



X, How can you bring citizens closer to their city councils?

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Abstract

This article seeks to analyze the relationship between city councils and citizens through social media to determine which variables affect the city council's activity on social media and citizens' engagement. We perform a comparative study of 17 city councils throughout Spain, one for each region's most populated municipality. The methodology used is quantitative and content analysis of interactions on social media between citizens and local government. We collect the data from social media, analyzing X (formerly Twitter) posts of the city councils selected before municipal elections held in May 2023. We considered reach, creation policy, responsiveness, media type and content topic in the posts published on the city council's X (formerly Twitter) account. Results shows that quantity of publication doesn't always translate to efficacy in terms of citizen engagement and that smaller cities tend to publish less tweets daily, but in average have more reach (view counts) and engagement (Likes, comments and retweets). In term of transparency, results show no relationship with engagement. Its practical contribution stems from best municipalities performance identification that are used for benchmarking purposes, and those who can ameliorate their engagement index.

Keywords Social media · Municipalities · Citizen engagement · Responsiveness · Media and content types

Introduction

E-government and e-participation have been studied extensively from various angles, such as debate over their conceptual definition, strategic planning and awareness, stages of evolution, and results. More specifically, research on e-participation and how citizens can participate in their city councils through various instruments began to appear around 2001 (Macintosh, 2004). Since 2010, this field has developed a new

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line of study related to social media use and its effect on citizen engagement (Jaeger & Bertot, 2010), and research on social media has grown tremendously.

Research on local administrations' social media

We begin by presenting some of the theories scholars adopt to study the phenomenon of social media in local administration. Bellucci et al. (2019) apply the dialogic accounting approach discussed by many academics in recent years (Brown, 2009; Brown and Dillard, 2013-1, 2013-2) to examine whether interaction on social media functions as a dialogic accounting mechanism to help stakeholders become more involved. Focusing on the top universities in the QS World University Rankings, their study defines dialogic accounting as a theoretical approach that recognizes the existence of plural ideological orientations, enables effective participation, ensures access for users without expertise, and is sensitive to power relations. Through content analysis of the Facebook and Twitter accounts of 200 universities in this ranking, Bellucci et al. (2019) conclude that many universities use social media to post information and help stakeholders become more engaged and involved in the organization. The authors claim that traditional accounting has not taken the opinions of stakeholders into account and that dialogic accounting creates these listening spaces.

Excellence theory is a general theory of public relations that specifies how public relations achieve more effective organizational structures, how these relations are organized to be more efficient, what the ideal environment and conditions are, and how we can determine the monetary value of public relations. This theory developed from an article by Grunig and Grunig (2008) that established a theoretical and empirical framework for the study of public relations. Their theory explains that excellence in communication is achieved by the key factors of building quality relationships between stakeholders and their organizations, independence of communications, empowerment through dominant coalitions in the organization, and establishment of symmetrical information. Given the importance of improving citizens' involvement in city politics and administration, Gálvez et al. (2017) draw on excellence theory to improve citizen engagement through community managers. Their study concludes, however, that this role has not yet succeeded in getting citizens to use social media as a method of direct contact with city councils. The authors argue that better training of staff and more communication with the organization's senior management are needed to achieve this goal.

Bonsón et al. (2020) use the umbrella of legitimization theory to study e-disclosure in environmental reporting on Twitter (now called X). The authors find that dissemination of specific environmental information is low but that municipalities with larger budgets and commitments to sustainability tend to share more environmental information. Social media can be used to legitimize the organization, regardless of its interaction capabilities. Legitimization theory argues the existence of a social contract between society and organizations through which societal expectations influence the organization when it communicates with citizens or users on social media (Manetti & Bellucci, 2016; Manetti et al., 2016; Deegan, 2002; Deegan, 2006).

Agency theory expects citizens in municipalities with larger populations to have more demands and conflicts of interest towards reducing information asymmetry

and to enable evaluation of their management. Social media can be used as tools to encourage communication and reduce agency costs (Cárcaba and García-García, 2010). Analysing e-disclosure in a comparative study of Italy and Spain, Guillamón et al. (2016) apply the concept of social media disclosure as a way to identify three groups of determinants: socio-economic determinants, financial determinants, and political determinants (gender of mayor and political ideology).

Various studies use the Unified Theory of Acceptance and Use of Technology (UTAUT) to examine acceptance of technology based on four constructs: performance expectancy, effort expectancy, social influence, and facilitating condition (Williams et al., 2015; Dwivedi et al., 2019). The parsimonious unified model of electronic government adoption (UMEGA) studies the context of e-government based on UTAUT, including the constructs mentioned above and adding perceived risk, attitude, and behavioural intention (Dwivedi et al., 2017). The UMEGA model is considered a driving conceptual theme in the field of e-government (Quintana et al., 2022).

After exploring the theoretical frameworks used by researchers in this area of study, we reviewed the most relevant publications on social media use by public administrations in Spain and the European Union. This analysis identified the gaps in research, especially in the Spanish context. We searched the Web of Science database using the queries shown in Table 1 to gather a list of publications that analyse city councils' social media use in Spanish and European cities. After applying these search queries, we filter the results with the keyword "Spain" and "Spanish". Table 2 summarizes the articles that study social media use in public administrations.

After searching Web of Science, we selected the open access studies based in Spain and other European countries published after 2015. Because social media evolves rapidly, it is important for purposes of comparison that these studies are recent. We found that the most-studied platforms were Twitter (now called X) and Facebook, and that they had been examined separately and together with other platforms as part of a comparative study. In recent years, however, Twitter-related studies were more frequent than studies of Facebook. Although little research has been performed on Instagram and YouTube, we found a few studies that focus specifically on these networks.

Most Twitter- (now named as X) related research analyses a large quantity of data gathered during a period of either a month or more than a year. Such analyses are possible because the data were gathered through APIs that enabled the researchers to download large sums of data in the period selected (although the most recent data collection date was 2019). In analysing the effect of COVID-19 on several aspects

Table 1 Search queries used in the literature review process

SEARCH QUERY
TS= ("MUNICIPALITIES" AND "SOCIAL MEDIA" AND "TWITTER")
TS= ("MUNICIPALITIES" AND "SOCIAL MEDIA" AND "FACEBOOK")
TS= ("MUNICIPALITIES" AND "SOCIAL MEDIA" AND "INSTAGRAM")
TS= ("MUNICIPALITIES" AND "SOCIAL MEDIA" AND "YOUTUBE")

