61	23.67
Utrera	52701	2819	5.35%	697	0.64	20.92
San Fernando	95643	1700	1.78%	480	0.73	17.92
Chiclana de la Frontera	83148	968	1.16%	837	3.79	16.92
Almería	195389	4254	2.18%	2409	4.04	16.47
Vélez-Málaga	79878	1335	1.67%	124	0.09	16.26
Torremolinos	67701	2405	3.55%	1088	0.83	15.68
Huelva	145115	1403	0.97%	815	1.25	15.5
Fuengirola	74929	3811	5.09%	1397	0.82	13.86
Roquetas de Mar	93363	2532	2.71%	1087	0.65	10.74
Málaga	569002	9630	1.69%	964	0.53	9.2
Sevilla	689434	24978	3.62%	3026	1.27	8.1

21.24%, std. = 11.21%).

Analysing the content types for the posts published on the municipalities' Instagram accounts (Table 8), we found that the most popular content fell into the cultural and marketing category (44.20%). This result suggests that municipalities tend to use their Instagram account as another cultural and city promotion tool. The second most commonly used category (22.64%) covered a range of topics that were not included in the other categories described. Another favoured category was content related to employment and educational issues (11.05%).

Table 9 shows that the most frequently used media type were pictures (82.55%), which was expected. Nevertheless, 11.61% of posts were videos, which are becoming increasingly common on this platform. Only 5.84% of posts were albums.

The analysis of citizen reactions was based on the metrics proposed by Bonsón and Ratkai (2013). The findings provided in Table 10 show that 100% of the posts received a reaction in the form of likes (P1), while only 33% (C1) of the posts received comments. Similarly, the average number of likes per post (P2) was quite high, 58.19, while the average number of comments (C2) was only 0.81. These measures were later divided by the number of followers and multiplied by 1000, the same technique as Bonsón and Ratkai (2013) applied. This way, we got the average number of likes and comments per 1000 followers. The result suggests that, between these two ways to interact with municipalities on Instagram, citizens tend to choose likes more often than comments as a means of engaging. By summing P3 (20.95) and C3 (0.29), we obtained the average index of citizen reactions (R): 21.25.

4.2. Statistical Analysis of research questions about activity and citizen reactions

RQ2. *: What variables affect the Instagram activity of municipalities?*

This first research question aimed to identify the factors associated with both account activity and citizen reactions on a municipality's Instagram. First, applying bivariate statistics, we examined whether there was any significant relationship between account activity and municipality size measured by the number of inhabitants by calculating the Spearman's rank correlation coefficient (Table 11). Our study found that there is no significant relationship.

RQ3. *: What variables affect citizen reactions on Instagram?*

Based on the previous literature, in the second section, the variables that may determine citizen reactions were identified. However, some were related with citizen reactions and some were not.

Table 12 present that we did not find any significant relationship with municipality size, but if we found a significant negative correlation with the level of activity and audience. Thus, our findings appear to imply that the citizen reactions are not correlated with municipality size and seems that too high activity or too wide audience generate lower reactions. However, this interpretation cannot be confirmed by this means.

Before making an appropriate interpretation regarding it, we must analyse both significant correlations, jointly: audience and activity regarding citizen reactions. Both audience and activity are characteristics of Instagram profiles. Table 13 shows that, considering both the

Table 8
Percentage of content types.

Content type	Percentage
Cultural and Marketing	44.20%
Other	22.64%
Employment and Education	11.05%
Sport	7.90%
Transport and Public works	5.52%
Security and Health	4.75%
Environment	3.95%

Table 9
Percentage of Media Type.

Media type	Percentage
Picture	82.55%
Video	11.61%
Album	5.84%

Table 10
Results of metrics for citizen reactions.

	Code	Max.	Average	Min.	St. D.
Popularity	P1	1.00	1.00	1.00	0.00
	P2	199.01	58.19	8.52	52.91
	P3	47.81	20.95	7.97	11.04
Commitment	C1	0.76	0.33	0.08	0.19
	C2	3.29	0.81	0.09	0.78
	C3	0.82	0.29	0.11	0.20
Reactions	P3+C3	48.62	21.25	8.10	11.21

Table 11
Relationship between population and activity.

