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Audit Institutions in the European Union: Public Service Promotion, Environmental Engagement and COVID Crisis Communication through Social Media

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Abstract: This article analyses Social Media (SM) use as a promotion tool for public institutions in the public audit sector. The authors propose a quantitative model to assess online engagement of 94 European audit institutions (national and regional) with their stakeholders, based on SM and web activity metrics of these institutions, with a focus on pressing matters such as environment, sustainability and the current COVID pandemic. The proposed model may be applied to assess organisations from any public or private sector. The research finds that SM presence helps audit institutions to promote their services more effectively by directing their stakeholders to extensive content on the audit institutions' websites, thus contributing to an increase in their web traffic. Most audit institutions do not have a strategy for the online promotion of their services and work outputs, nor do they, in general, use SM for intensively promoting environmental or sustainability-related messages. The only exception is the European Court of Auditors, who clearly promotes its environment-related activity by actively and increasingly posting on SM and referencing its reports. Audit institutions could benefit from the nature of their evidence-based activity and promote their findings on emerging topics to positively influence public policies and accountability at all levels.

Keywords: public services promotion; online communication; social media; sustainability; environment; environmental sustainability; COVID

1. Introduction

Social Media (SM) give a unique and extraordinary opportunity to the public sector to promote its policies and activities, sending messages to interact with the citizens [1]. At the same time, SM may also lead to exposure to criticism and opinions from stakeholders, which may influence the course of the marketing strategies chosen by public institutions.

In the last three decades, public organisations transitioned towards more 'business-like' models of operation through the now well-established New Public Management [2–5]. Consequently, public service quality is now commonly assessed by the beneficiaries of the services—the citizens. Thus, public organisations have been increasingly more interested in implementing promotion strategies of their services to try to convey a positive image about their activity and performance, although not without difficulties [6,7]. However, these institutions cannot apply the same conventional service promotion strategies as the private sector. They need to adapt service promotion techniques to their broader purpose and follow marketing principles according to their needs, setting standards and benchmarks different from conventional business [8,9].

One of the most used and useful tools for service promotion is online communication through SM. It is relatively inexpensive, and it offers to the organisations the possibility not only to convey a message regarding their activities but also the added value of interacting with their stakeholders.

The subject of this research is an area of the public sector which is relatively unknown and not very often researched [10], namely public audit institutions.

This research aims to offer a broader picture on how public audit institutions across Europe use online tools, specifically SM, to promote their services and the outputs of their activity, especially on pressing issues for the society today such as two of the biggest global crises at present: environmental sustainability and the COVID-19 pandemic, by interacting and engaging with their stakeholders—the citizens. Empiric quantitative methods (statistical correlations for quantitative and qualitative variables, cluster analysis) are used to analyse data and metrics from SM and websites of 94 European audit institutions. This exploratory and comparative analysis aims to establish online communication patterns and online communication engagement with stakeholders, as well as assessing how the institutions promote their activity on SM platforms on sensitive and worrying matters, such as climate change and the current pandemic.

Online channels offer new opportunities for public sector institutions to promote their services and expand their base audience. This is applicable also to audit institutions, more so as they are not as socially visible as other public institutions in the eyes of the citizens. The study of communication strategies [11] and online promotion of activities of audit institutions gives a good picture of the strategies implemented by the institutions themselves [12], even though their audience's response and interaction are still unexplored. Therefore, this article proposes to cover this gap with a model for measuring and comparing online engagement of audit institutions. It may also be applied to any organisation to help decision-makers focus their efforts towards better promoting the services they render to the society or the products they put on the market. Furthermore, as more research on SM in the public sector is desirable [12,13], this analysis complements [12] by analysing the SM promotion of environmental topics by European audit institutions and presents succinct although enlightening findings on communication regarding COVID-19.

The interest for this subject is not only academic, by proposing a valid field of analysis for postulates such as customer orientation or value co-creation [14], but also clearly professional, by proposing better strategies for public administrations for the provision of services to the citizens. However, the public audit sector has benefited little from this double advantage (academic and professional). This study contributes to the existing literature by exploring the audit sector—a less researched branch of the public administration [15]—from the fresh marketing perspective of SM engagement. It also offers a complete model for SM engagement analysis both in general and on specific topics. At the same time, the results of this analysis provide valuable insight for the audit institutions by pointing out flaws in their service promotion strategies and thus offering them contrasted information on how they may improve this aspect of their activity.

The research proceeds as follows: first, after this introduction, the theoretical framework is presented with a multidisciplinary approach; second, research questions are presented and data is described; afterwards, methodology and results are presented and discussed; and, finally, conclusions are drawn from this research.

2. Theoretical Framework

Marketing of the public sector is a well-explored area in research [16–19]. Since Kotler and Armstrong [20] proposed broadening the scope of Marketing, its applications have multiplied, particularly in services in the public sector [21–23].

The concept of 'exchange' [24,25] is the foundation of marketing decisions and actions between two parties, one party offering and the other party seeking a service or a product and both looking to maximise benefits while minimising costs [26]. The exchange, a complex mechanism in general, becomes even more sophisticated in the case of public services given a large number of stakeholders,

the blurred lines of benefits maximisation (efficiency and effectiveness) and cost minimisation (economy) [27] and the intervention of other factors such as ethics and social responsibility [21,28].

The audit institutions do not exactly have an exchange-type of relationship with the citizens as public sector audit does not provide a direct service to the citizens but performs a public service for and on behalf of the citizens. This important difference is a relevant factor in the way these institutions fulfil their role, operate, and promote their activity and the services they render to society. Unlike other public services, such as the health system, the education system, or the legal systems, to name the most common ones, they seldomly have direct interactions with the citizens. SM may transform this relation between audit institutions and their stakeholders because it offers an avenue for exchanging information between both parties, with the institutions promoting their services and activities and the stakeholders giving their feedback on these issues. This may have consequences in the strategies that they adopt to choose the audit topics and to promote the results of their work to the public.

Audit institutions do not assume a management role in the public sector. However, they influence it as they oversee the performance of public organisations and contribute to enforcing accountability at all levels from an external and independent viewpoint [29,30], which makes their activities important for public sector management [10,31].

Audit institutions are bound by normative constraints in form of audit standards, adopted and accepted at an international level. They operate under a limited number of institutional models: Anglo-American, Eastern, Germanic, Napoleonic, and Nordic. These institutions are highly professionalised and homogeneous in terms of their activity, scope, and operations. Their main role is to oversee, independently, the soundness of finance management and the good governance in public administration. Thus, public audit bodies are a good example of how the mechanisms of institutional isomorphic change—the Institutional Theory [32]—operate. It could then be expected that they may adopt similar strategies regarding the promotion of their services before their main stakeholders—the citizens, which could also be influenced by other social, economic, and cultural factors [33–37].

The audit activity was traditionally dedicated mainly to financial and compliance audits under strict audit procedures. Since the adoption of New Public Management systems, more emphasis has been placed on performance audit [38–41], to assess the efficiency, effectiveness, and economy in the use of public resources and policy design and implementation. This approach allows the audit institutions to differentiate themselves from one another and to establish unique strategies in terms of choosing audit topics, aligned with social interests and public policies. This strategy has the double benefit of serving the social interests and, if rightly implemented, of legitimizing audit institutions' existence and continuation [42].

For the researched sector—public audit services—the 4Ps marketing mix [43,44] cannot be applied as such. Only one component is retained—Promotion—under the understanding that the remaining three, Product, Price, and Place, do not really apply to the case. The product (service in this case) is clearly defined by the mandate of audit institutions worldwide and it is not expected to vary considerably over time, namely the supervision of sound use of public resources and the evaluation of policies and actions of the public administration based on efficiency, effectiveness and economy criteria. Like many other public entities, audit institutions do not perform on an open market based on establishing a Price for the provided service. They operate in a certain territory (Place), be it countries or regions, where their stakeholders are situated and do not seek to gain attention outside their area of action. After ruling out the first three components of the marketing mix, Promotion may then be retained and studied as its core component in the case of audit institutions. Promotion is primarily put in place through communication channels [19]. These channels may be traditional media or, in recent years, online outlets and platforms such as SM, organisations' own websites, or third parties' websites.

SM offer wide opportunities for public institutions to promote and market their services and activity outputs to a wider audience. This was acknowledged by international organisations of audit institutions such as INTOSAI (International Organisation of Supreme Audit Institutions),

EUROSAI (European Organisation of Supreme Audit Institutions), and the EU Contact Committee which apply communication guidelines to be used by audit institutions [45,46]. However, these online tools bring challenges and require adapting to new marketing strategies [47,48].

Communication is a powerful tool for service promotion [49], especially in the public sector, such as public audit, where audit institutions need to focus the attention of citizens and policymakers on specific high-valued policies and topics of interest [50]. This is the case for sustainability and environmental issues or the current pandemic, which may boost trust and loyalty in the public institutions, if their stakeholders perceive that public institutions are delivering values such as efficiency and overall service quality [51] similarly to the evidence obtained in the private sector—see [52,53].