Source: Developed by the authors

Table 2 Most recent studies grouped by type of medium analysed

Medium analysed	Authors	Countries	No. of cities	Sample posts	Period of data	Dates of data collection	Software	Type of statistical analysis	Associated topic
Twitter	Bonsón et al., 2020	Spain, Andalusia	119	817,903 tweets	Several years	2019, March	Python	Linear regression and ordinary least squares (OLS)	Environmental reporting
Twitter	Bonsón et al., 2019	Spain, Andalusia	28	345,960 tweets	Several years	2018, June	Python and R	Welch's ANOVA, generalized linear model (GLM)	Citizen engagement
Twitter	Villodre et al., 2021	Spain	17 ministry departments	3200 tweets	1 week	2019, June	T-hoarder kit	Exploratory analysis	External transparency
Twitter	Criado et al., 2020	Europe	8	Survey	1 month	2018, January	LynGuo	Semantic algorithms	Public service delivery
Facebook	Bonsón et al., 2013	Europe	75	Not found	1 month	2012, October	SPSS	Pearson correlations	Citizen engagement
Facebook	Sáez-Martín et al., 2018	Spain	62	68,156 posts	1 year	2016, June	SPSS	Wilcoxon test	Political scenario
Facebook	Canadas et al., 2019	Europe	288	226,294 posts	1 year	2016, June	Power Query M language for Facebook data model	Student's parametric t-test, multiple linear regression	Political scenario
Facebook	Guillamón et al., 2016	Italy and Spain	217	Not found	1 year	2014	SPSS	Correlations, OLS	Social media use
Facebook	Padairo et al., 2021	Portugal	304	Not found	4 months	2020, March to July	SPSS	Regression	COVID-19 pandemic
Instagram	Perca et al., 2021	Spain, Andalusia	17	14,742 posts	Several years	2018, September	Instaloader and R	Generalized linear model	Public debt
YouTube	Bonsón and Bednárková, 2018	Europe	75	30 videos	1 month	2014, December	SPSS	Pearson's Chi-squared test and Spearman's rho Correlation coefficient	Citizen engagement
Twitter & Facebook	García-Rayado et al., 2021	Europe	28 (SAIs), 63 (RAIs), 1 (ECA)*	1110 posts	Not found	2018, June	SPSS	OLS, Mann-Whitney U, Kruskal-Wallis H	Interaction of public audit institutions

Table 2 (continued)

Medium analysed	Authors	Countries	No. of cities	Sample posts	Period of data	Dates of data collection	Software	Type of statistical analysis	Associated topic
Twitter & Facebook	Montañaes et al., 2020	Spain	6	Not found	1 year	2014 to 2015	LikeAlizer and SPSS	Regression, Kruskal-Wallis, Mann-Whitney tests	Financial transparency
Twitter & Facebook	Haro-de-Rosario et al., 2018	Spain	80	9401 tweets and 9682 Facebook posts	1 month	2014, December	SPSS	Multiple linear regression	Citizen engagement
Twitter & Facebook & Instagram	Cervi et al., 2022	Spain, Catalonia	3	356 tweets, 105 Facebook posts, 37 Instagram posts	2 weeks	2020, October	SPSS	Descriptive	Political marketing
All	Criado et al., 2018	Spain	146	122 surveys	6 months	2016	SPSS	Descriptive	Social media diffusion

Source: Developed by the authors

* 28 Supreme Audit Institutions (SAIs), 63 Regional Audit Institutions (RAIs), and the European Court of Auditors (ECA)

of relationships between individuals and public administrations, we found that is important to research the data produced after this global pandemic, as we expected to find some differences from studies that analysed data from before vs. after 2020. The statistical instruments most frequently used were OLS, regressions, and correlations. We also found that most studies adopt the methodology developed by Bonsón et al. (2013) to measure engagement in the social media of public administration.

Finally, we found no research comparing cities from different regions of Spain that analysed and compared the content creation policy and engagement metrics of Twitter (now called X) accounts from different municipalities.

Table 2 is sorted by type of social network. The research focused in one social network is shown first. Afterward, the research that compare several social networks is laid out.

Transparency index

Two transparency indices have been significant in measuring transparency in Spain.

The first Spanish index, ITA Spain (Transparency International Spain), is the Spanish section of Transparency International, an organization founded in 2006 to prevent corrupt practices in Spain. ITA is also the index published for the 110 municipalities analysed—the largest municipalities in terms of inhabitants (i.e., municipalities with over 65,000 inhabitants). The transparency of the information that municipalities provide to citizens is measured by 80 indicators of transparency, relationships with citizens, financial information, and other public services. This index was published annually from 2008 to 2010 and biannually until 2014; the last published index is from 2017. Until publication of the Spanish Transparency Law, this index was the only reference for transparency and good practices in Spain. We found no evidence that an index would be published soon. Still, some city councils continue to use ITA (e.g., Badajoz, Vigo, Bilbao) on their web pages as a system of transparency indicators.

The second index used in Spain, “Dytra”, is a social transparency and open government platform that creates a dynamic transparency index. It belongs to Dytra IVZW, an international non-profit organization headquartered in Belgium. Citizens and private individuals can apply to become Social Observers of Transparency and Public Ethics and participate in evaluating city councils. Dytra’s ranking is based on a sample of 567 city councils, and the index includes only councils for cities with over 15,000 inhabitants. The index is dynamic, which means it is updated daily, and positions in the ranking can change from one day to another. This non-profit organization also performs transparency rankings for other public institutions, such as universities or political parties. Dytra’s worldwide reach enhances the possibility of comparison with other countries. The indicators evaluated refer to transparency, citizen participation, financial information, open data, and other public services. The webpage also shows a chronology of transparency for the municipality selected. Dytra is designed following the current regulation. We stress that we found no reference to publicity, management, or accessibility to social media platforms in either of the transparency indices analysed in this study.

Research questions

To understand the role of social media in the development of e-government and e-participation in local administrations, we studied the social media accounts of Spanish municipalities to determine which variables affect city councils' social media activity and whether a better relationship leads to a more transparent city council and greater citizen participation in politics (engagement). We also sought to determine whether a correlation exists between the transparency indices of the municipalities studied, and their activity and relationship to citizens through social media. Our study compares a selection of city councils in Spain. We therefore propose the following research questions, in line with Perea (2021) and Bonsón et al. (2013, 2019):

- RQ1: Do more transparent city councils have more interaction with citizens on social media?
- RQ2: To what extent does X (formerly Twitter) reach and creation policy affect citizen engagement?
- RQ3: How do municipalities use X (formerly Twitter) as a communication and engagement channel?
- RQ4: Do media type and content topic on X (formerly Twitter) affect citizen engagement?

Research method, sample, and data collection

Research method

We performed a comparative study of 16 city councils throughout Spain, one for each region's most populous municipality. The Tables 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18 present the data by city, using the same order for each table. The order of cities corresponds to municipality size in terms of inhabitants. We measured a series of variables to answer each research question. We derived the metrics to measure citizen engagement from the following studies. The following variables were based on Perea et al. (2021), Bonsón et al. (2019), Gálvez et al. (2017), Bonsón et al. (2013), and Agostino (2013): Popularity (likes), Commitment (comments), and Virality (sharing). The engagement metric was the sum of the data gathered for the first three metrics. We also proposed an additional metric, Reach, to measure the number of times a tweet was viewed. As X (formerly Twitter) has only provided this metric since December 2022, previous studies have not included it. We thus calculated an engagement index using reach weighted by view counts for the tweets, since we expected tweets with more view counts to indicate publications with better engagement (the tweets reach more people). Table 3 explains the method for calculating the engagement metrics.