Dependent variable	Independent variable	Spearman's coefficient	Significance	Conclusion
Activity (number of posts)	Population (number of inhabitants)	0.157	0.5466	No significant correlation

Table 12
Relationship between activity, population, audience and citizen reactions.

Dependent variable	Independent variable	Spearman's coefficient	Significance	Conclusion
Reactions	Activity (number of posts)	−0.738 **	0.001	Negative relationship
	Population (number of inhabitants)	−0.223	0.142	No significant correlation
	Audience (number of followers)	−0.637 **	0.007	Negative relationship

** Significant at p<0.01 (2-tailed)

Table 13
Multiple linear regression: Relationship between activity, audience and citizen reactions.

Independent variable	Dependent variable				
	FC Citizen reactions				
	Estimate	Std. Error	Z value	Sig.	Conclusion
(Intercept)	28.503	3.383	8.424	7.47e-07 ***	
Activity	-0.009	0.004	-2.079	0.0565 *	Negative relationship
Audience	0.000	0.000	0.298	0.770	No significant correlation

* Significant at p<0.1 (2-tailed)
*** Significant at p<0.1 (2-tailed)

audience and the activity, it is evident that the audience is not correlated with the reactions of the citizens, while the activity is negatively correlated with the reactions. However, it is a very weak relationship and it only slightly affects reactions. For each post that is published, the reactions are reduced by 0.009. Therefore, having a greater number of posts published implies that the reactions of citizens are reduced very

subtly.

In addition, it can be seen in Table 5, where the metrics of each municipality appear, that the optimal level to obtain high levels of citizen reactions is to have fewer than 100 posts published on the profile. Above that number of posts, the citizen reactions begin to decrease, albeit in a very subtle way.

We present Tables 14 and 15 to study the relationship between the media type and the citizens' reactions. Table 14 depicts descriptive statistics regarding media type and citizens' responsiveness, where it can be seen that different media types lead to different levels of reactions. According to the results, pictures generated more likes (92.58) than other media types, although videos received the most comments (1.96), which opened a path for two-way dialogue, as the municipalities could reply to citizen comments. The album media type received the fewest likes and comments.

Welch's ANOVA test was used to analyse the relationship between media type and citizen reactions. The results suggest that a significant relationship exists between citizen reactions and media type (Table 15). Thus, using a particular media type leads to increased reactions (measured by likes and comments). Among the three media types present on the Instagram, pictures and videos led to higher levels of reactions than albums.

To determine whether there is a difference in the citizen reactions variable (comments and likes) among media types, an independence test was applied in Table 16. The test was carried out for comments and for likes on the different media types (pictures, album and video). Significant differences were found among likes and comments values for different media types.

Since the independence test was significant, a post-hoc analysis was performed to determine which groups differ from the other groups. To identify which of the media types vary in terms of comments and likes, we carried out a pairwise permutation test; the results are presented in Table 16. It shows that groups sharing the same letter are not significantly different.

The pictures, the albums and the videos are significantly different in the comments, while the likes of the pictures are not significantly different from the likes of the videos (and vice versa), only in this case the likes of the albums if they are significantly different.

The final research question offered for this study looks at whether different content types generated different levels of citizen reactions. Table 17 shows that each post on the municipality's Instagram account generated, on average, 84.90 likes and 1.23 comments. Our findings also show that: (1) transport and public works content generated more comments (1.97); (2) cultural and marketing content and the 'other' category generated more likes, 88.49 and 114.86 respectively. It is interesting to note that these three content types are the ones with the highest standard deviation in the likes and comments. This might occur because these three content types are quite broad, grouping different sub-topics related to their main content.

Similarly, Welch's ANOVA test also confirmed that there was a significant relationship between content type and citizen reactions

Table 14

Descriptive statistics of media type and citizen reactions.