Furthermore, communication has a defining role in crisis management and risk perception by making information available to the stakeholders [54], thus enhancing transparency, and strengthening the trust of citizens in their institutions. Citizens are more likely to follow messages and instructions from authorities and leaders if these messages are conveyed in familiar terms, but based on scientific and fact-supported data, thus helping them to perceive the gravity of specific events or crisis [55].

For all of the above reasons, in the past decade, audit institutions have increased their use of online tools (Web 2.0 and SM) [12].

This opens opportunities for research from multidisciplinary perspectives, especially in times when spreading fake news and misinformation, particularly using online communication tools, has become commonplace and represents a growing source of concern about the quality of information [56]. The fact that audit is a fact-backed, evidence-based activity should contribute to audit institutions having a more prominent role in promoting messages to society on sensitive topics such as environmental issues or the current pandemic crisis. SM are in fact the right tool to do so [57–59] and facilitate direct interaction with stakeholders, leading to reinforced accountability, and therefore contributing to enhance transparency and citizens' trust in the public sector.

3. Research Questions and Data Description

The research aims to answer the following research questions:

- RQ1. What is the online engagement and activity on SM and Web 2.0 of audit institutions in Europe and their explanatory factors?
- RQ2. Do audit institutions engage with their stakeholders on SM and Web 2.0 in similar manners?
- RQ3. Do audit institutions communicate and engage on sustainability and environmental issues on SM?
- RQ4. How do audit institutions communicate on the current COVID pandemic crisis on SM?

The sample for this research consists of 94 European audit institutions, both at EU and UK national (29 institutions—27 EU member states Supreme Audit Institutions (SAI), the ECA as the Supreme Audit Institution at EU level and UK's National Audit Office) and regional level (65 regional audit institutions (RAI)—9 for Austria, 2 for France, 16 for Germany, 7 for the Netherlands, 16 for Poland, 12 for Spain, and 3 for the UK). The sample is coincidental with the 92 European audit institutions from [12] to which two French RAIs were added: Île de France and Provence Alpes Côte d'Azur. These two RAIs, while not independent from the French SAI, are the only French regional audit chambers using SM to promote their activities.

Data for this research comprises web metrics and SM contents and metrics of the analysed institutions. These metrics depict in different forms not only the online activity of audit institutions but also the interaction and engagement on SM and Web 2.0 between them and their stakeholders (citizens and other institutions). Ninety-four websites were analysed. SM contents and metrics were collected in July–August 2020 by means of Python *GetOldTweets3* library for Twitter and Python *facebook_scraper* library for Facebook. For the content analysis part of the research related to environmental engagement, SM contents in languages other than English were translated to English using Python *GoogleTrans* library.

Web metrics data was retrieved from the AHREFS database in August 2020. AHREFS is a toolset for Search Engine Marketing (SEM) and Search Engine Optimisation (SEO) analysis used by marketing professionals [60]. The database contains data for some 4 billion webpages, updated daily, having the second most active crawl bot after Googlebot. It provides a series of web metrics from which this research uses Referring Domains (the total number of unique domains linking to the target web—in this case, the researched audit institutions website) and Total Traffic (the researched audit institution website or URL's estimated monthly organic traffic visitors reaching the website without using paid search results, as shown by this powerful database). These are trusted metrics used by SEO and SEM tools to assess website quality. Organic traffic's benefits are, among others, trust, credibility, and better ranking for a certain website [61,62]. Referring Domains as unique backlinks to a website is a common metric also used in calculating websites ranks [63–65]. A third web metric was added, showing if the target website is adapted to mobile devices or not (dichotomous variable). This variable was deemed of interest considering that, as of August 2020, some 50% of the internet usage in Europe [66] is made on mobile devices (mobiles, smartphones, or tablets), up from some 31% in 2015 and only about 10% in 2012. It is therefore important for a webpage to be adapted to mobiles, being thus more user-friendly and increasing the probability of usage on a mobile device.

Descriptive statistics for the Web and SM data involved in our analysis are presented in Appendix A, Table A1.

To answer RQ1 and RQ2, different variables on SM and Web 2.0 activity were analysed. Thus, out of the 94 studied European audit institutions, 31 of them—one third—have a Twitter account (16 SAIs, 14 RAIs, and the ECA) and 15—only 16% of them—have a Facebook account (14 SAIs and the ECA). 13 of the 94 audit institutions (14%) communicate both on Twitter and Facebook. For each SM account, all contents were retrieved from the initial set-up moment of SM accounts by auditing institutions. The data consists of a total of 34,234 Twitter posts and 12,337 Facebook posts published by the 31 and 15 audit institutions, respectively.

The data analysis shows some interesting insights about the SM communication of European audit institutions. For instance, bearing in mind that a verified account (blue badge) means that an account of public interest is authentic, our analysis shows that only three out of the 31 Twitter accounts are verified (ECA, UK's NAO, and France's SAI), being three out of the four most followed accounts amongst the 31 audit institutions. For Facebook, only one out of the 15 accounts is verified (the French SAI). Regarding followers, the 31 audit institutions have more than 290,000 followers on Twitter, with an average of 9370 followers per account, with two SAIs (France and the United Kingdom) accounting for some 73% of the total followers and 50% of the accounts being followed by less than 560 people. However, Twitter audit tools [67,68], used to audit the quality of Twitter accounts followers, determined that these two accounts may have around 20 to 25% of fake followers, or 'bots', compared to some 5–10% for the rest of the audited accounts. In this analysis, followers shown by the profiles of the audit institutions are used, without making any adjustments regarding potential-bot followers. Followers per 1 million active Twitter users per country or region were calculated using SM activity and Internet penetration data from [69]. On this metric, Latvia ranks first with 220 followers, followed by Poland (188) and France (111), all of them well above the average of 35 followers and the 80% of the audit institutions which have less than 32 followers.

For environment and sustainability engagement analysis (RQ3), SM posts were filtered using a list of terms related to sustainability based on [70]. The list of the most frequent 40 hashtags used in Twitter as per [70] was refined by removing terms which, while related to sustainability as per the mentioned research, were not really related to the environment or considered too general for the present analysis—such as #architecture, #blockchain, #business, #construction, #design, #education, #innovation, #leadership, #sac18, #sustainable, #tech, #technology. The hashtag #sustainable was taken out after analysing the tweets filtered when using this term as it had no relation to the researched topics. For example, in multiple cases, this term was used in relation to sustainable financing, sustainable budget, sustainable finance—common topics of audit yet obviously not related to the environment. Also,

it was observed that, in the few cases where the term sustainable was appearing in environment-related posts, other terms from the list were appearing too, which means those posts would be filtered in any case, even if the #sustainable term was not used. Out of the list of 40 terms, 28 were retained. The content analysis of the posts allowed for retaining additional terms related to the environment, thus obtaining a list of 86 words and expression which was then used to filter the entire pool of posts on both SM. The majority of the 86 terms appear in [70], as being related to the 40 main sustainability hashtags used on Twitter. Most terms were not filtered in the form of hashtags because during content analysis it was observed that audit institutions do not use hashtags consistently throughout their online communications. The list of words and expressions are presented in Table 1:

Table 1. Filtering Terms and Expressions for Environmental Posts.

#csr	Earthday	nature
#eco	ecodesign	natural disaster
#esg	ecofriendly	organic
#ETS	Ecologic	pesticide
#nature	Ecology	photovoltaic
#rse	electric cars	plastic
#sdgs	emission trading system	plasticfree
agriculture	Energy	pollution
air quality	energy efficiency	recycling
biodiversity	environment	renewable
biofuels	flood	renewableenergy
carbon	food	renewableenergy
carbon neutral	food innovation	sdg
circular economy	food security	social impact
circulareconomy	food tech	soil
clean energy	food waste	solar
clean tech	foodsecurity	solar energy
cleanenergy	foodwaste	solarenergy
climate	forest	sustainability
climate action	fuel	waste
climate change	global goals	waste water
climate emergency	global warming	wastewater
climate neutral	globalgoals	water
climateaction	globalwarming	water quality
climatechange	green	wind energy
contamination	green building	wind power
desertification	green deal	zero waste
drought	greenhouse	zerowaste
Earth Day	heat	

Note that 75% of the audit institutions active on Twitter and 60% of the audit institutions active on Facebook posted less than 15 environment-related tweets per year. The evolution of posts per year will be analysed in a section below.

To answer RQ4, SM messages were filtered using the following list of COVID-related terms: COVID, SARS-CoV-2, coronavirus, pandemic, health crisis, lockdown.

Fourteen out of the 31 Twitter accounts and three out of 15 on Facebook accounts did not post any message related to the pandemic, so posting on these topics cannot be considered a generalised trend amongst audit institutions. In general, they posted an average of 11.5 messages (some 2 messages per month) on Twitter and less than 5 on Facebook (less than 1 message per month) on this topic. However, it is noteworthy mentioning one RAI, the Wales Audit Office, who started using Twitter at the end of 2019 and published a staggering 265 messages on COVID only (some 25% of all its posts). They have posted on very different topics such as changing audit methods caused by the pandemic—content directed to professional stakeholders—, the impact of the pandemic on public finances, the state of the national health system, or contents about public libraries or personal wellbeing—including adapting

published content for children—, promoting thus messages specifically directed towards the general public. The institution with most interactions is the French SAI, who only posted 11 tweets on the matter but received an average of 50 retweets and 50 favourites per COVID-related post, being the average for all accounts 3.2 retweets and 4.1 favourites, respectively. Out of the 11 tweets, eight were related to the impact of the pandemic on the public finances. The three remaining tweets were recalls of the SAI's stances on the 2010 influenza pandemic and one tweet out of these three was related to the SAIs' stance on masks acquisition. This tweet received some 70% of the COVID-related retweets and likes.