For analysing engagement with audience and activity, we used number of followers and number of daily publications. To study the relationship between engagement and reach, we used reach (measured as number of view counts in X (formerly Twit-

Table 3 Metrics of engagement calculation method*

Metric	Code	Calculation
Popularity	P1	Number of likes at least once/total tweets
	P2	Total number of likes/total tweets
	P3	$(P2/\text{number of followers}) * 1000$
Commitment	C1	Number of tweets commented on at least once/total tweets
	C2	Total number of comments/total tweets
	C3	$(C2/\text{number of followers}) * 1000$ fans
Virality	V1	Number of tweets retweeted at least once/total tweets
	V2	Total number of retweets/total tweets
	V3	$(V2/\text{number of followers}) * 1000$
Reach	REA1	Total number of view counts/total tweets
	REA2	$(\text{REA1}/\text{number of followers}) * 1000$
Stakeholder engagement index by reach		$(P3 + C3 + V3) / \text{REA2}$

Source: Developed by the authors

*These indicators were taken from Perea et al. (2021), Bonsón et al. (2019), Gálvez et al. (2017), Bonsón et al. (2013), and Agostino (2013)

ter)). To analyse the municipality's creation policy and engagement, we used creation policy (measured as tweets originally created by the account analysed or retweeted from other accounts, and type of retweeted accounts), and reach. The self-created policy metric was measured by dividing total of self-created tweets by total tweets. To analyse responsiveness, engagement, and reach, we used type of answers and view counts.

To study media type and reach, we analysed each media type (text only, emoticon, photo, video, GIF, link, or hashtag). We also created eight categories for the types of media used, divided by textual elements (only text, no other media), graphic elements (emoticons and text), interactive elements (hashtag or links with text), visual elements (photo, video, or GIF with text), and combination of elements (interactive and visual; graphic and interactive; graphic and visual; graphic, interactive, and visual) to determine which combination works best to elicit engagement. Bonsón et al. (2019) noted the need for studies that explore the effect of hashtags on citizen engagement, as previous literature confirmed that X (formerly Twitter) publications with hashtags increased their visibility (Grover et al., 2018). We therefore wanted to study the engagement metrics for each media type, weighted by view counts of tweets (reach). Additionally, content topic was analysed by classifying the content of the post into different topic categories and measuring which topic was published most. We also analysed the presence of political content (presence of government or government achievements).

Based on Perea et al. (2021) and Bonsón et al. (2013, 2019), the methodologies used are quantitative descriptive analysis, bivariate analysis, analysis of variance (ANOVA), and generalized linear model (GLM) analysis of interactions on social media between citizens and local government.

Our preliminary analysis covered four social media platforms that previous research indicated to be the most valuable for use by public administrations (Criado

et al., 2018; Perea et al., 2021). These platforms are X (formerly Twitter), Facebook, Instagram, and YouTube. Finally, we decided to focus on X for in-depth analysis to determine which variables affect the city council's activity on social media and citizens' engagement. (For the cities studied, X consistently has the most followers of the social media considered.) We also studied the impact of transparency position as measured by the Dyntra Index on the variables studied.

Sample and data collection framework

We selected the cities based on the criterion of most populous city in each autonomous community. The legislation shows that all municipalities have a duty to enhance citizen participation. Article 25 of the Laws Regulating the Basis of Local Government (Bases de Regimen Local BOE-A-1985-5392) urges municipalities to enhance citizen participation and promote efficient and sustainable use of ICTs. Article 69 states that local governments will ensure both that information on their activity reaches citizens and that citizens participate in local life.

The cities selected also had to have been analysed in Dyntra's Transparency Index. These requirements yielded the 17 cities selected for this study, with two exceptions. Because Santander does not have X (formerly Twitter), Santander is not analysed in part of this study, reducing the total number of cities analysed in this area to 16. The other exception is Vigo, where the mayor has an account in X but the city council does not. We therefore used Vigo's mayor's account as a reference to measure differences from the other cities in terms of relationship to citizens and communication styles. To determine the study population, we consulted data from the "Instituto Nacional de Estadística" (INE) to choose the municipalities with the largest population in each autonomous community. The data were drawn from the latest Population Census (2021).

After identifying the municipalities for analysis, we proceeded to search their social media accounts. We used an Internet search engine and the keywords "name of social media platform" + "name of city council". If the social media link was not found, or if it led to an unofficial account, we examined the official webpage of the municipality to find the link to their social media accounts. If this method did not yield results, we searched the name of the city council on the social media webpage. We then checked that the X (formerly Twitter) account redirected viewers to the official webpage and that the latest posts were recent. This process yielded 16 official municipality accounts for X and Facebook (although Vigo's accounts for X and Facebook were those of the mayor), 15 for Instagram, and 17 for YouTube.

In some municipalities, different areas of activity (e.g., culture area or youth department) had different social media accounts. This multiplicity occurred to a greater extent on X than on other social media platforms. Our study focused on the city council's main account. The tweets from each account were downloaded each day of the week and measured, following the rule of downloading data from the previous day to measure reach during the same period of time.

Data collection for the tweets was performed one by one, copying all data, images, and replies for further analysis. Two different researchers performed this data collection process and then crossed-checked the database to unify coding criteria and

mitigate researcher bias. The time frame of data collection was 12 and 24 h after publication of the tweet to ensure that the variables were measured for the same time period. We used this method to avoid the bias inherent in the data collection process used by most software to retrieve data from social media platforms. For example, if we recover the last seven days' tweets on Day Eight, tweets posted on Day One are more likely to have more likes than the tweets posted on Day Seven. Although this bias can be avoided by downloading data each day for the previous day, most studies gather the data in one time frame.

The period selected was the week before the municipal and regional elections held May 28, 2023. In the following pages, we use tweets as synonym of the term “shares”, as the company Twitter changed the name to “X” over the course of this study. Tweets posted from May 22–26 were collected on the following day. We chose this week for analysis because we expected citizens' engagement with their city councils to be higher due to the imminent municipal and regional elections. We chose to gather data manually because most software does not enable study of the interaction between citizen and official accounts in replies to each tweet. We therefore adopted an in-depth qualitative approach to data collection and subsequent analysis. Since Bonsón et al. (2020) used the Python library “Twint”, which could not scrape retweets from the account, the study could only analyse original tweets. Our study goes further, however. We were able to scrape the retweets because we collected the tweets manually. Our tweet extraction method produced 813 tweets within the timeframe May 22–26, 2023. The data were analysed using the following steps: collection of test data to develop the methodology to be followed; creation of variables to be measured and their calculation method; standardization of data collection procedures; regularization of database by the two data collectors; and calculation of aggregate measures of the variables for the 17 cities studied.

Results and discussion

This section answers the research questions and analyses the relations between the variables analysed.

Activity, audience, transparency, and engagement

First, we present the results obtained for engagement (proposed by Bonsón et al. (2019) which includes popularity, commitment and virality) and the stakeholder engagement index by reach added in our study, relative to publication activity, audience (measured as followers and penetration ratio), and transparency position (Table 4). In general, these results indicate that quantity of publication does not always translate into efficacy in terms of citizen engagement. The results for the relationship between transparency and engagement show greater engagement in Quartile 4. This result may occur because Vigo is part of that quartile and the account is run by the mayor, making it an outlier. We can thus establish a negative relationship between transparency and engagement. If we eliminate Vigo, we cannot establish this relationship.