Media Type		Number of Comments	Number of Likes
Picture	Mean	1.29	92.58
	N	15,674	1,126,569
	Std. Deviation	3.67	155.49
Album	Mean	0.93	74.22
	N	1,590	127,068
	Std. Deviation	2.88	116.91
Video	Mean	1.96	84.62
	N	1,687	72,585
	Std. Deviation	5.76	101.43
Total	Mean	1.28	89.89
	N	18,951	1,326,222
	Std. Deviation	3.75	148.93

Table 15

Welch's ANOVA test of media type and citizen reactions. Relationship between the media type and citizen reactions (measured by number of Comments, and Likes).

Dependent variables	Independent variable	Method	Significance
Comments	Media Type	Welch's ANOVA	0.00
Likes		Welch's ANOVA	0.00

Table 16

Media type: one-way permutation test of independence and Post-hoc test: pairwise permutation tests.

		Dependent variable	
		Citizen reactions	
Independent variable	Media type	Comments	Likes
	p-value	9.48E-08	9.81E-08
	Pic	a	A
	Album	b	B
	Video	c	a

Table 17

Descriptive statistics of content type and citizen reactions.

Content Type		Number of Comments	Number of Likes
Cultural and Marketing	Mean	1.27	*88.49*
	N	9,893	691,839
	Std. Deviation	3.89	159.64
Other	Mean	1.52	114.86
	N	6,081	459,912
	Std. Deviation	4.08	158.90
Employment and Education	Mean	0.66	47.29
	N	1,284	92,401
	Std. Deviation	1.95	79.57
Sport	Mean	0.95	61.81
	N	1,324	86,411
	Std. Deviation	2.51	86.14
Transport and Public Works	Mean	1.97	82.54
	N	1,920	80,640
	Std. Deviation	6.05	146.79
Security and Health	Mean	0.71	57.93
	N	598	48,658
	Std. Deviation	1.74	93.14
Environment	Mean	1.04	60.19
	N	728	42,013
	Std. Deviation	2.21	60.50
Total	Mean	1.23	84.90
	N	21,828	1,501,874
	Std. Deviation	3.72	143.08

Table 18

Welch's ANOVA test of content category and citizen reactions. Relationship between content and citizen reactions (measured by number of comments and likes).

Dependent variables	Independent variable	Method	Significance
Comments	Content category	Welch's ANOVA	0.00
Likes		Welch's ANOVA	0.00

(Table 18). The results suggest that, indeed, different content types may generate different levels of citizen reactions (measured by the number of likes and comments). We found that the most engaging content type was

cultural and marketing, transport and public works, and the category 'other'.

To determine whether there is a difference in the citizen reactions variable (comments and likes) among content types, an independence test was applied in Table 19. It was carried out on the different content types (cultural and marketing, other, employment and education, sport, transport and public works, security and health, and environment). Significant differences were found among likes and comments values for different content types.

Since the independence test was significant, a post-hoc analysis was performed to determine which groups differ from the other groups. To identify which of the content types vary in terms of comments and likes, we carried out a pairwise permutation test; the results are presented in Table 19. It shows that groups sharing the same letter are not significantly different.

In the comments, it is stated that both "other" content and "transport and public works" content is significantly different than other content types. "Employment and education" content and "security and health" content is not significantly different in terms of comments. A similar relationship exists between "cultural and marketing" content and "environment" content, and between "sport" content and "environment" content.

The same is not true of likes. "Other" content and "employment and education" content is significantly different with respect to the different content types, while the likes are not significantly different between "cultural and marketing" content and "transport and public works" content. The same occurs between "security and health" content and "sport" content, and between "environment" content and "sport" content.

5. Discussion

Instagram is an effective way for government to interact directly with citizens through images, videos, and short snippets of text (CitySourced, 2018). Despite this, according to our results, local governments with a high level of public debt do not adopt or actively use Instagram. Our analysis finds that municipalities' adoption and active use of Instagram only depends on the financial situation of the municipality, specifically on the level of public debt. A possible explanation for this finding is that although entry costs to social media use are relatively low, a number of organisational and financial resources are needed (Mickoleit, 2014). In 2013, 40% of municipalities in the United Kingdom devoted, at least, one full-time employee equivalent per week to maintain their social media presence (BDO, 2013). The indebted governments do not have the capacity to maintain those resources.