Table 2 presents the variables used in this research, supported by existing research.

Table 2. Literature support for variables.

	Item	Source
Variables	SM posts and interactions	[71]
	Web-related variables	[61–65]
	SM Sustainability-related terms	[70]
Model	SM Engagement Scores	[72,73]
	Clusters	[12]

4. Methodology and Discussion of Results

4.1. Overall Analysis of Web and SM Engagement (RQ1 and RQ2)

To answer RQ1, regarding the engagement and activity on SM and Web 2.0 of audit institutions in Europe and their driving factors, Spearman's correlation (quantitative variables) shows that the number of followers on Twitter is significantly linked to the number of Twitter active users (69) per country or region (Table 3, Panel A).

At the time of data collection, the audit institutions posted on Twitter an average of 12.63 posts per month, with the ECA and Latvia being the most active with an average of approximately 50 tweets per month. As Appendix A, Table A1, Panel A1 shows, they get an average of 2.17 retweets per tweet, with France standing out with an average of 17 retweets per tweet. Also, they receive a very low number of replies with 0.25 replies per tweet, with Poland receiving most replies at 9.61. The SAIs tweets receive an average of 2.84 favourites per tweet. These numbers may be compared to the average number of tweets per active Twitter user which accounts for some 98.6 tweets per month [74], showing that the audit institutions are making an uneven and limited use of SM.

Facebook account followers were chosen instead of account likes. A follower chooses to receive updates from the followed account in their newsfeed, whereas a 'Like' may indicate just agreement or willingness of being recognised as a fan of the account but not to actively follow it. Therefore, Facebook followers are considered more important as a metric as they have the potential of actively following and engaging with the content of audit institution Facebook account by liking, sharing, or commenting the posts, which is not necessarily true for the 'Likes'. The 15 audit institutions active on Facebook have a total of 52,827 followers, with the Polish SAI being the most followed account, with 10,681 followers. The average number of Facebook followers is 3522 followers and 50% of the accounts have less than 2975 followers (see Appendix A, Table A1, Panel A2).

Spearman's correlation (Table 3, Panel A) shows that the number of followers of Facebook is significantly linked to the number of Facebook active users per country or region [69], although the link is not as strong as in the case of Twitter.

The audit institutions posted on Facebook an average of less than 11 posts per month. As Appendix A, Table A1, Panel A2 shows, the institution with most posts is Hungary with 2337, active since 2012, almost three times more than the average of 822 posts per audit institution. However, as for Twitter, the ECA, who established its Facebook account in 2015, is the most frequent Facebook poster with an average of 26.4 posts per month.

Table 3. Explanatory drivers for online engagement.

	Factor	Audit Institutions	Mean SM Followers	Mean Total Traffic	Spearman	Kruskal-Wallis
Panel A	Twitter active users per country/region	31	9369.68		0.5766 ***	
	Facebook active users per country/region	15	3521.80		0.4383 (*)	
Panel B	Population	94		1952.35	0.5724 ***	
Panel C	Twitter + Facebook	13		7095.46		24.39 ***
	Twitter	31		4623.71		19.21 ***
	Facebook	15		6377.73		17.27 ***
Panel D	No SM	61		602.64		
	SAIs	29		5599.31		26.39 ***
	RAIs	65		325.25		

$N = 94$; (*) $p < 0.1$; *** $p < 0.005$.

Regarding web metrics, out of the 94 websites, 81 are mobile adapted. Most organic traffic was measured on France's SAI website, followed by Poland's and Italian SAIs websites, all with more than 15 times the average traffic of the rest of the websites. Furthermore, as per Appendix A, Table A1, Panel A3, the UK NAO website has the most referring domains, with 24,440, 30 times more than the average and 100 times more than 75% of the rest. It is followed by the ECA and the French SAI's websites, with around 15,000 referring domains each, over ten times more than the average and some 17 times more than 75% of the audit institutions websites. The website traffic is significantly related to the population [75], weighted by internet penetration rate per country or region [69] as Spearman correlation shows (Table 3, Panel B).

The Kruskal-Wallis test (quantitative versus qualitative variables with two or more categories) has evidenced that web traffic significantly depends on whether or not the audit institutions are absent from SM or are present on any or both of the analysed SM platforms and whether or not they are supreme or regional institutions (Table 3, Panel C and D respectively). These results are in line with [76] and [77] which also conclude that SM presence has an influence on the web activity. Also, it may be observed that four SAIs, namely France, UK, Latvia, and the ECA, have the most active SM accounts and websites. Results also show that SAIs' websites are visited more frequently than RAIs websites.

To measure SM engagement, the Unmetric engagement score [72,73] was used. To calculate this score, all interactions (Retweets, Replies, and Favourites for Twitter and Shares, Comments, and Likes for Facebook) are considered but weighted differently, considering that the type of interaction has different strengths. Thus, for Twitter and Facebook, respectively, Retweets/Shares are deemed to indicate a stronger commitment with the account, given that it is expanding the message to a wider audience, who is not necessarily following the account whose message is shared. Likewise, Replies/Comments are weighed higher than Favourites/Likes because they start conversations and may engage both the followed account and other followers. Thus, the weights currently proposed by Unmetric are used and the score is calculated as Interactions divided by Fans, with the interactions calculated as follows: Retweets or Shares * 10 + Replies or Comments * 5 + Favourites or Likes, for Twitter and Facebook, respectively. While this score uses similar metrics as [71], the metrics were weighted to acknowledge the strength of each type of interaction. The rationale for using weighted interactions is supported by previous research such as [13,78–82].

For Twitter, engagement scores range from 1.13 to 27.50 (see Appendix A, Table A1, Panel A4), with the highest value corresponding to Finland's SAI, followed by an RAI, namely Scotland's audit office. The lowest engagement score corresponds to the UK NAO, explained by its large followers' base compared with most of the rest. The average Twitter engagement score is 9.28 and more than 50% of the accounts rank below. Figure 1 presents a visual representation of Twitter engagement scores for the SAIs and the ECA, ranked from 0 (for SAIs without Twitter presence) to 27.50.

As Appendix A, Table A1, Panel A4 shows, for Facebook, engagement scores range from 2.47 to 20.20, with the highest value corresponding to Latvia, followed by Lithuania with 12.5 and the ECA with 11.08. The lowest Facebook engagement score corresponds to Estonia, followed closely by Slovakia with 2.68. 60% of the Facebook accounts rank below the mean engagement score of 8.12. Figure 2 presents Facebook engagement scores for SAIs and the ECA, ranked from 0 (for SAIs without Facebook presence) to 20.20.

The figures show that some SAIs maintain similar engagement level on both SM platforms (e.g., on the higher side, Latvia, Lithuania, Austria, Netherlands, Portugal, or the ECA).

Furthermore, Spearman's test was performed to study the correlation between the engagement scores on web and on SM (a zero score was considered for the audit institutions without SM presence) and the following eight relevant indexes: OECD's Open Data Index (ODI), Corruption Perception Index (CPI), Open Government Index (OGI), E-Government Index (EGI), E-Participation Index (EPI), Online Service Index (OSI), EU Open Data Maturity Index Europe (ODMIE), EU Digital Economy and Society Index (DESI). The indexes were considered for measuring digital readiness, transparency, accountability, and citizens participation in public life. For RAIs country indexes were considered.