Table 4 Engagement, audience, and transparency

City	Stakeholder Engagemet Index (P3+C3+V3))	Stakeholder engagement index by reach (P3+C3+V3) / REA2	X (formerly Twitter) followers	Penetration % of followers / inhabitants	Average no. of daily tweets	Total no. of published tweets	Transparency position	Transparency quartile
Madrid	0,025	9,81	801,200	24.4%	14.8	74	18	1
Barcelona	0,023	11,12	248,300	15.3%	9.6	48	13	1
Valencia	0,165	36,16	82,700	10.5%	24.8	124	62	2
Sevilla	0,133	36,95	202,200	29.5%	9.0	45	57	2
Zaragoza	0,098	21,17	99,400	14.6%	13.2	66	4	1
Murcia	0,076	17,26	46,600	10.1%	22.2	111	116	4
Palma de Mallorca	0,187	24,02	27,900	6.6%	11.6	58	98	3
Las Palmas de GC	0,228	19,76	46,200	12.1%	4.0	20	26	2
Bilbao	0,124	34,90	16,700	4.8%	7.6	38	9	1
Valladolid	0,894	109,27	60,900	20.5%	10.2	51	62	2
Vigo	5,809	413,08	18,000	6.1%	3.2	16	148	4
Gijón	0,208	24,66	30,900	11.5%	2.8	14	87	3
Pamplona	0,329	72,87	16,900	8.3%	11.6	58	67	3
Albacete	0,542	53,31	10,300	6.0%	3.8	19	259	4
Badajoz	0,968	120,55	15,400	10.2%	2.0	10	232	4
Logroño	0,463	50,88	18,600	12.4%	12.2	61	26	2

Source: Developed by the authors

It is interesting to note that engagement is almost five times higher in Vigo, where the account is managed by the city's mayor, than in the other cities, even though the penetration ratio is only 6% and activity is minimal (an average of only three tweets per day). Similarly, Badajoz shows a high penetration rate of 10%, a stakeholder engagement index by reach of 120,55, and a very low number of tweets published per day—a total of 10 in the period analysed. Valladolid shows a high penetration and engagement rate, while publishing and average of 10 tweets per day. Although Albacete shows a small penetration ratio in its population, followers of the municipal account have very high engagement, 53,31 in the index used. Murcia and Valencia share results concerning penetration, with an average of 10%, the highest number of daily tweets, 22 and 24, respectively. Madrid and Barcelona shows a surprisingly low engagement index and stakeholder engagement index by reach.

Reach and engagement

We analysed engagement (popularity, commitment, virality), by reach and laid the results by city (see Table 5). We introduced reach as a measure to address the new metric adopted in X (formerly Twitter) from December 2022—that is, “view count”. Following Perea et al. (2021), we created two metrics, REA1 and REA2, explained in Table 3 above. Concerning engagement, the metric has been pondered by the view count ratio and shows the engagement index proposed by Bonsón et al. (2019) and the stakeholder engagement index by reach, along with transparency and audience data.

Table 5 shows some outlying data, as in the case of Vigo. In this case, some of the outlier data emerge because a few tweets have a very high view count rate. Second, we observe that smaller cities have a higher average reach ratio, a finding also consistent with ratios for engagement and stakeholder engagement index by reach. Smaller cities thus tend to publish fewer tweets daily, but the tweets published have on average more reach (view counts) and engagement (likes, comments, and retweets).

Creation policy and engagement

Municipal accounts have two options when publishing a new tweet. They can create a new tweet or retweet a post previously published by another account. To study this phenomenon, we analysed the number of posts each city publishes per day and the creation policy it followed.

Table 6 shows that most of the tweets were original, although the rate of retweets was higher than expected, 19% of the total database. As to city distribution, Murcia had the most retweeted posts (45), followed by Valencia (43), with an average considerably higher than the average of all cities analysed. The city with the most retweets relative to total tweets was Las Palmas de Gran Canaria. Of its total 20 tweets published, half were retweets from other accounts. The accounts with the highest percentages of self-created tweets were Badajoz and Vigo, followed by Madrid and Zaragoza. We used the data on creation policy to analyse which type of post has most views and thus had the greatest reach.

Table 5 Engagement and reach (view counts)

City	Stakeholder Engagement P3+C3+V3	Stakeholder engagement index by reach (P3+C3+V3) / REA2	Reach (view count)	
			REA1 Total no. of views/ total tweets	REA2 (REA1/no. of followers) *1000
Madrid	0,025	9,81	7,841.8	9.8
Barcelona	0,023	11,12	2,756.4	11.1
Valencia	0,165	36,16	2,977.0	36.0
Sevilla	0,133	36,95	7,443.8	36.8
Zaragoza	0,098	21,17	2,094.7	21.1
Murcia	0,076	17,26	800.6	17.2
Palma de Mallorca	0,187	24,02	664.9	23.8
Las Palmas de GC	0,228	19,76	902.3	19.5
Bilbao	0,124	34,90	580.7	34.8
Valladolid	0,894	109,27	6,600.0*	108.4*
Vigo	5,809	413,08	7,330.8*	407.3*
Gijón	0,208	24,66	755.7	24.5
Pamplona	0,329	72,87	1,226.0	72.5
Albacete	0,542	53,31	543.5	52.8
Badajoz	0,968	120,55	1,841.5	119.6
Logroño	0,463	50,88	937.7	50.4
AVERAGE	0,604	65,985	2,831.1	64.7

Source: Developed by the authors

Table 6 Creation policy

City	Self-created tweets	Retweeted posts	Total tweets	Self-created within city %	Retweeted post within city %	Retweeted posts by city/ total retweeted posts %
Madrid	73	1	74	98.6%	1.4%	0.6%
Barcelona	41	7	48	85.4%	14.6%	4.5%
Valencia	81	43	124	65.3%	34.7%	27.4%
Sevilla	40	5	45	88.9%	11.1%	3.2%
Zaragoza	63	3	66	95.5%	4.5%	1.9%
Murcia	66	45	111	59.5%	40.5%	28.7%
Palma de Mallorca	51	7	58	87.9%	12.1%	4.5%
Las Palmas de GC	10	10	20	50.0%	50.0%	6.4%
Bilbao	31	7	38	81.6%	18.4%	4.5%
Valladolid	47	4	51	92.2%	7.8%	2.5%
Vigo	16		16	100.0%	0.0%	0.0%
Gijón	11	3	14	78.6%	21.4%	1.9%
Pamplona	53	5	58	91.4%	8.6%	3.2%
Albacete	18	1	19	94.7%	5.3%	0.6%
Badajoz	10		10	100.0%	0.0%	0.0%
Logroño	45	16	61	73.8%	26.2%	10.2%
TOTAL	656	157	813	80.7%	19.3%	100.0%
%	80,7%	19,3%	100,0%			

Source: Developed by the authors

Table 7 View counts based on creation policy

Source: Developed by the authors

Metrics	Self-created	Retweet others	Total
Total view counts	1,915,813	613.984	2,529,797
Average view counts	2,920.4	3,910.7	3,111.7
Engagement index	8.377	1.287	9.664