On the other hand, the geolocation, the political leanings and the population of the municipality do not explain this case. The reason may be that in the case of geolocation, tourism in both coastal and inland municipalities is similar; domestic tourism has improved in Andalusia but stays in sun and beach destinations have decreased (Agencia, 2018). In the case of the political leanings, governments of the left and right

actively adopt and use Instagram in a similar way. Even though left-wing governments tend to be more transparent (García-Sánchez et al., 2013), right-wing governments are more likely to adopt e-government initiatives (Tolbert, Mossberger, & McNeal, 2008). The population is also not considered to offer an explanation since SM is considered an accessible medium for any public institution (Criado & Rojas-Martín, 2013)

Our study presents that 58.62% (17/29) of the largest Andalusian local governments maintain an official Instagram account. A similar percentage (67%) occurs in Dutch municipalities (Faber, Budding, & Gradus, 2019). Thus it seems that Instagram is not a SM that is much used in the local administration field, compared to other SMs. This may be because Instagram is a relatively "young" platform, dating to 2010, compared to Facebook and Twitter, created in 2004 and 2006 respectively.

However, it is possible that more local governments will join Instagram, as happened between 2009 and 2011 in the US, when Facebook and Twitter were relatively "young" SM platforms. Just 13% of local governments had Facebook in 2009, and its adoption skyrocketed to nearly 87% in 2011; similarly, the use of Twitter increased from 25% to 87% (Mossberger et al., 2013). However, this growth will not occur with the same with the same intensity regardless of location, since the use of SM is higher in the US than in the EU (Torres, Royo, & Garcia-Rayado, 2020).

Despite it seems that Instagram is a slightly consolidated SM in the local administration field. Instagram seems to be an interesting alternative platform for local administrations, as it enables the visual promotion of the city and municipal services for a substantially lower cost than traditional means of advertising. This way, the municipality can leverage Instagram and use it as a dissemination channel for various public issues or initiate a conversation with citizens. Yet a simple presence does not guarantee an active and fruitful communication between the municipality and its audience (Bonsón et al., 2017).

Our results show that the audience (number of followers) varies considerably depending on the municipality. When the audience is considered in relative terms—followers with respect to population—the average penetration rate on Instagram was 2.53%, which reflects very small interest on the part of the Andalusian population in following their municipalities on Instagram in general. This contrasts with the data that Instagram is one of the SM with the highest penetration among Andalusians (The Social Media Family, 2018). This can be explained by the fact that Instagram is mainly millennials' SM, where up to 66% of users are under 39 (The Social Media Family, 2019), and millennials simply do not feel as interested in public issues as the older audience (Fry, Igielnik, & Patten, 2018). The small interest in public affairs among Instagram users is reflected in the low citizen reaction (21.24) that was detected in our study, despite governments' attempts to adapt the methods of communication and make them more digital and mobile, as technology is no longer a choice for the "new policy," but an obligation (Gutierrez-Rubi, 2017).

Despite the low penetration and participation of citizens with their municipalities on Instagram, it is still an appropriate SM platform for public affairs, because it is a highly visual SM that has gained remarkable popularity (Marengo et al., 2018), especially among younger people (Bresnick, 2019; Choi & Sung, 2018), as well as a a relatively "young" SM platform in comparison with Facebook and Twitter. The other popular highly visual SM platforms, Snapchat and TikTok, are not suitable for local administrations. TikTok has great virality, since a video from a user with absolutely no followers can quickly gain a large audience (Anderson, 2020), but this platform is more of a meme factory (Tolentino, 2019). Snapchat requires creative content that users can disseminate, but this platform has low visibility compared to Instagram because of a feature which causes content to disappear, which restricts comments or likes (Choi & Sung, 2018). Snapchat is a platform that is more useful for political communication (Morales Ruiz & Romo Jiménez, 2017; Morante & Cuena, 2017). In contrast, Instagram is a platform that spans a large audience, since it has great bridging social

Table 19
Content type: one-way permutation test of independence and Post-hoc test: pairwise permutation tests.