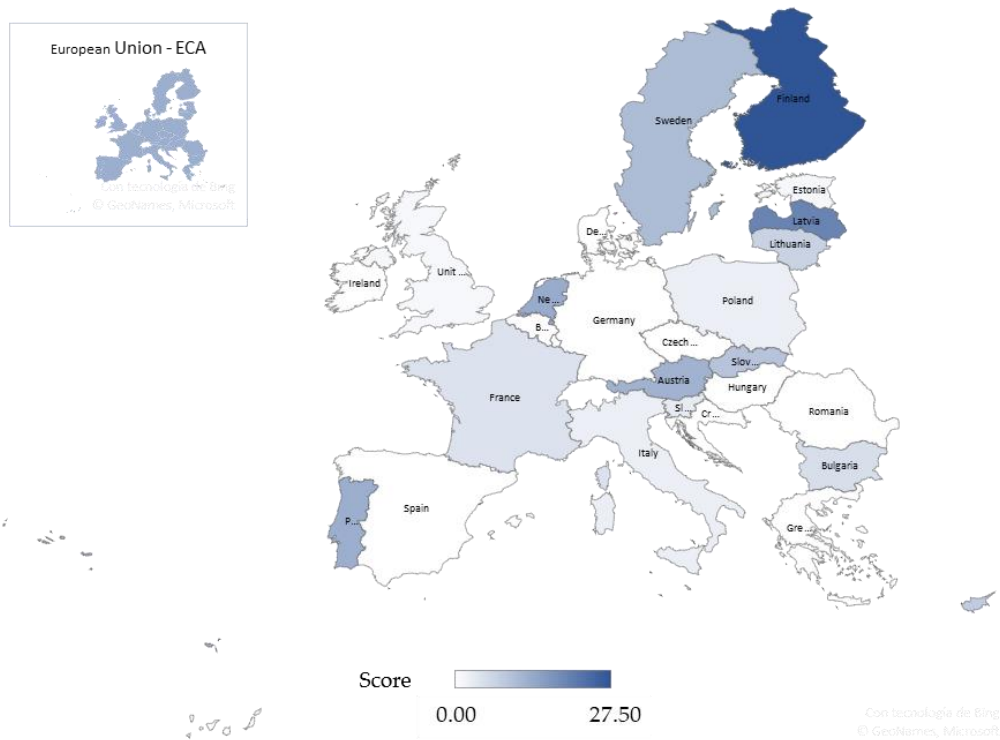


Figure 1. Twitter Engagement of EU Supreme Audit Institutions (SAIs) and the ECA (the Supreme Audit Institution at EU level).

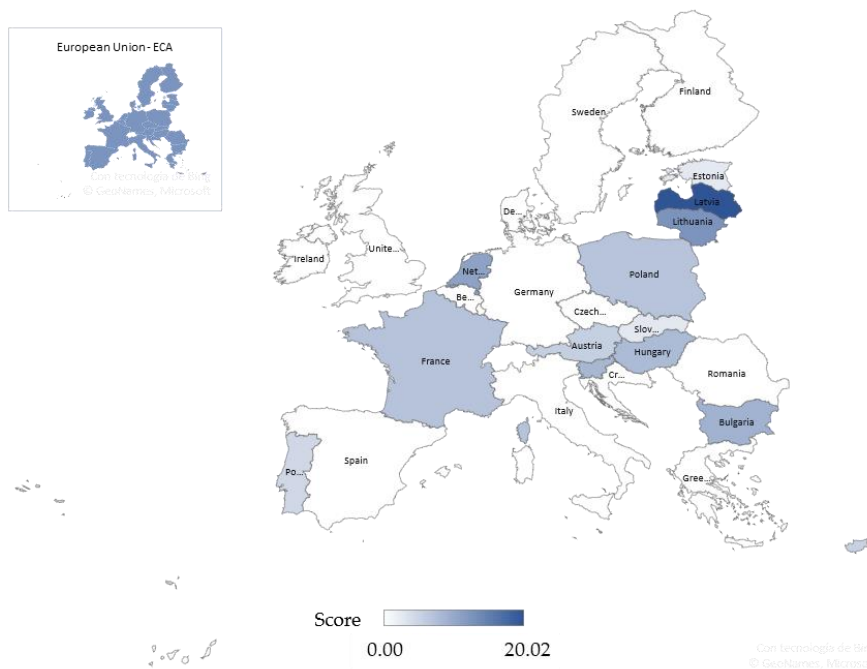


Figure 2. Facebook Engagement of EU SAIs and the ECA.

As per Table 4, results show that SM engagement is significantly related for Twitter to both EGI and OSI and for Facebook to CPI and ODMIE. Engagement on both SM was found significantly related to the EU DESI, the only index for which data was available at EU level, thus for all 94 analysed institutions. At the same time, web traffic was found to be inversely related on a significant level

with the CPI and with OGI, meaning the citizens from countries ranking low on the corruption index (perceived as more corrupt) and on the transparency index (perceived as less transparent) are more actively consulting the websites of their national or regional audit institutions. Given that the audit institutions provide fact-checked information and opinions and are independent of the governments, it makes sense that the stakeholders (citizens, in general) are turning to their websites for truthful and verified information if the government is not transparent and it is perceived as more corrupt.

Table 4. Bivariate analysis for SM engagement scores and Web traffic.

Spearman Correlation	ODI ^a	CPI ^b	OGI ^c	EGI ^b	EPI ^b	OSI ^b	ODMIE ^b	DESI
Twitter Engagement score	0.0228	0.0285	0.0319	0.2923 ***	0.0774	0.2648 *	−0.0336	0.1864 (*)
Facebook Engagement score	−0.0730	−0.2752 **	−0.1249	−0.1100	−0.1148	−0.1089	−0.2409 *	−0.1883 (*)
Total Traffic	0.1060	−0.3518 ***	−0.4257 ***	−0.0284	−0.0764	0.0310	−0.1199	−0.1482

N = 94; ^a *N* = 87; No data for Bulgaria, Croatia, Cyprus, the ECA, Hungary, Malta and Romania; ^b *N* = 93; No data for the ECA; ^c *N* = 86; No data for Cyprus, the ECA, Ireland, Latvia, Lithuania, Luxembourg, Malta and Slovakia; (*) *p* = 0.07; * *p* < 0.05; ** *p* < 0.01; *** *p* < 0.005.

These findings complement [83] on studying social and economic factors related to corruption levels.

It may be therefore concluded that online activity and engagement, both on the web and on SM, for the 94 European audit institutions under analysis is heterogeneous and depends at different levels on some of the factors studied (for instance, corruption, transparency or digital development).

To answer RQ2, regarding the similarity of online engagement of audit institutions, hierarchical clustering is performed. Nine variables are used, three for Twitter, three for Facebook, and three for the web. For both SM, the variables are Followers (weighted by one million SM active users by country or region), the average number of Posts per month and Engagement Scores. For the web, the variables are the previously mentioned Referring Domains, Total Traffic, and Mobile web. The correlation matrix shows significant correlations between some of the nine variables. Principal Component Analysis is therefore performed on standardised variables to reduce the dimensionality of the data and shows that the two main components explain over 70% of the variance. Hierarchical clustering using Ward linkage is performed after and four clusters are identified among the 94 audit institutions, as per Appendix B, Table A2.

As Figure 3 shows, the clusters are coded from 0 to 3. Those belonging to cluster 3 are the institutions that promote their activities through SM the most and to 0 the ones who do it the least. The four clusters are presenting obvious differences; therefore, it may be concluded that audit institutions use SM and Web 2.0 in very different manners to promote their activity and to engage their stakeholders. Of the audit institutions, 84% belong to the lowest cluster 0. The institutions belonging to this cluster do not generally use SM or if they do, they have very little activity on it, a small number of followers and they seldomly post, which leads to very low online engagement with their stakeholders. Bulgaria is an interesting case in this cluster. While Bulgaria's NAO is among the audit institutions with a higher SM and Web 2.0 adoption [12], its engagement data is rather disappointing in the sense that in spite of a high number of online tools adopted, the use of these tools is not intensive, leading to very low engagement levels both on SM and on the web, with a very low impact of the strategy of promotion of their audit services and work outputs. It is also noteworthy that all RAIs, except Audit Scotland in cluster 1, belong to the lowest active cluster. Only two institutions—the ECA and Latvia—belong to the highest cluster 3, so they are clearly differentiated and ahead from the rest. This confirms the previous analysis of individual variables where it was observed that they were among those presenting the highest activity both on SM and on the web. The finding about Latvia, whose position is coincidental

with the cluster distribution in [12], is however surprising given the low classification of the country in all indexes previously used for bivariate analysis (see Table 3). It may be thus interpreted that Latvian public auditors are generally keener to promote online their activity than the rest of the country's public administration. Furthermore, the ECA is very active in posting and engaging its followers on SM and on the web. Content and web analysis show that they update content frequently and often post links to reports on their SM, which may help engage followers, as well as on certain topics showing a willingness to convey specific messages on these topics. Cluster 2 includes four SAIs, two of which are present only on one of the SM platforms (Italy and UK). However, when analysing individual variables, these two SAIs present an intense activity on Twitter, posting above the average, and are also presenting a high website activity, meaning that their stakeholders make an intensive use of their online content. Although not adopting a high number of online tools as [12] clustering show—it is placed in the lowest activity cluster—, the findings show that Italy makes optimal use of its few adopted online tools. Finally, cluster 1 includes nine institutions, eight SAIs and one RAI. Six of them use both SM platforms but make moderate use of them and present a moderate use of their web services by their stakeholders. Thus, it can be concluded that, while some clusters could be established, online engagement is not only heterogeneous but also and more importantly quite low, especially for RAIs. The analysis also shows that SM activity boosts web activity, which should encourage audit institutions to fully adopt SM channels to improve their service promotion strategy.



Figure 3. Hierarchical clustering for online engagement (SAIs).