Table 8 View counts of categories of retweeted accounts

Source: Developed by the authors

Account categories	Total view counts	Average view counts	Total retweeted accounts	% of view counts	% total retweets
Libraries	8,502	1,214.57	7	0.3%	4.5%
Urban Waste	7,252	1,450.40	5	0.3%	2.9%
Innovation and Science	21,686	2,168.60	10	0.9%	5.8%
Environment	130,410	5,670.00	23	5.2%	13.5%
Health	30,437	2,174.07	14	1.2%	8.2%
Mayor	149,500	37,375.00	4	5.9%	2.3%
Youth	9,221	838.27	11	0.4%	6.4%
Sport	11,681	1,668.71	7	0.5%	4.1%
Tourism	2,927	2,927.00	1	0.1%	0.6%
Housing	3,123	3,123.00	1	0.1%	0.6%
Employment	14,780	2,956.00	5	0.6%	2.9%
Transport	9,624	1,604.00	6	0.4%	3.5%
Education	1,289	1,289.00	1	0.1%	0.6%
Culture	67,890	1,655.85	41	2.7%	24.0%
Citizen protection	147,994	7,047.33	21	5.9%	12.3%
TOTAL	2,529,797	3,111.68	157		

The total view counts metric was higher in the self-created category only because there were more self-created than retweeted tweets. To better understand the relationship between creation policy and reach, we examined the average metric for view counts. Table 7 shows that the average reach of posts retweeted from other accounts was higher than that of tweets created by the city council. The accounts that the municipalities' X (formerly Twitter) accounts retweet thus have greater reach than the municipal accounts' own tweets. It is important to note that the engagement and reach metrics from retweeted tweets refer to the original tweet.

The average view counts in the post that were retweets of others (3,910 on average) were higher than those of self-created tweets. If we turn to engagement, however, we find that tweets originally created by the city council had a higher engagement index.

We also wanted to see whether a specific category or type of account had above-average reach. The city councils use the retweet to disseminate information from other services. Most city councils publish primarily their own content (%), but some retweet more than they publish their original tweets (as seen above in the case of Murcia, Valencia, and Las Palmas de Gran Canaria). We therefore measured the indicators of self-created tweets and accounts from which the retweets came. Table 8 shows that tweets originally posted by a mayor and retweeted have the highest aver-

age view counts, followed by environment and citizen protection. The category most retweeted is that of culture and environment.

After this descriptive analysis, we performed in-depth analysis of the municipal accounts' content creation protocol. We observed homogeneity within a city's content creation policy. That is, each city followed the same daily publication structure. For example, several cities always started by greeting the new day and giving information about the weather, then followed with posts about culture. Valencia and Murcia (among other cities) followed this pattern. We believe that very rigid programming of content creation robs the organization of identity, spontaneity, and approachability. Such rigidity may decrease two-way communication. Although such a pattern can be helpful in structuring the work of the person in charge of social media, research has yet to determine whether a rigid publication structure enhances engagement.

Responsiveness, reach, and engagement

By considering use of threads as a content creation policy, we can analyse whether tweets posted as a thread have more engagement and view counts. We also seek to determine the most popular type of answer and the frequency with which the public administration answers citizens directly. Table 9 shows that most answers were in the form of a thread, although they represent less than 5% of the total database (61 out of 813). The public administration, in contrast, only answered a citizen directly five times. In terms of engagement, threads performed better in Pamplona than in other cities that tend to publish threads, followed by Logroño. The type of answer with the most view counts was tweets posted as a thread. These tweets were viewed less

Table 9 Type of answers from the municipality

City	Total no. of published tweets	Thread	Informative	Responses to citizen %	Engagement index of threads	Engagement index of informative answer
Madrid	74			0.0%		
Barcelona	48	5		0.0%	0.005	
Valencia	124			0.0%		
Sevilla	45		2	4.4%		0.016
Zaragoza	66	3		0.0%	0.015	
Murcia	111	12	2	1.8%	0.010	0.018
Palma de Mallorca	58	3		0.0%	0.008	
Las Palmas de GC	20			0.0%		
Bilbao	38			0.0%		
Valladolid	51	3		0.0%	0.075	
Vigo	16			0.0%		
Gijón	14			0.0%		
Pamplona	58	22		0.0%	0.169	
Albacete	19	2		0.0%	0.054	
Badajoz	10			0.0%		
Logroño	61	11	1	1.6%	0.084	0.021
TOTAL	813	61	5	7.9%	0.422	0.055

Source: Developed by the authors

often than the original tweets posted (included as “No answer” in Table 10). View counts showed a slight difference between informative answer and thread. Note that Sevilla’s posts with an informative answer were viewed more than the city’s total amount of tweets. Finally, in Pamplona, the reach of tweets published as threads was close to that of original tweets, 44% and 55%, respectively.

Media type and engagement

This section analyses the media type used by municipalities and the relationship of media type to engagement. The categories were created to reflect the existence of emoticons in the text; type of media the post used (photo, video, or gif, if any); and use of links or hashtags. As Table 11 shows, most of the tweets used emoticons (85%) and photos (90%). Indeed, emoticons were a graphic element that structured and unified the content and identity of the account. Half of the tweets (54%) shared a link to broaden information, and 37% of the total tweets added a hashtag to the publication to increase its reach. In the data collection phase, we observed that most accounts used a short link (e.g., “bitly”). Only 0.4% of the tweets were published with text only.

As to media type by city, Barcelona seemed to use the widest range of visual elements (photo, GIF, and video). Murcia, Bilbao, and Pamplona stood out for their use of text-only tweets. This practice could be related to the use of threads as a strategy to spread information about an original tweet. Bilbao, Madrid, and Sevilla, in contrast, used links in most of their tweets (89% and 80%, respectively). As to hashtags, Badajoz used hashtags 90% of the time, Valencia 81%, and Madrid 77%. Most cities

Table 10 View counts by type of answer

City	Total view count by type of answer				% view counts within city		
	Informative	Thread	No answer	Total general	Informative	Thread	No answer
Madrid			580,296	580,296	0.0%	0.0%	100.0%
Barcelona		7,139	125,167	132,306	0.0%	5.4%	94.6%
Valencia			369,152	369,152	0.0%	0.0%	100.0%
Sevilla	42,896		292,076	334,972	12.8%	0.0%	87.2%
Zaragoza		18,487	119,765	138,252	0.0%	13.4%	86.6%
Murcia	24,005	6,343	244,264	274,612	8.7%	2.3%	88.9%
Palma de Mallorca		2,975	35,592	38,567	0.0%	7.7%	92.3%
Las Palmas de GC			18,045	18,045	0.0%	0.0%	100.0%
Bilbao			22,068	22,068	0.0%	0.0%	100.0%
Valladolid		8,278	328,324	336,602	0.0%	2.5%	97.5%
Vigo			117,293	117,293	0.0%	0.0%	100.0%
Gijón			10,580	10,580	0.0%	0.0%	100.0%
Pamplona		31,723	39,387	71,110	0.0%	44.6%	55.4%
Albacete		1,359	8,967	10,326	0.0%	13.2%	86.8%
Badajoz			18,415	18,415	0.0%	0.0%	100.0%
Logroño	2,671	7,765	46,765	57,201	4.7%	13.6%	81.8%
TOTAL	69,572	84,069	2,376,156	2,529,797	AVERAGE		
% Total	2.8%	3.3%	93.9%	100.0%	1.6%	6.4%	91.9%