		Dependent variable	
		Citizen reactions	
Independent variable	Content type	Comments	Likes
	p-value	1.11E-015	2.2E-16
	Cultural and Marketing	a	a
	Other	b	b
	Employment and Education	c	c
	Sport	**d**	**d e**
	Transport and Public works	e	**a**
	Security and Health	**c**	**e**
	Environment	**a d**	**d**

capital, so users are likely to be less inhibited, connecting with people who are outside of their daily circle (Phua et al., 2017), such as their local government.

The total Instagram activity of the municipalities in our study varies. The average daily activity was one post per day, which is in compliance with the average brand posting 1.5 times per day on Instagram (Union Metrics, 2014), since the activity should be frequent, but not overwhelming (Bonsón et al., 2017). By posting once per day, a post is likely to have a +3.39% individual improvement over the average reach, but it decreases from there (Dash Hudson, 2019). Yet, as Patel (2016) states, it is not posting frequency but consistency that matters.

In our study, we found that pictures or photos were the most frequently used media type (82.55%) by municipality Instagram accounts. According to Bossetta (2018), the media types that the platform supports, and the limitations imposed on them, directly affect the content that municipalities publish. Although the video format is supported by Instagram, its limitations in terms of length cause a low presence of content such as longer political debates among municipalities on this platform. Overall, the number of video posts was rather scarce in comparison to pictures.

Relevant content is other of the key aspects to gain an audience's attention. Municipalities therefore should to actively incorporate this visual platform into their online communication strategy, where cultural and marketing content type is the most common across the analysed Instagram accounts (44.20%). While one can argue that all SM serves the purpose of self-promotion (Alshawaf & Wen, 2015), it is particularly notable in the case of Instagram, where the ability to self-promote is a main feature, more prominently exhibited than on other SM platforms (Marcus, 2015). Instagram is used more to present the ideal self instead of the true self, for the purpose of showing off and drawing attention by posting self-presentational photos (Choi & Sung, 2018). Moreover, Instagram is a SM platform that has features which support tourism communication activities (Purnomo & Muhibbin, 2018).

While local governments use Facebook as a complementary means of providing transactional e-government services, and use Twitter to supplement online information services (Gao & Lee, 2017), they use Instagram to promote their city, publishing posts of its streets, its landscapes and its regional holidays, giving value to the municipality in order to promote tourism.

The results of our study also show that citizens opt more often for like buttons in comparison to comments while interacting with municipalities on Instagram, which is very likely due to the simplicity of this method. By clicking the 'like' button, citizens can express their opinion quickly and easily. In addition, the 'like' button on this platform can also offer greater visibility than a comment, as the individual's name may appear immediately below the 'liked' content. However, this finding is not exclusive to citizen reactions on Instagram. The same occurs with other SM, such as Twitter, in both the public, analysing the citizen engagement in municipalities (Bonsón et al., 2019), and private sector, analysing the stakeholder engagement in hotel industry (Bonsón et al., 2016).

Regarding the determinant of activity, our analysis did not find a significant relationship between the size of the municipality and Instagram activity. Being a municipality with a lot population does not automatically imply more activity on Instagram. In this respect, the same does not happen on Facebook with Western European municipalities, Bonsón et al. (2017) reported that bigger local governments tend to be more active than smaller municipalities when it comes to SM usage. However, the use of SM involves fixed costs (Guillamón et al., 2016), so once Instagram has been adopted, both large and small municipalities have the same ability to publish their posts.