4.2. Environmental Engagement (RQ3)

Marketing research must contribute to the global conversation on sustainability and environment and it must do so by providing organisations with results and proposals which may help improve their marketing strategies and actions [84]. As sustainability and more specifically, environment sustainability, becomes more embedded into all the dimensions of life, society is more demanding of public institutions to introduce the sustainability and environmental dimension into their activity [85] and they need to promote this aspect of their activity to their stakeholders. Such is the case for audit institutions. In fact, environmental sustainability and climate change are key audit topics in recent years, as INTOSAI's guidelines show [86]. INTOSAI is pushing audit institutions to monitor the implementation of the United Nations' Sustainable Development Goals by national and regional

public administrations worldwide. Therefore, analysing how audit institutions respond to this challenge is important. Given the public interest on this pressing matter, promoting sustainability and environment-related services by communicating with and engaging stakeholders is essential. Just as important is measuring the stakeholders' engagement on the topic. This would ensure that, by correctly promoting this activity, audit institutions are able to influence related public policy in a positive manner.

Thus, to answer RQ3, environment-related metrics and contents are analysed. From the analysis of Environment-related Tweets and Facebook posts, the ECA is revealed as the institution with most posts on both SM platforms: 735 on Twitter and 243 on Facebook.

Figure 4 shows that the ECA is the institution which promotes the most environmental and sustainability-related content (190 tweets and 84 Facebook posts in 2019 only), with Finland coming second on Twitter, posting three times less frequently than the ECA, and Slovakia coming second on Facebook with 41 posts. What is more eye-catching is that aside from the ECA, most of the audit bodies do not seem to have an appetite for increasing the promotion of sustainability and environment-related messages on SM, as the frequency of post remained constant and low over the years. This is especially obvious for Twitter activity, which makes this observation relevant given that Twitter is the preferred SM channel for activity promotion for these institutions.

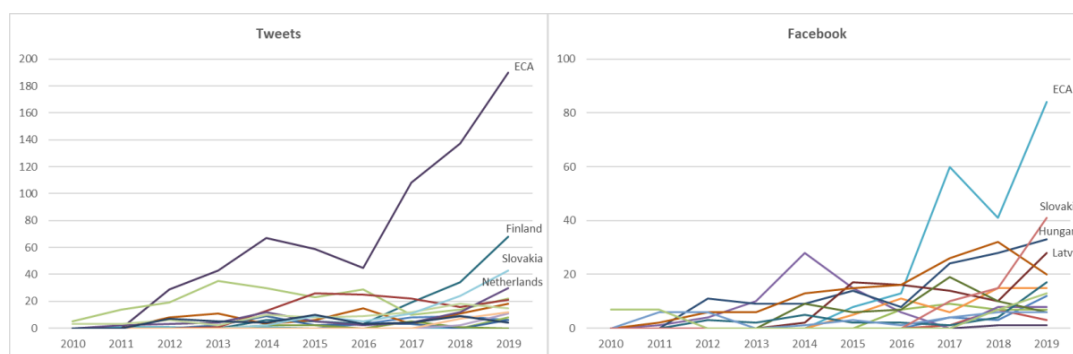


Figure 4. SAI's environment-related social media (SM) Activity (Posts per Year).

As explained below, the evolution of environment-related messages promotion by the audit institutions reflects significant events in the climate change debate. In 2011, the Durban Platform for Enhanced Action was adopted by the signing parties of the United Nations Framework Convention on Climate Change Treaty. Then, in 2015, the Paris Agreement was adopted, followed by the approval of the Paris Agreement Rulebook (the Katowice Rulebook) during the COP 24-Katowice Climate Summit in 2017, which establishes the framework for implementing and supervising the compliance with the Paris Agreement by the signing countries. As the graphs show, while all audit institutions modestly increased the promotion of environment-related messages on SM, the ECA is the only institution which shows a focus on promoting environment and sustainability messages and activities. Furthermore, 43% of ECA's environment-related tweets refer to audit reports—only 9% in the case of the Finland SAI. Likewise, 56% of ECA's environment-related Facebook posts refer to audit reports (followed by Slovakia with 26%). Reports are relevant as they offer objective fact-based conclusions and recommendations (in this case, environment-related reports), and are, therefore, a reliable information source for their stakeholders—citizens and policymakers. By promoting reports on SM, auditors may place themselves as key actors in combating climate change and promoting messages may engage the citizens into actively requesting environment-friendly actions from their authorities. All this may ultimately lead to environment-oriented and sustainable public policies.

Furthermore, correlations between environment-related interactions and total interactions on SM were studied. Table 5 presents various significant links between the different engagement metrics for both SM platforms.

Table 5. Correlations on Environment-related metrics.

Twitter-Spearman Correlation	Total Tweets	Total Retweets	Total Tweet Replies	Total Tweet Favourites	EPI ^a	CCPI
Total Environment-related Tweets	0.009 ***				0.1963	0.3671 *
Total Environment-related Retweets		0.9139 ***			0.3192 (*)	0.4188 *
Total Environment-related Tweet Replies			0.9202 ***		0.3776 *	0.3400 (*)
Total Environment-related Tweet Favourites				0.8781 ***	0.2772	0.3455 (*)
<i>N</i> = 31; ^a <i>N</i> = 30, No data for ECA; (*) <i>p</i> < 0.1; * <i>p</i> < 0.05; *** <i>p</i> < 0.005						
Facebook-Spearman Correlation	Total Facebook Posts	Total Facebook Shares	Total Facebook Comments	Total Facebook Likes	EPI ^b	CCPI ^c
Total Environment-related Facebook Posts	0.8714 ***				−0.3319	0.2044
Total Environment-related Facebook Shares		0.8321 ***			−0.1824	0.4066
Total Environment-related Facebook Comments			0.7413 ***		−0.3018	0.1388
Total Environment-related Facebook Likes				0.9143 ***	−0.4110	0.3890
<i>N</i> = 15; ^b <i>N</i> = 14; No data for ECA; ^c <i>N</i> = 14; No data for Malta; *** <i>p</i> < 0.005						
Twitter-Kruskal-Wallis	% Environmental-Related Retweets/Total Retweets	% Environmental-Related Tweet Replies/Total Tweet Replies		% Environmental-Related Tweet Favourites/Total Tweet Favourites		
% Environmental-related Tweets/Total Tweets.	0.536	8.699 ***		0.020		
Twitter-Kruskal-Wallis	Retweets/Tweet	Replies/Tweet		Favourites/Tweet		
Retweets/Environmental-related Tweet	1.085					
Replies/Environmental-related Tweet		3.913 *				
Favourites/Environmental-related Tweet				0.236		
<i>N</i> = 31; * <i>p</i> < 0.05; *** <i>p</i> < 0.005						

Table 5. Cont.

Facebook-Kruskal-Wallis	% Environmental-Related Shares/TotalShares	% Environmental-Related Comments/Total Comments	% Environmental-Related Likes/Total Likes
% Environmental-related Posts/Total Posts	1.208	0.073	0.021
Facebook-Kruskal-Wallis	Shares/Post	Comments/Post	Likes/Post
Shares/Environmental-related Post	0.362		
Comments/Environmental-related Post		0.269	
Likes/Environmental-related Post			0.021
N = 15			

As Table 5 shows, significant correlations (Spearman's correlation for quantitative variables) were found for both SM platforms. We find that environment-related interactions are related to the general SM activity of the audit institutions—in other words, the more audit institutions post and interact in general, the more they do it on environmental-related issues. Kruskal-Wallis tests (quantitative versus qualitative variables of two or more categories) performed on differences between total interactions and environment-related interactions showed that, in the case of Twitter, total tweets get a higher number of replies (in total and per tweet) than the environmental-related tweets. The other environment-related interactions showed no significant variations when compared to total interactions.

Furthermore, correlations of SM promotion of environment-related messages and activity through environment-related indicators: the Environmental Performance Index (EPI) and the Climate Change Performance Index (CCPI). EPI was created and published jointly, starting in 2006, by the Columbia University's Earth Institute, and the World Economic Forum [87]. It is calculated using 32 performance indicators in 11 categories to assess sustainability in 180 countries. Starting in 2005, the CCPI is produced by Germanwatch, the NewClimate Institute and the Climate Action Network [88]. It measures 57 countries and geographical areas' performance on 14 indicators in four categories: greenhouse gas emissions, renewable energy, energy use and climate policy. Spearman's correlation values show that EPI and CCPI are linked at a significant level only for Twitter, meaning the higher the countries' score on EPI and on CCPI (region, for ECA), the more audit bodies promote environment-related contents on Twitter. No significant correlation was found on Facebook activity.

4.3. The COVID-19 Pandemic (RQ4)

During the current COVID-19 pandemic, the need for auditing the authorities' and states' responses was often stated in the public debate. As public bodies in charge of supervising all aspects of the public sector, audit institutions, by means of performance audits, are the adequate institutions to perform this task. The relevance of this task is also proven by the interest INTOSAI, as SAIs overseeing body, at the international level, takes in surveying SAIs on their promotion strategy regarding COVID-19 related issues [89]. It is thus relevant to analyse whether audit institutions have claimed to have a prominent role in overseeing the states' response in this crisis. To analyse the audit institutions involvement in this worldwide health crisis, this analysis assesses COVID-19-related institutional SM engagement. Given that the pandemic similarly affected all European countries, audit institutions' SM communications are analysed to determine if they communicate with their stakeholders on this topic and how to answer RQ4. Results are presented in Table 6.