Source: Developed by the authors

Table 11 Percentage of media type usage out of total tweets by city

City	Text only %	Emoticon %	Photo %	Gif %	Video %	Link %	Hashtag %
Madrid	0.0%	100.0%	98.6%	0.0%	86.5%	1.4%	77.0%
Barcelona	0.0%	79.2%	79.2%	4.2%	75.0%	12.5%	37.5%
Valencia	0.0%	96.8%	95.2%	0.0%	59.7%	2.4%	80.6%
Sevilla	0.0%	97.8%	91.1%	0.0%	80.0%	2.2%	51.1%
Zaragoza	1.5%	57.6%	97.0%	0.0%	74.2%	0.0%	40.9%
Murcia	0.0%	95.5%	83.8%	0.0%	38.7%	2.7%	27.0%
Palma de Mallorca	0.0%	98.3%	100.0%	0.0%	15.5%	0.0%	25.9%
Las Palmas de GC	5.0%	55.0%	95.0%	0.0%	65.0%	0.0%	25.0%
Bilbao	0.0%	97.4%	68.4%	0.0%	89.5%	5.3%	57.9%
Valladolid	0.0%	23.5%	100.0%	0.0%	45.1%	2.0%	7.8%
Vigo	0.0%	25.0%	100.0%	0.0%	0.0%	0.0%	25.0%
Gijón	0.0%	92.9%	100.0%	0.0%	35.7%	0.0%	14.3%
Pamplona	0.0%	94.8%	79.3%	0.0%	36.2%	1.7%	12.1%
Albacete	0.0%	100.0%	100.0%	0.0%	10.5%	0.0%	47.4%
Badajoz	0.0%	90.0%	80.0%	0.0%	30.0%	0.0%	90.0%
Logroño	0.0%	98.4%	85.2%	0.0%	55.7%	1.6%	62.3%
TOTAL	0.4%	81.4%	90.8%	0.3%	2.0%	49.8%	42.6%

Source: Developed by the authors

Table 12 Engagement index by reach for each media type by city

City	Text only	Emoticon	Photo	Gif	Video	Link	Hashtag
Madrid		0.07	0.07		0.00	0.06	0.06
Barcelona		0.05	0.05	0.00	0.00	0.03	0.02
Valencia		0.31	0.30		0.01	0.18	0.26
Sevilla		0.14	0.13		0.01	0.12	0.07
Zaragoza	0.00	0.05	0.13			0.07	0.04
Murcia		0.28	0.26		0.01	0.08	0.12
Palma de Mallorca		0.27	0.27			0.05	0.11
Las Palmas de GC	0.08	0.08	0.15			0.10	0.04
Bilbao		0.11	0.11		0.01	0.10	0.08
Valladolid		0.20	0.81		0.07	0.25	0.03
Vigo		0.51	4.91				0.51
Gijón		0.16	0.18			0.07	0.05
Pamplona		0.30	0.29		0.00	0.07	0.04
Albacete		0.42	0.42			0.02	0.19
Badajoz		0.81	0.80			0.03	0.81
Logroño		0.54	0.47		0.01	0.31	0.38
TOTAL	0.08	4.30	9.35	0.00	0.13	1.56	2.81

Source: Developed by the authors

used photos in almost every tweet. Examination of the results of this media usage relative to the engagement index shows that the results do not always support a city's choices of media type.

Table 12 shows the results of the media choices made by official X (formerly Twitter) account managers when publishing a tweet. For example, we see that the

effort Badajoz invested in sharing hashtags to increase publication reach (90% of tweets had a hashtag) paid off, with an engagement index of 0.81. This figure is far greater to than that for Valencia, which also shared hashtags (81%) but obtained an engagement index of only 0.26. As to sharing links, Logroño and Valladolid had the most engagement because more or less half of their tweets contained a link (56% and 45%, respectively).

Although Bilbao, Sevilla, and Madrid shared links in more than 80% of their publications, they obtained low engagement results. If we turn to photos, most of the cities shared photos in the majority of their publications. The best engagement returns were found in Vigo, perhaps because the account is run by the mayor and he appears in a large proportion of the photos he shares. Badajoz and Logroño also achieved good engagement results from sharing photos.

Bonsón et al. (2019) mentioned the need for studies that explore the effect of hashtags on citizen engagement, as previous literature confirmed that X (formerly Twitter) publications with hashtags increased their visibility (Grover et al., 2018). We therefore studied the engagement metrics for each media type, weighted by view counts of the tweets (reach).

Table 13 shows that tweets with photos and emoticons received more likes, comments, retweets, and view counts as a whole, a result also confirmed by the engagement index for reach. Table 14 also shows that hashtags (2.8) and links (1.5) ranked second in the citizen engagement index.

We created eight categories for the types of media used, divided by textual elements (only text, no other media), graphic elements (emoticons), interactive elements (hashtag or links), visual elements (photo, video or GIF), and the combination of elements.

Table 15 shows that the elements that increase engagement when used alone are visual (9.40) and interactive (3.58). Analysis of the combination of media elements shows that the most effective category is a graphic element combined with either a visual element (photo, video, or GIF) or an interactive element (hashtag or link). The category of tweets with interactive and visual elements (without emoticons), in contrast, receives the worst engagement index.

Table 15 displays the results of a one-way ANOVA test performed to determine whether a significant relationship exists between categories of media content and

Table 13 Likes, comments, retweets, view counts, and engagement index by media type

Media type	Likes	Retweets	Comments	View counts	No. of media types used	Engagement index by reach
Text only	73	10	1	5621	2	0.079
Emoticon	5,179	2,397	783	1,945,070	697	4.305
Photo	7,790	3,223	1,147	2,328,129	736	9.348
Gif	1	3	8	4943	2	0.002
Video	284	105	32	58,490	19	0.126
Link	3,498	1,639	501	1,527,456	446	1.560
Hashtag	3,046	1,508	441	1,166,753	370	2.807

Source: Developed by the authors

Table 14 Likes, comments, retweets, view counts, and engagement index by media category

Media elements categories	Likes	Retweets	Comments	View counts	No. of media elements	Engagement index by reach
Textual element (only)	73	10	1	5621	2	0.079
Graphic element	82	38	20	27,245	22	0.091
Interactive element	4,651	2,224	676	1,841,131	587	3.588
Visual element	7,873	3,282	1171	2,371,062	756	9.403
Interactive & visual	570	266	61	129,242	54	0.347
Graph & interactive	3,967	1,884	613	1,630,488	526	3.217
Graph & visual	5,032	2,312	737	1,873,357	649	4.147
Graph, interactive, & visual	3,902	1,837	587	1,586,020	500	3.150

Source: Developed by the authors

Table 15 One-way ANOVA test of existence of media content and engagement metric

Dependent variable	Independent variables	Method	Significance
Engagement	Categories of media content	One-way ANOVA	0.00

Source: Developed by the authors

engagement metric. The results confirm that the category of media used influences the engagement metric.