Other aim of our research was to shed light on what determine the citizen reactions on Instagram. Our findings outline that citizen reactions were negatively associated with activity. Instead, previous studies concluded that a public administration maintains a high level of activity in SM, this will not necessarily lead to its citizens becoming

more strongly reactions (Bonsón et al., 2017; Ma, 2013). In our case, this is due to Instagram's algorithm. Instagram opted to remove the chronological order of posts in the feed and to base the algorithm on the engagement level of the content (García, 2019). Instagram (2019) tweeted:

What shows up first in your feed is determined by what posts and accounts you engage with the most, as well as other contributing factors such as the timeliness of posts, how often you use Instagram, how many people you follow, etc. [Tweet]

So, if the publications do not generate engagement, that is, if the citizens do not comment on or share the publications of the local government, the organic algorithm will penalise it and will allow fewer and fewer people to see it (Lopez Acera, 2018). The algorithm "understands" that if nobody likes the content, then it is not interesting content and the visibility of the publications in their followers' feeds will be reduced.

This is what has happened to the Andalusian governments, since, in general, they obtain a low level of reactions because Instagram users are mostly young people (The Social Media Family, 2019) who are not interested in public affairs (Fry et al., 2018), nor they have a sense of belonging to the community, which is a reason for following the municipality's account (Paucar Quispe & Arias Quintanilla, 2019). Therefore, although the local governments continue to publish, the posts will not be shown in citizens' feeds and, in this way, they will receive fewer reactions.

Neither the population nor the audience are related to citizen reactions. A municipality with a high population or audience on Instagram will not necessarily lead to its citizens becoming more strongly engaged. However, Ma (2013) had earlier observed the phenomenon of large audience and lower citizen reactions and argued that it might be explained by a feeling of closeness or a perception that one's voice can actually be heard in smaller communities. Citizens feel more encouraged to express themselves, but communication is more difficult in larger communities, so SM is used as a means of strengthening networks with agents in that community (Gao & Lee, 2017).

Therefore, taking into account the results on citizen reactions previously discussed— that greater activity on Instagram reduces citizen reactions due to the algorithm of this platform and due to the minimal initial interest of its posts, and that the size of the population or audience does not affect the reactions—we can demonstrate that it is true that the number of followers is not nearly as important as the type of followers you have (DeMers, 2014).

Another finding emerging from this study is related to relationship between the content and media type with citizen reactions. Our results suggest that pictures or photos generally produce higher rates of likes, which has been previously pointed out by several studies (Bonsón et al., 2015; Davison, 2007; Graves et al., 1996; Hofmann et al., 2013; Zavattaro et al., 2015). A picture, generating more likes than other media types, can significantly increase the visibility of the post (Araujo, Correa, da Silva, Prates, & Meira, 2014). On the other hand, video is the media type that produces the highest response rate and, therefore helps to initiate a dialogue with citizens.

Regarding the question of which content type generates higher citizen reactions, we found that cultural, city promotional and 'other' content generated the most likes, but the content type that received the most comments was related to transport and public works. Some cities use Instagram to promote local scenery or even to educate travellers on what they can and cannot travel with on local transportation, and to engage with citizens who have questions (Hootsuite, 2018). While some studies argue that there is not such a single topic that would guarantee higher citizen reactions (Hofmann et al., 2013), other studies were able to identify certain patterns and found that cultural and city promotional content seem to be the most engaging (Bonsón et al., 2019; Bonsón & Bednárová, 2018). Our findings are in compliance with the latter. Nevertheless, a possible reason for such a popularity of city promotional content within our sample might be that Andalusia is one of the most popular tourist destinations in Spain (INE, 2018). The three Andalusian

cities Seville, Malaga and Granada are among the most popular cities on Instagram hashtag-wise (Holidu, 2017).

5.1. Contribution to social media research and practice

Once the results of the research questions were obtained and discussed, we could see that our research sheds light on how local governments use Instagram. The SM field of research for public administration has concentrated its research on Facebook and Twitter, leaving Instagram aside (Blank & Lutz, 2017).

This may be because Instagram is still a relatively "young" SM compared to Facebook and Twitter, and its popularity is currently growing (We are social & Hootsuite, 2020). It may also be due to the difficulty of analysing posts, because the Instagram API is very restrictive or almost non-existent (Murthy, Gross, & McGarry, 2016). Academics may have seen, as our study has shown, that local government posts on Instagram generate little reaction from citizens.