Correlations between COVID-related posts and engagement and total SM metrics were studied. Considering that the pandemic affected only the year 2020, correlations were calculated with SM metrics from 2020 SM messages, as Table 6 shows. The bivariate analysis shows that, while pandemic-related posts on both SM platforms are related to the general SM activity metrics, links are stronger when compared only with general SM activity for the year 2020. Furthermore, correlations of SM promotion of pandemic-related messages with a health-related indicator was studied. The index is The Global Health Security (GHS) Index [90]. It assesses health security in 195 countries. The GHS Index is developed by the Nuclear Threat Initiative and the Johns Hopkins Center for Health Security together with The Economist Intelligence Unit and aims to help improve national health systems and the international capacity to address infectious disease outbreaks leading to worldwide epidemics and pandemics. Bivariate analysis showed no link on both SM platforms between this index and the audit institutions' message promotion activity regarding COVID-19 and the pandemic. However, this index may be of interest for future research for assessing public sector response to this and other health crises.

Kruskal-Wallis tests performed on average 2020 interactions and COVID-related interactions showed that, in the case of Twitter, total tweets get a higher number of interactions (per tweet) than the COVID-related tweets. For Facebook, COVID-related interactions showed no significant variations when compared to total interactions.

Table 6. Correlations on COVID-related metrics.

Twitter-Spearman Correlation	Total Tweets	Total 2020 Tweets	Total Retweets	Total 2020 Retweets	Total Tweet Replies	Total 2020 Tweet Replies	Total Tweet Favourites	Total 2020 Tweet Favourites	GHSI ^a
Total COVID-related Tweets	0.6036 ***	0.7821 ***							0.0538
Total COVID-related Retweets			0.6647 ***	0.7326 ***					0.1348
Total COVID-related Tweet Replies					0.6055 ***	0.6913 ***			0.1947
Total COVID-related Tweet Favourites							0.6172 ***	0.6752 ***	0.0542
<i>N</i> = 31; ^a <i>N</i> = 30; No data for ECA									
Facebook-Spearman Correlation	Total Facebook Posts	Total 2020 Facebook Posts	Total Facebook Shares	Total 2020 Facebook Shares	Total Facebook Comments	Total 2020 Facebook Comments	Total Facebook Likes	Total 2020 Facebook Likes	GHSI ^a
Total COVID-related Posts	0.5189 *	0.5637 *							−0.0597
Total COVID-related Shares			0.6806 **	0.8818 ***					−0.0390
Total COVID-related Comments					0.7129 ***	0.7489 ***			−0.1405
Total COVID-related Likes							0.7742 ***	0.8423 ***	−0.0331
<i>N</i> = 15; ^a <i>N</i> = 14; No data for ECA									
Twitter-Kruskal-Wallis	% COVID-Related Retweets/Total 2020 Retweets		% COVID-Related Tweet Replies/Total 2020 Tweet Replies			% COVID-Related Tweet Favourites/Total 2020 Tweet Favourites			
% COVID-related Tweets/Total 2020 Tweets	0.006		3.023 (*)						0.057

Table 6. Cont.

Twitter-Kruskal-Wallis	2020 Retweets/Tweet	2020 Replies/Tweet	2020 Favourites/Tweet
COVID Retweets/COVID-related Tweet	5.364 *		
COVID Replies/COVID-related Tweet		8.008 ***	
COVID Favourites/COVID-related Tweet			6.493 *
<i>N</i> = 31; (*) $p < 0.1$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.005$			
Facebook-Kruskal-Wallis	% COVID-related Shares/Total 2020 Shares	% COVID-related Comments/Total 2020 Comments	% COVID-related Likes/Total 2020 Likes
% COVID-related Posts/Total Posts	1.931	0.110	0.028
Facebook-Kruskal-Wallis	2020 Shares/Post	2020 Comments/Post	2020 Likes/Post
COVID-related Shares/COVID-related Post	0.589		
COVID-related Comments/COVID-related Post		0.468	
COVID-related Likes/COVID-related Post			0.337
<i>N</i> = 15			

While the analysis shows that the audit institutions did not put special emphasis on promoting pandemic-related messages on SM, it may be still too early to reach conclusions. Content analysis research should be conducted in the future to analyse not only “if” but “how” audit institutions have communicated on this matter.

5. Conclusions

Despite being a service provider, and therefore serving citizens as customers, audit institutions do not seem to be focused on promoting their services and activity. According to our findings, they make an uneven use of online tools—SM and the web—for these purposes. However, as they develop an activity whose outputs are based on evidence and facts, they should be expected to be more customer-oriented and claim a more prominent role in promoting messages to society on sensitive topics such as environmental issues or the current pandemic by making more consistent use of online tools.

As opposed to the private sector services, where SM are already heavily used [81], SM are evidently underused by audit institutions as public service providers, both on general and on specific topics as revealed by this analysis. Regional patterns across Europe were difficult to establish. The results show that most of the audit bodies do not appear to have a well-defined online communication strategy on SM. This situation leads to a very low engagement with its stakeholders, therefore diminishing the audit institutions’ capacity of promoting messages on their strategy, services, and work outputs. This low engagement does not benefit a strong co-creation with citizens as public actors in the value creation process.

The analysis could only determine one relevant point on strategy promotion from one audit institution, that is the ECA’s strategy on Environment and Sustainability. ECA’s metrics show that promoting environment and sustainability-related messages and audit services—reports—has a positive influence on stakeholders engagement with the institution’s SM channels, which may be interpreted as an endorsement or confirmation of the legitimacy theory [42], where institutions take actions in pressing matters for the citizens to reaffirm their existence and justify their continuity. It also confirms institutional isomorphism [32], with the ECA joining other relevant European and international institutions—the European Commission, the European Parliament, the United Nations in their discourse and policy development on climate. It must be again underlined that audit institutions may decisively influence sustainability and environment-related public policies through their audit conclusions and recommendations. They should therefore not only incorporate sustainability and environment-related topics to their services but should also make these a key part of their promotion strategy. It would attract more stakeholders to their SM platforms and webs, which would also help these institutions to strengthen their position as key players in influencing policymaking, thus legitimizing their activity and existence. This is also the case for the online promotion of COVID-19 related activities. Audit institutions could be important actors in evaluating national health and welfare systems and also the response of the public administration to the COVID-19 pandemic through performance audits. As such, they should take the stage by promoting to their stakeholders the role audit institutions could play and the services they are performing on this topic and also by presenting directly to the public the results of their work on this important pressing issue.

Furthermore, regarding online tools usage, the analysis indicates that Twitter is the preferred SM platform, which is coincidental with findings related to the private audit sector [91] or to other institutions from the public administration [13,71], although not in all cases [92]. This is still surprising considering that at EU level (including the UK), Facebook and Twitter have an aggregated number of more than 296 million users, out of which some 80% (240 million) are Facebook users and some 20% (56 million) are Twitter users. Thus, most audit institutions are not seemingly maximizing the use of SM for promoting their activity and services. These institutions should focus more on using Facebook as their prevalent SM tool as it gives access to a much larger audience which could engage and help audit institutions become better known by the general public. At the same time, age is a key factor

in the consumption of SM contents. Previous research shows that younger people are more prone to use and engage in SM [93]. This is yet another reason for audit institutions to adapt their promotion strategies and turn to SM as a key element of their communication strategy.

Furthermore, website traffic was found to be influenced by the presence of SM. Therefore, audit institutions should adopt a unified online strategy by incorporating SM into their promotion tools, which would positively influence the size of their website audience. This is important because SM allows for limited content, as opposed to the website which allows for extensive content. Thus, by establishing a SM presence, all audit institutions could attract their stakeholders' attention to certain matters of interest in specific policy areas, an interest which could be further cultivated with extensive and detailed content about their services and work outputs on their website, through links on their SM platforms. Not being present on SM limits that option, as access to the website may be made only by a conscious decision of the user which goes specifically to the website to look for information or who is directed to that information through indirect channels such as online news outlets or other institutions.

This research also reveals great disparity in online service promotion strategies between national and regional institutions, with the latter lagging way behind the former. This is in line with previous research [12,92,94]. The use of SM as a marketing tool for promoting services and messages is relatively inexpensive [95,96] although effective in value co-creation [97]. However, strategy and knowledge are needed to obtain the desired results. It may be therefore desirable for audit institutions to study their target audiences and their preferred means of communication and then concentrate their efforts in promoting their services and the outputs of their work by deploying communication techniques closer to the average citizen and by choosing topics closer to their stakeholders' interests. A good example of this is the newly inaugurated communication strategy of the Welsh RAI on Twitter.

This article makes two main research contributions. First, on the theoretical side, it proposes a model for measuring engagement on SM and on Web 2.0 which allows for comparisons among institutions or organisations both on the public and the private sector. Second, on the practical side, it offers guidelines for audit institutions to improve their marketing and promotion strategies without having to dedicate relevant resources to the task. This would benefit the citizens and thus increase their trust in public institutions, which would further benefit all actors involved: better public service for citizens, more awareness and improved legitimacy for these public institutions.