Content topic and engagement

This section analyses the topic most published and the presence of political content (presence of government or government achievements). Following previous studies (Perea et al., 2021; Bonsón et al., 2013; Agostino, 2013), we used the list proposed by Martí et al. (2012) to analyse the topic content of the tweets. We also included the four aspects studied by Cervi et al. (2022) to analyse the presence of government, government achievements, and political content.

Cultural activities, education, and public works and town planning were by far the content categories with the most published content (see Table 16). The categories with the least published content were financial reporting and housing. We wonder if these results are due to the fact that we gathered the data one week before the municipal elections in most of Spain. The person responsible for social media may have carefully chosen the topics published to avoid generating controversy.

In terms of engagement, the most published category, cultural activities and sports, caused the most citizen reactions, followed by public works and town planning. As municipal elections were close, we observed that municipalities tended to share positive information about achievements for the city, such as renovations, new public buildings, or facilities that the government in power had managed. Education and city marketing information also led to better engagement.

Table 16 Content topic by city

Content category	Total	Engagement index by reach
Public works and town planning	86	1.088
Environment	81	0.412
Attention to the citizen	17	0.030
Citizen participation	20	0.744
Social services	17	0.026
Citizen protection and security	54	0.315
Public transport	8	0.026
Employment and training schemes	43	0.225
Health	19	0.086
Education	93	0.642
Cultural activities and sports	293	5.138
Housing	10	0.030
Governance issues	26	0.095
Financial reporting	1	0.003
Marketing/city	45	0.803
TOTAL	813	9.664

Source: Developed by the authors

To understand the political aspect of the public administrations, we analysed the categories proposed by Cervi et al. (2022) in their study of three municipalities in Catalonia. The results are shown in Table 17.

Valladolid was the municipality with the most prevalent categories. We find tweets with presence of the mayor (18% of tweets by Valladolid), presence of government (24%), and government achievements (53%). Vigo, Valladolid, Las Palmas de Gran Canaria, and Logroño also shared predominantly tweets that highlighted government achievements (50%, 53%, 40%, and 30%, respectively). In the case of Vigo, this result was due to the fact that the account is run directly by the mayor or his communication team, not by a civil servant in charge of the local government's social media.

Table 18 displays the results for engagement. Vigo obtained the highest engagement performance. The engagement index was 4.69 for tweets in which the mayor appeared, as opposed to 1.54 for tweets with government achievements. The only other city with noteworthy engagement when sharing government achievements or when the mayor was present was Valladolid. The category that appeared the most in tweets overall was government achievements, with a combined engagement index of 2.65. The category presence of mayor was greatly affected by the outlier case of Vigo.

We performed a one-way ANOVA test to determine whether a significant relationship exists between the presence of government or political information and the engagement metric. The results confirm that the presence of this type of information influenced the engagement metric only when sharing tweets where the mayor was present or when sharing government achievements (Table 19).

To confirm the results of the one-way ANOVA test, we performed a GLM analysis (Table 20). This model confirmed that the presence of government and political information can generate higher engagement, especially for the tweets in which the mayor appears or government achievements are highlighted.

Table 17 Percentage of presence of government, achievements, and political content by city

City	Presence of mayor	Presence of the rest of the government	Government achievements	Political/ ideological content	Content most published
Madrid	0.0%	0.0%	0.0%	0.0%	None
Barcelona	0.0%	0.0%	6.3%	0.0%	Government achievements
Valencia	0.0%	0.0%	5.6%	0.0%	Government achievements
Sevilla	0.0%	0.0%	26.7%	0.0%	Government achievements
Zaragoza	0.0%	0.0%	15.2%	0.0%	Government achievements
Murcia	2.7%	2.7%	17.1%	0.0%	Government achievements
Palma de Mallorca	0.0%	0.0%	20.7%	0.0%	Government achievements
Las Palmas de GC	0.0%	0.0%	40.0%	0.0%	Government achievements
Bilbao	0.0%	2.6%	2.6%	0.0%	Presence of the rest of the government
Valladolid	17.6%	23.5%	52.9%	0.0%	Government achievements
Vigo	87.5%	0.0%	50.0%	6.3%	Presence of mayor
Gijón	0.0%	0.0%	7.1%	0.0%	Government achievements
Pamplona	1.7%	0.0%	3.4%	0.0%	Government achievements
Albacete	5.3%	10.5%	0.0%	0.0%	Presence of the rest of the government
Badajoz	0.0%	0.0%	0.0%	0.0%	None
Logroño	4.9%	3.3%	29.5%	0.0%	Government achievements

Source: Developed by the authors

Conclusions

Contribution

This study analysed the relationship between city councils and citizens through social media to determine which variables affect the city council's activity on social media and citizens' engagement. We collected the data from social media to analyse city councils' X (formerly Twitter) posts published before the municipal elections held in May 2023. Based on previous research (Perea et al., 2021; Bonsón et al., 2019; Gálvez et al., 2017; Bonsón et al., 2013; Agostino, 2013; Guillamón et al., 2016; Cervi et al., 2022), we considered engagement, activity on social media, audience, transparency, reach, creation policy, responsiveness, media type, and content topic in the posts published on the city council's X account.

In line with other authors (Bellucci et al., 2019; Bonsón et al., 2013; Guillamón et al., 2016; Cárcaba and García-García, 2010), we found that social media allows citizens and organizations to open a dialogue and interact online, encouraging innovation and improving transparency. Social media can serve as a tool of dialogic communication that enables public service providers to receive real-time feedback. Social media can also be understood as a tool encouraging communication with citizens and thus reducing agency costs. Agency theory expects citizens in municipalities with

Table 18 Engagement index by reach for each type of government or political information by city

City	Presence of mayor	Presence of government	Achievements of government	Political or ideological content
Madrid				
Barcelona			0.002	
Valencia			0.021	
Sevilla			0.055	
Zaragoza			0.033	
Murcia	0.017	0.007	0.019	
Palma de Mallorca			0.046	
Las Palmas de GC			0.071	
Bilbao		0.020	0.020	
Valladolid	0.369	0.087	0.652	
Vigo	4.693		1.547	0.177
Gijón			0.013	
Pamplona	0.009		0.011	
Albacete	0.005	0.036		
Badajoz				
Logroño	0.036	0.013	0.166	
TOTAL	5.130	0.161	2.657	0.177

Source: Developed by the authors

Table 19 One-way ANOVA test of existence of government or political information and engagement metric

Dependent variable	Independent variables	Method	Significance
Engagement	Presence of mayor	One-way ANOVA	0.00
	Presence of government	One-way ANOVA	0.86
	Achievements of government	One-way ANOVA	0.000
	Political or ideological content	One-way ANOVA	0.22

Source: Developed by the authors

larger populations to have more demands and conflicts of interest towards reducing information asymmetry and to enable evaluation of their management.

We measured the number of social media and followers, determined which social media were used most, and analysed the characteristics of the relationship between the different city councils. Our analysis included city size, proportion of city council responses to citizens' comments, and engagement among official city council X (formerly Twitter) accounts. The most popular social media platform among citizens in terms of followers was X, which consistently has more followers than any other social media platform. We chose to evaluate X for this study due to this predominance among followers.