Some of our findings—that most indebted municipalities do not usually adopt and actively use SM, and that the quality of followers is more important than the quantity— have already been demonstrated with respect to other SM platforms. However, we demonstrate that citizens do not interact much with their local governments on Instagram, and make suggestions regarding how the posts should be designed so that they will generate greater reactions from the citizens.

In the same vein, we believe that the results emerged from our study may have practical implications for public-sector community managers in charge of online communications. Insights from our study might help them to better formulate and set their online communication strategies by revealing factors that might lead to higher citizen responsiveness.

For instance, a smaller but more engaged audience interacting with the municipality is better than a large number of inactive followers. Similarly, local government activity in terms of posting should be focused on quality rather than quantity of messages.

As technology is no longer an option for the "new policy," but rather an obligation (Gutierrez-Rubi, 2017), to attract more quality followers, municipalities should use Instagram effectively. However, it is not enough to approach the audience by adapting communication methods and making them more digital and mobile. They should also publish in a way that interests' citizens. Transmitting messages through creative posts can attract millennials and involve them in these matters.

If the intention of the municipality is to obtain feedback or to generate a debate through the comments, the most appropriate media type would be the video format. On the other hand, if the municipality's objective is the dissemination of information or an event promotion, then a photo/picture format is the best option for the higher visibility.

Municipalities might also bear in mind that the content types that are generally less interesting, such as education and employment or health and safety, should be published by means of pictures or videos, but not in an album, as this would generate even fewer reactions.

In addition, the present study provides implications for the private sector as well, in particular, small businesses, as the results of this analysis can be applicable to the behaviour of their followers. In order to have an attractive Instagram profile, small businesses should know which media and content types are the most appealing to their audience to establish a successful online communication strategy on this platform.

Before establishing an online communication strategy on Instagram, a municipality should clearly define the main purpose of their Instagram profile (inform, initiate a debate, promote, etc.) as users are not likely to spend their time and effort actively participating in the municipality's SM without being sure of the benefits and value that can be derived from their continued participation (Al-Debei, Al-Lozi, & Papazafeiropoulou, 2013; Bonsón et al., 2017). Perhaps the most important aspect of online communication is the ability to have a fluent conversation with citizens when addressing their queries. Within the dialogic communication, the municipality should try to address the complaints, suggestions and needs of citizens (Junta de Castilla y León, 2012). This is a strategy

which, if applied correctly, creates a win-win situation, as when municipalities are able to identify and solve problems, the general quality of public services improves as well.

6. Conclusions

As far as we know, this is the first study exploring how municipalities use Instagram to communicate and engage with citizens. Our study provides a robust initial assessment of Instagram usage in the public sector by analysing all of the posts published by the largest Andalusian municipalities. The following questions were addressed: (RQ1) To what extent do municipalities use Instagram as a communication channel to engage with their citizens, and what motivates its use? (RQ2) What variables affect the Instagram activity of municipalities? (RQ3) What variables affect the citizen reactions on Instagram?

The results suggest that the adoption and active use of Instagram depends on public debt, and that when local governments have a high level of indebtedness, they do not adopt and actively use Instagram.

A little more than half of analysed Andalusian municipalities have an official corporate Instagram account with different levels of activity and audience where content related to cultural activities and city promotion was the most posted.

In terms of citizen reactions, the most frequent interaction from citizens was through likes. In addition, the population of the municipality does not seem to be correlated with the level of reactions, nor does there appear to be a correlation between the size of the municipalities' audience on Instagram and the citizen reactions. However, a significant negative relationship was found between the reactions and the municipality's Instagram activity. This implies that the local government should focus less on follower count and more on their reactions.

The results emerging from this study also show that pictures or photos lead to more likes than other media types, while videos generate more comments. Regarding content type, posts related to cultural, promotional and the 'other' category tended to generate more likes, while content related to transport, and public works generated the highest rate of comments, both (likes and comments) being attributes of citizen reactions.