This research has limitations and offers future avenues for research. Regarding the limitations, content analysis was limited to identifying environment/sustainability and pandemic-related posts and was conducted only on SM, not on the websites. As for future research opportunities, the proposed model could be applied to audit institutions from other geographical areas or to other bodies in the public administration. This would allow for cross-sectorial and cross-geographic comparative analysis. Future researchers may study SM followers' profiles and interactions—replies or comments—content to apply sentiment analysis on how the topics promoted by the audit institutions are perceived by their stakeholders and thus assess stakeholders trust in the institutions. Furthermore, research may be conducted in studying promotion of audit services on specific areas of government such as the health systems, infrastructure or tourism, to analyse how audit institutions promote to the citizens the results of their work on performance audits of the health strategies or infrastructure plans implementation at a national level or of tourism promotion at a local level. Also, further studies may attempt to identify social, cultural, and economic factors determining the communication and marketing strategies of audit institutions.

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Appendix A. Web and SM Data Descriptive Statistics

Table A1. Web and SM Data Descriptive Statistics.

Panel A1							
TWITTER (N = 31)	Min.	Max.	Mean	Std Dev	25%	50%	75%
Followers	104	132,065	9369.68	27,334.22	305.50	559.00	3626.00
Total Tweets	18	5466	1107.55	1453.61	110.50	443.00	1502.50
Total 2020 Tweets	0	1102	118.42	205.30	19.50	61.00	133.50
Total Environment-related Tweets	0	735	65.03	135.18	7.00	20.00	71.50
Total COVID-related Tweets	0	265	13.71	47.41	0	2.00	7.00
Total Retweets	18	34,661	3270.87	6836.99	155.50	460.00	3212.00
Total 2020 Retweets	0	2633	393.39	655.25	19.00	95.00	432.00
Total Environment-related Retweets	0	2277	208.29	473.47	5.00	21.00	139.00
Total COVID-related Retweets	0	554	43.87	111.84	0.00	1.00	17.00
Total Tweet Replies	4	2614	368.55	651.85	15.00	54.00	325.50
Total 2020 Tweet Replies	0	373	53.58	95.78	1.50	18.00	52.50
Total Environment-related Tweet Replies	0	291	22.71	55.34	0	2.00	15.00
Total COVID-related Tweet Replies	0	137	7.39	25.96	0	0	2.00
Total Tweet Favourites	17	17,831	3088.55	4571.72	233.00	607.00	4396.00
Total 2020 Tweet Favourites	0	5295	648.48	1116.51	47.50	218.00	582.00
Total Environment-related Tweet Favourites	0	2209	199.29	422.30	7.00	34.00	180.00
Total COVID-related Tweet Favourites	0	548	56.58	120.07	0.00	5.00	41.50
Report-related Environment Tweets	0	315	20.65	57.59	1.50	4.00	13.00
Retweets/Tweet	0.1084	170.074	21.826	29.488	0.9073	15.127	24.322
Replies/Tweet	0.0108	12.826	0.2778	0.2917	0.0894	0.2320	0.3198
Favourites/Tweet	0.5133	96.153	28.479	25.437	13.234	15.598	31.654
Retweets/2020 Tweets	0	0.2519	0.0565	0.0729	0.0032	0.0150	0.0842
Replies/2020 Tweets	0	0.5579	0.1488	0.1435	0.0407	0.1005	0.2448
Favourites/2020 Tweets	0.0003	0.1646	0.0187	0.0333	0.0011	0.0053	0.0247
Retweets/Environmental-related Tweet	0	148.023	19.377	27.586	0.5357	11.000	23.546
Replies/Environmental-related Tweet	0	11.163	0.1974	0.2666	0	0.0870	0.3940
Panel A2							
FACEBOOK (N = 15)	Min.	Max.	Mean	Std Dev	25%	50%	75%
Followers	211	10,681	3521.80	3221.63	949.50	2975.00	4257.50
Total Facebook Posts	132	2337	822.47	628.35	339.00	736.00	1132.50
Total 2020 Facebook Posts	11	140	68.00	39.96	40.50	67.00	90.50
Total Environment-related Facebook Posts	2	243	75.20	64.33	33.50	60.00	93.50
Total COVID-related Facebook Posts	0	15	4.93	4.51	1.50	4.00	8.00

Table A1. Cont.

Total Facebook Post Shares	26	4787	1343.93	1538.12	291.00	506.00	1890.50
Total 2020 Facebook Post Shares	0	470	132.00	153.71	16.00	50.00	224.00
Total Environment-related Facebook Post Shares	0	801	181.40	270.45	31.00	48.00	147.50
Total COVID-related Facebook Post Shares	0	102	14.20	27.17	0.00	0.00	12.50
Total Facebook Post Comments	9	1677	467.07	504.96	150.50	319.00	583.50
Total 2020 Facebook Post Comments	0	184	36.20	49.29	5.00	17.00	40.00
Total Environment-related Facebook Post Comments	0	172	45.27	57.37	5.00	18.00	69.00
Total COVID-related Facebook Post Comments	0	16	2.60	3.98	0.00	2.00	3.00
Total Facebook Post Likes	399	39,711	10,207.53	10,769.88	2863.00	5560.00	14,515.50
Total 2020 Facebook Post Likes	58	8530	1473.20	2184.75	286.50	833.00	1321.50
Total Environment-related Facebook Post Likes	20	7969	1208.27	1981.72	230.00	674.00	1275.50
Total COVID-related Facebook Post Likes	0	308	99.87	114.03	15.50	35.00	181.50
Report-related Environment Posts	0	136	20.27	33.07	6.50	14.00	19.00
Shares/Post	0.1757	7.1034	1.6506	1.8855	0.5974	0.7731	1.6854
Comments/Post	0.0271	2.5776	0.6478	0.6937	0.2111	0.4476	0.8838
Likes/Post	1.2018	29.6442	13.4343	9.7012	6.5593	9.3561	21.5418
Shares/2020 Facebook Post	0	7.0149	1.9744	2.3413	0.2999	0.8687	2.7864
Comments/2020 Facebook Post	0	2.7463	0.5884	0.7611	0.0654	0.3696	0.7172
Likes/2020 Facebook Post	2.41	61.3669	19.3454	16.4316	5.5749	20.1558	23.7391
Shares/Environmental-related Post	0	9.4167	1.9294	2.3936	0.7685	1.1667	1.7208
Comments/Environmental-related Post	0	1.6167	0.5338	0.5027	0.0981	0.2687	0.9660
Likes/Environmental-related Post	1.75	32.7942	13.6736	9.2442	7.1658	12.4490	20.7613
Shares/COVID-related Post	0	17.0000	2.8498	4.9431	0	0	2.9375
Comments/COVID-related Post	0	3.0000	0.5921	0.9376	0	0.3333	0.5000
Likes/COVID-related Post	0	49.6667	16.3736	14.8235	3.0333	16.2727	24.0000
Panel A3							
WEB (N = 94)	Min.	Max.	Mean	Std Dev	25%	50%	75%
Referring Domains	30	24,440	1357.37	3462.21	114.75	237	883.5
Total Organic Traffic	0	34,788	1952.35	5778.19	62.25	264	1125.5
Mobile Web	0	1	0.86	0.35	1	1	1
Panel A4							
Engagement Scores	Min.	Max.	Mean	Std Dev	25%	50%	75%
Twitter Engagement Score (N = 31)	1.13	27.50	9.28	7.13	3.86	7.56	12.88
Facebook Engagement Score (N = 15)	2.47	20.02	8.12	4.38	5.43	7.70	9.85

Appendix B. European Audit Institutions Clusters on Web and SM Activity and Engagement

Table A2. European Audit Institutions Clusters on Web and SM Activity and Engagement.

Country	Region/Institution	Type	Website	Twitter	Facebook	Cluster
EU	European Court of Auditors	SAI	www.eca.europa.eu	@EUauditors	@EUauditors	3
Latvia	Valsts Kontrole	SAI	www.lrvk.gov.lv	@vkontrolē	@Vkontrolē	3
France	Cour des Comptes	SAI	www.ccomptes.fr	@Courdescomptes	@ccomptes	2
Italy	Corte dei Conti	SAI	www.corteconti.it	@CorteContiPress		2
Poland	Najwyższa Izba Kontroli	SAI	www.nik.gov.pl	@nikgovpl	@NIKgovPL	2
UK	National Audit Office	SAI	www.nao.org.uk	@NAOorguk		2
Austria	Rechnungshof Österreich	SAI	www.rechnungshof.gv.at	@RHSprecher	@RechnungshofAT	1
Cyprus	Audit Office of the Republic of Cyprus	SAI	www.audit.gov.cy	@Audit_Office_Cy	@1506654692971677	1
Estonia	Riigikontroll	SAI	www.riigikontroll.ee	@riigikontroll	@riigikontroll	1
Finland	Valtiontalouden Tarkastusvirasto	SAI	www.vtv.fi	@vtv_fi		1
Hungary	Állami Számvevőszék	SAI	asz.hu/		@penzugyiszemle	1
Lithuania	Valstybės kontrolė	SAI	www.vkontrolė.lt	@LithuaniaSAI	@valstybeskontrolė	1
Netherlands	Algemene Rekenkamer	SAI	www.rekenkamer.nl	@rekenkamer	@rekenkamer	1
Slovakia	Najvyšší kontrolný úrad	SAI	www.nku.gov.sk	@NKUSR	@nkusr	1
UK	Audit Scotland	RAI	www.audit-scotland.gov.uk	@auditscotland		1
Austria	Burgenländischer Landesrechnungshof	RAI	www.blrh.at			0
Austria	Kärntner Landesrechnungshof	RAI	www.lrh-ktn.at			0
Austria	Landesrechnungshof Tirol	RAI	www.tirol.gv.at/landtag/landesrechnungshof			0
Austria	Landesrechnungshof Vorarlberg	RAI	www.lrh-v.at			0

Table A2. Cont.