We analysed the frequency of activity, audience, and type of content in the post published on the city council's X (formerly Twitter) account. To analyse engage-

Table 20 GLM of government and political information

Independent variables	Dependent variable		
	Engagement metric		
	coefficient	Std. err.	Sig.
Presence of mayor	1.901251	0.190404	0.000
Presence of government	-0.6893568	0.2433868	0.005
Achievements of government	0.6051959	0.101825	0.000
Political or ideological content	-0.2000504	1.025.806	0.845
Constant	2.425.933	0.0402413	0.000

Source: Developed by the authors

ment, we used a well-known and widely used metric that measures popularity (likes), engagement (comments), and virality (shares) (Perea et al., 2021; Bonsón et al., 2019; Gálvez et al., 2017; Bonsón et al., 2013; Agostino, 2013; Guillamón et al., 2016; Cervi et al., 2022). Contrary to expectations, we found no direct significant ratio or relationship between the municipality's population size and the ratio of citizen reactions.

Although high activity on an account seems to have a negative effect on citizen participation, accounts that reward more curation of content in their publications and restrict the number of publications seem to gain more citizen response. We thus believe that it is important for the people responsible for a city's social media to have specific training on how to manage a social media platform and maximize citizen response when sharing information and meeting transparency objectives. And such training is not only about meeting objectives. Cities should also be careful of their public image and work to generate a good relationship with their citizens. In cities with more than 200,000 inhabitants, penetration rates grew during the period analysed. We found, however, that quantity of publications did not always translate into efficacy in terms of citizen engagement.

The results for engagement ranked Vigo first, where the X (formerly Twitter) account is managed by the city's mayor. Engagement on the city's X accounts was almost five times higher in Vigo than in other cities. Badajoz and Valladolid ranked second and third position in stakeholder engagement index by reach, with high penetration and engagement rates. Third, Albacete showed a small ratio of penetration and very high engagement. Surprisingly, we find that Valencia and Murcia, the cities most active on X, have a low engagement index, indicating that quantity of publication does not always translate into efficacy in terms of citizen engagement.

As to reach, measured as view count of publications, we discovered that smaller cities had on average a higher reach ratio than larger cities, as well as a consistent degree of engagement. Smaller cities tend to publish fewer tweets daily, but these tweets have on average more reach (view counts) and engagement (likes, comments, and retweets).

Our analysis shows homogeneity within a city's content creation policy. That is, each city follows the same daily publication structure. We believe that a very rigid programming of content creation robs the organization of identity, spontaneity, and approachability. Such rigidity may thus decrease two-way communication. Although

it structures the work of the person(s) responsible for social media, research has yet to determine whether a rigid publication structure enhances engagement.

We also analysed the creation policy of the X (formerly Twitter) accounts. Murcia and Valencia showed the highest rate of retweets from other accounts. In Vigo and Madrid, retweets had on average more view counts in terms of reach. Finally, Vigo, Valladolid, Las Palmas de Gran Canaria, and Logroño shared the position of most tweets highlighting government achievements. We also found that original accounts of retweeted posts had greater reach than the municipal accounts. The origin accounts of retweeted posts were sent mainly from city mayors' accounts and accounts related to the environment and citizen protection. Finally, our analysis of municipalities' responsiveness through X accounts showed that only 5% of total tweets analysed were direct answers to citizens.

Regarding media and content type of the tweets analysed, most publications used emoticons and photos to convey a visual identity and enhance communication. Half of the tweets shared a link to further information, and 37% added a hashtag to the tweet to increase its reach. Cultural activities, education, and public works and town planning were by far the content categories that published the most content. The content categories that published the least were related to financial reporting and housing.

Finally, we examined the presence of mayor or government achievements in the content of the tweet. We performed one-way ANOVA tests and GLM analysis to determine whether a significant relationship existed between presence of government or political information and the engagement metric. These analyses confirmed that the presence of government and political information generated higher engagement, especially for the tweets in which the mayor appeared or that highlighted government achievements.

Contrary to prevailing assumptions, residents of larger urban areas demonstrated a lower level of engagement with municipal governments than those in smaller municipalities. Moreover, in more populous cities, municipal administrations tended to adopt a more fragmented approach to communication, establishing distinct channels and accounts for different services.

We therefore recommend that local governments use social media not only as an informative communication channel (like the official webpage), but as another method available for gathering suggestions, interacting with the citizens, and enhancing citizen participation in government-related issues. Our study also reveals that public administrations do not regulate social media use.

This paper fills a research gap. It compares engagement and activity performance across Spanish municipalities in all autonomous regions. We found no other studies comparing cities throughout Spain. That is, the only studies that specifically analyse and compare the content creation policy and engagement metrics of X (formerly Twitter) accounts from different municipalities covered only one region of Spain. We also analysed the retweets and their impact on view count and engagement in the municipalities' X accounts, and qualitatively assessed the responsiveness of the city council on X.

The originality of this paper lies in its valuable information enabling local government representatives to enhance development of their social media presence. For

academics researching this area, our findings contribute to filling the knowledge gap on social media presence, reputation, and management in public administrations, specifically in local governments. This paper is also useful for the people in charge of municipalities' social media platforms that have no defined content creation policy or professional social media management (represented by the position of social media manager). The argument identifies how municipalities with the most engagement program their content and interaction with citizens, providing guidelines for other cities. Its practical application stems from its identification of the municipalities to be used for benchmarking purposes and of the municipalities that can improve their engagement index.

Limitations

As researchers, we identified some limitations to our study. Its analysis of social media may be affected by observer bias, as measurement was performed by the researcher. However, using two data collectors for greater objectivity and having two professionals in the field perform a data collection audit mitigates this bias. In addition, the volume of data collected is small compared to that in other studies. This is the case because we wanted to perform in-depth analysis of the interaction between citizens and city councils, as well as qualitative analysis of this interaction. Besides, our study may benefit from a more comprehensive analysis of other social networks that could yield a better view of the phenomenon. Finally, while this study was being performed, X (formerly Twitter) closed its API to general public, making X available only through paid subscription plans. Any software designed to gather data from X is thus no longer available for free, and the price to access the API is not affordable by researchers. As the research questions and indicator evolved, we chose to collect that data for the final database at a significant date, the week before the municipal elections. We did so because we believe citizens tend to be more active and engage more with social media at election time.

Future research lines

One future research line would be longitudinal analysis that gathers data from the same municipalities at several different times to determine variability of the variables analysed—namely, the municipality's activity and citizens' engagement. We also hope to analyse differences in the relationship established with citizens in small municipalities, where the administration is closer to the citizen. The results in the municipal elections in Spain led to a call for national elections in July 2023. This call gave us another opportunity to gather data before the election date and compare the results for the same cities. Also, another research line could analyse the case of the municipalities with several accounts in different social networks and how this affects engagement.

Another research path could corroborate our findings on municipality community managers' content creation policies, analysing the guidelines for social media use through semi-structured interviews or a questionnaire administered to those in charge of social media.

Author Contribution Garrote-Quintana, Alba.: Data curation, Formal analysis, Investigation, Methodology, Writing - original draft; Urquía-Grande, Elena: Conceptualization, Data curation, Software Supervision, Validation, Writing - review & editing; Delgado-Jalón, María Luisa: Conceptualization, Data curation, Validation, Writing - review & editing.

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Declarations

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


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