In short, the local governments that tend to adopt and actively use Instagram are those with a low public debt, and their activity on Instagram has a negative influence on citizen reactions, while certain media and content types can stimulate higher levels. Furthermore, despite the low reaction of citizens to posts, Instagram is a useful SM platform for local governments interested in attracting more tourism to their municipalities.

7. Limitations and future research

Before closing, a number of limitations have to be acknowledged. The first limitation is related to the objective of the study. In the present study, citizens' reactions were analysed merely through the number of likes and comments; the content of messages was not considered. Therefore, an interesting line of research might be to conduct a study exploring the reasons that lead users to interact with municipalities' Instagram accounts. By analysing the content, it would be possible to examine how they express their social and political opinions to local governments' issues or how they respond to Instagram messages posted by these institutions.

The stories that governments upload have not been analysed since they are beyond our reach. It would be interesting to see how they usually treat their stories and how the citizens react to them. However, it was impossible for this analysis since stories are only kept in the profiles for 24 hours and the reactions to them are not visible to the public (they can only be seen by the one who posts the story). However, it may be possible to analyse the content and type of media in the stories that local governments have indicated as highlights by permanently placing them in the feed. By considering the content of messages and stories, we

would be able to analyse citizen engagement in more depth.

Thus, considering the content of messages and stories, we would be able to analyse citizen engagement in more depth.

There is also a limitation related to the sample. A sample bias occurs as only 29 municipalities were analysed, which might have implications for the generalisability of the results. This study therefore opens new avenues for future research where the number of samples could be extended. Instead of analysing the Andalusian municipalities with more than 50,000 inhabitants, which represent 50% of the Andalusian population, one could study municipalities with more than 10,000 inhabitants, which represents 80% of the population. We could even consider all of the Andalusian municipalities, 100% of the Andalusian population, since the automatic process of the methodology we used for both the collection of tweets and their subsequent analysis requires little effort.

Regarding the statistical analysis, the limitations of our study stem from the non-normal distribution of our data. Hence, nonparametric alternatives such as Spearman's rank correlation and Welch's ANOVA were adopted, which are generally less accurate than parametric tests.

A limitation related to the automated content analysis should be acknowledged as well. This method classified the posts using a dictionary of the most frequent words. Although this approach eliminates subjectivity, the classification process is a subject to a certain level of error in case that there are ambiguous posts that belong to more than one category. Future research might therefore try to come up with more accurate techniques to reduce this limitation. In addition, future investigation might focus more precisely on the sub-categories of the content types—culture and marketing, others, and transport and public works—in order to better understand the high standard deviation of these three categories in the number of likes and comments.

Another limitation of our study stem from the fact that comments and likes were considered proxies for citizens' reactions, yet they might have different contextual meaning. Another factor worth exploring might be hashtags, as according to Duguay (2016), the posts with hashtags are much more visible throughout the online network, which might have implications for citizen engagement commitment (Grover, Kar, & Davies, 2018).

The present study has been carried out in Andalusia at the local level of public administration. Nevertheless, the contributions of our study could be applied on other Spanish regions such as Catalonia, Madrid, Valencia or Zaragoza, which report similar rates in terms of Instagram usage (Delgado von Eitzen, 2016; The Social Media Family, 2018). Nevertheless, further research is needed to confirm any similar trends. In addition, further studies might extend the sample across international regions, which might improve the generalizability of the results and also help to identify and understand different trends and tendencies in SM usage in the public sector from the international perspective.

It would also be interesting for future research to consider political characteristics of the municipality to study its effect on citizen reactions. We found that the municipality with the greatest citizen reactions was Estepona, which curiously has the most voted-for mayor in Spain in large municipalities over the last two municipal elections (Europa Press, 2019). Therefore, there could be a positive relationship between citizen reactions on Instagram and the satisfaction of citizens with elected representatives.

Last but not least, an interesting line of research might be to understand whether the sentiment (tone) of the message can positively influence citizen participation on local government Instagram accounts. For example, on Twitter, a positive tone accompanied with photo sharing, exclamation points, and retweets tends to generate more active participation (Zavattaro et al., 2015).

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The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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