Country	Region/Institution	Type	Website	Twitter	Facebook	Cluster
Austria	Niederösterreichischer Landesrechnungshof	RAI	www.lrh-noe.at			0
Austria	Oberösterreichischer Landesrechnungshof	RAI	www.lrh-ooe.at			0
Austria	Salzburger Landesrechnungshof	RAI	www.salzburg.gv.at/pol/lt-rechnungshof			0
Austria	Stadtrechnungshof Wien	RAI	www.stadtrechnungshof.wien.at			0
Austria	Steiermärkischer Landesrechnungshof	RAI	www.landesrechnungshof.steiermark.at			0
Belgium	Rekenhof Cour des Comptes Rechnungshof	SAI	www.courdescomptes.be			0
Bulgaria	Сметна палата на Република България	SAI	www.bulnao.government.bg	@bnao1880	@bnao1880	0
Croatia	State Audit Office	SAI	www.revizija.hr			0
Czech Republic	Nejvyšší kontrolní úřad	SAI	www.nku.cz			0
Denmark	Rigsrevisionen	SAI	uk.rigsrevisionen.dk			0
France	Ile de France	RAI	www.ccomptes.fr/fr/crc-ile-de-france	@crcidf		0
France	Provence Alpes Cote d'Azur	RAI	www.ccomptes.fr/fr/crc-provence-alpes-cote-dazur	@crcpaca		0
Germany	Bayerischer Oberster Rechnungshof	RAI	www.orh.bayern.de			0
Germany	Bundes Rechnungshof	SAI	www.bundesrechnungshof.de			0
Germany	Hessischer Rechnungshof	RAI	rechnungshof.hessen.de	@RH_Hessen		0
Germany	Landesrechnungshof Brandenburg	RAI	www.lrh-brandenburg.de			0
Germany	Landesrechnungshof Mecklenburg Vorpommern	RAI	www.lrh-mv.de			0

Table A2. Cont.

Country	Region/Institution	Type	Website	Twitter	Facebook	Cluster
Germany	Landesrechnungshof Nordrhein Westfalen	RAI	www.lrh.nrw.de/			0
Germany	Landesrechnungshof Sachsen Anhalt	RAI	lrh.sachsen-anhalt.de			0
Germany	Landesrechnungshof Schleswig Holstein	RAI	www.landesrechnungshof-sh.de			0
Germany	Niedersächsischer Landesrechnungshof	RAI	www.lrh.niedersachsen.de			0
Germany	Rechnungshof Baden Württemberg	RAI	www.rechnungshof.baden-wuerttemberg.de			0
Germany	Rechnungshof der Freien Hansestadt Bremen	RAI	www.rechnungshof.bremen.de			0
Germany	Rechnungshof der Freien und Hansestadt Hamburg	RAI	www.hamburg.de/rechnungshof			0
Germany	Rechnungshof des Saarlandes	RAI	www.rechnungshof.saarland.de			0
Germany	Rechnungshof Rheinland Pfalz	RAI	www.rechnungshof-rlp.de			0
Germany	Rechnungshof von Berlin	RAI	www.berlin.de/rechnungshof			0
Germany	Sächsischer Rechnungshof	RAI	www.rechnungshof.sachsen.de			0
Germany	Thüringer Rechnungshof	RAI	thueringer-rechnungshof.de			0
Greece	Ελεγκτικό Συνέδριο	SAI	www.elsyn.gr/el			0
Ireland	Office of the Comptroller and Auditor General	SAI	www.audgen.gov.ie			0
Luxembourg	Cour des Comptes	SAI	www.cour-des-comptes.lu			0
Malta	Ufficju Nazzjonali tal Verifika	SAI	nao.gov.mt		@NAOMalta	0

Table A2. Cont.

Country	Region/Institution	Type	Website	Twitter	Facebook	Cluster
Netherlands	Noordelijke Rekenkamer	RAI	www.noordelijkerekenkamer.nl			0
Netherlands	Randstedelijke Rekenkamer	RAI	www.randstedelijke-rekenkamer.nl	@rekenrandstad		0
Netherlands	Rekenkamer Amsterdam	RAI	www.rekenkamer.amsterdam.nl	@rekenkamerma		0
Netherlands	Rekenkamer OostNederland	RAI	rekenkameroost.nl	@rekenkameroost		0
Netherlands	Rekenkamer Rotterdam	RAI	rekenkamer.rotterdam.nl			0
Netherlands	Rekenkamer Zeeland	RAI	www.rekenkamerzeeland.nl	@RekenkamerZld		0
Netherlands	Zuidelijke Rekenkamer	RAI	www.zuidelijkerekenkamer.nl			0
Poland	Regionalna Izba Obrachunkowa w Bydgoszczy	RAI	www.bydgoszcz.rio.gov.pl			0
Poland	Regionalna izba Obrachunkowa w Gdansk	RAI	www.bip.gdansk.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa w Katowicach	RAI	www.katowice.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa w Krakowie	RAI	www.krakow.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa w Łodzi	RAI	www.lodz.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa w Lublinie	RAI	www.lublin.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa w Olsztynie	RAI	www.olsztyn.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa w Poznaniu	RAI	www.poznan.rio.gov.pl			0
Poland	Regionalna izba Obrachunkowa w Rzeszowie	RAI	www.rzeszow.rio.gov.pl			0

Table A2. Cont.

Country	Region/Institution	Type	Website	Twitter	Facebook	Cluster
Poland	Regionalna Izba Obrachunkowa w Szczecinie	RAI	www.szczecin.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa w Warszawie	RAI	bip.warszawa.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa w Zielonej Górze	RAI	www.zielonagora.rio.gov.pl			0
Poland	Regionalna Izba Obrachunkowa we Wrocławiu	RAI	bip.wroclaw.rio.gov.pl			0
Poland	Regionalna izby Obrachunkowej w Kielcach	RAI	bip.kielce.rio.gov.pl			0
Poland	Regionalnej Izby Obrachunkowej w Białymstoku	RAI	bialystok.rio.gov.pl			0
Poland	Regionalnej Izby Obrachunkowej w Opolu	RAI	rio.opole.pl			0
Portugal	Tribunal de Contas	SAI	www.tcontas.pt	@tribunalcontas	@TribunaldeContasdePortugal	0
Romania	Curtea de Conturi a României	SAI	www.curteadeconturi.ro			0
Slovenia	Računsko Sodišče Republike Slovenije	SAI	www.rs-rs.si	@racunskosodisce	@racunskosodisce	0
Spain	Audiencia de Cuentas de Canarias	RAI	www.acuentascanarias.org			0
Spain	Cámara de Comptos de Navarra	RAI	camaradecomptos.navarra.es	@camaradecomptos		0
Spain	Cámara de Cuentas de Andalucía	RAI	www.ccuentas.es	@CamaraCuentas		0
Spain	Cámara de Cuentas de Aragón	RAI	www.camaracuentasaragon.es	@cuentasdearagon		0
Spain	Cámara de Cuentas de la Comunidad de Madrid	RAI	www.camaradecuentasmadrid.org			0
Spain	Consejo de Cuentas de Castilla y León	RAI	www.consejodecuentas.es			0
Spain	Consello de Contas de Galicia	RAI	www.consellodecontas.es			0

Table A2. Cont.

Country	Region/Institution	Type	Website	Twitter	Facebook	Cluster
Spain	Sindicatura de Comptes de Catalunya	RAI	www.sindicatura.org	@sindicaturacat		0
Spain	Sindicatura de Comptes de la Comunitat Valenciana	RAI	www.sindicom.gva.es			0
Spain	Sindicatura de Comptes de les Illes Balears	RAI	www.sindicaturaib.org			0
Spain	Sindicatura de Cuentas del Principado de Asturias	RAI	www.sindicatur.es			0
Spain	Tribunal de Cuentas de España	SAI	www.tcu.es			0
Spain	Tribunal Vasco de Cuentas Públicas	RAI	tvcv.eus/			0
Sweden	Riksrevisionen	SAI	www.riksrevisionen.se	@riksrevisionen		0
UK	Northern Ireland Audit Office	RAI	www.niauditoffice.gov.uk	@niauditoffice		0
UK	Audit Wales	RAI	www.audit.wales	@WalesAudit		0

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