Social Media in times of change: a three-period analysis of sentiment and engagement on the romanian ministry of education's online presence

Tănase Tasențe
Ovidius University of Constanța, Faculty of Law and Administrative Sciences, Romania ✉ ⓘ

Mihaela Rus
Ovidius University of Constanța, Faculty of Law and Administrative Sciences, Romania ✉ ⓘ

Mari-Isabella Stan
University of Constanța, Faculty of Law and Administrative Sciences, Romania ✉ ⓘ

Mihaela Luminița Sandu
Ovidius University of Constanța, Faculty of Psychology and Education Sciences, Romania ✉ ⓘ

ENG **Abstract: Introduction:** This research investigates the role of social media in institutional communication, with a focus on its effectiveness in engaging stakeholders within the educational sector. It analyzes the impact of digital transformation on public institutions, focusing on how governments' strategic communication during the COVID-19 pandemic, the adoption of digital platforms, and Facebook's role in Romanian public administration demonstrate social media's capabilities. It highlights the effectiveness of social media in spreading information, engaging public sentiment, and enhancing communication strategies during crises. Additionally, it addresses the challenges of combating misinformation and underscores the importance of developing tailored communication strategies. **Methodology:** The study investigates the engagement of the Romanian Ministry of Education on social media, especially Facebook, during the pre-pandemic, pandemic, and post-pandemic periods. It aims to discern shifts in communication strategies and public engagement by analyzing posting frequency, engagement rates, sentiment analysis, and reaction types, employing tools like Fanpagekarma and RStudio for data collection and analysis. **Results:** The analysis indicates an uptick in post frequency by the Ministry of Education during the pandemic, with sentiment analysis revealing a consistently positive tone. This suggests a strategic shift towards more optimistic messaging. Engagement rates showed considerable variation pre-pandemic but stabilized during and after the pandemic, indicating effective content resonance with the audience. **Conclusions:** The study underscores the significant role of social media in crisis communication, evidenced by increased engagement and strategic positive messaging. It recommends institutions continue utilizing social media for flexible communication strategies, suggesting that a balance of optimistic messaging with transparent discussions about challenges can boost public trust and engagement, aiding in the development of a well-informed and resilient society.

Keywords: Facebook, social media, institutional communication, education, crisis communication, engagement, sentiment analysis, Covid-19

ES Las redes sociales en tiempos de cambio: un análisis de tres periodos del sentimiento y el compromiso sobre la presencia en línea del Ministerio de Educación rumano

Resumen: Introducción: Esta investigación investiga el papel de las redes sociales en la comunicación institucional, centrándose en su eficacia para involucrar a las partes interesadas dentro del sector educativo. Analiza el impacto de la transformación digital en las instituciones públicas, centrándose en cómo la comunicación estratégica de los gobiernos durante la pandemia de COVID-19, la adopción de plataformas digitales y el papel de Facebook en la administración pública rumana demuestran las capacidades de las redes sociales. Destaca la eficacia de las redes sociales para difundir información, captar el sentimiento del público y mejorar las estrategias de comunicación durante las crisis. Además, aborda los desafíos de combatir la desinformación y subraya la importancia de desarrollar estrategias de comunicación personalizadas. **Metodología:** El estudio investiga la participación del Ministerio de Educación rumano en las redes sociales, especialmente Facebook, durante los períodos prepandémico, pandémico y pospandémico. Su objetivo es discernir cambios en las estrategias de comunicación y la participación del público mediante

el análisis de la frecuencia de las publicaciones, las tasas de participación, el análisis de sentimientos y los tipos de reacciones, empleando herramientas como Fanpagekarma y RStudio para la recopilación y el análisis de datos. **Resultados:** El análisis indica un aumento en la frecuencia de publicaciones por parte del Ministerio de Educación durante la pandemia, y el análisis del sentimiento revela un tono consistentemente positivo. Esto sugiere un cambio estratégico hacia mensajes más optimistas. Las tasas de participación mostraron una variación considerable antes de la pandemia, pero se estabilizaron durante y después de la pandemia, lo que indica una resonancia efectiva del contenido con la audiencia. Conclusiones: El estudio subraya el importante papel de las redes sociales en la comunicación de crisis, evidenciado por un mayor compromiso y mensajes estratégicos positivos. Recomienda que las instituciones continúen utilizando las redes sociales para estrategias de comunicación flexibles, lo que sugiere que un equilibrio entre mensajes optimistas y debates transparentes sobre los desafíos puede impulsar la confianza y el compromiso del público, ayudando al desarrollo de una sociedad resiliente y bien informada.
Palabras clave: Facebook; redes sociales; comunicación institucional; educación; comunicación de crisis; engagement; sentiment analysis; Covid-19

1. Introduction

In the contemporary digital environment, social media has emerged as a key channel for institutional communication, significantly impacting the dynamics of interaction between educational entities and their stakeholders. The significance of digital transformation in the educational sector is thoroughly examined in the study by Du et al. (2023), which underscores the necessity for institutions to adapt and innovate through digital means to ensure sustainable growth and competitive advantage.

In the realm of consumer engagement and social media, the work of Micu et al. (2021) delves into the application of neuromarketing techniques in understanding user interactions on social platforms. This approach is essential for institutions looking to leverage social media for better engagement and understanding of public sentiment, especially in the digital economy where consumer data plays a significant role in decision-making processes.

The strategic use of digital communication by ministries of health during the COVID-19 pandemic is critically analysed by Aksak et al. (2023), who highlight the challenges and successes of disseminating vital health information and influencing public behaviour during a global health crisis.

The study by Istrate et al. (2022) focuses on institutional communication in the digital age and analyses the adoption of integrated digital systems by public institutions. It emphasizes the transformative impact of the internet on facilitating interaction and service delivery. The research particularly notes the accelerated digital development prompted by the COVID-19 pandemic, underscoring the emergence of intelligent communication systems as essential components in the public institutional framework.

Lastly, Zeru's (2021) investigation into the use of Facebook in Romanian public administration provides a detailed examination of the factors that influence engagement between authorities and citizens. This study contributes to the understanding of how digital technologies are reshaping government communication, promoting active citizen participation, and impacting the democratic process.

The aim of our research is to develop a thorough comprehension of the role of social media in public institution communication strategy. To achieve this, we will examine engagement and sentiment analysis, as well as the online communication strategy within the Romanian Ministry of Education.

2. Literature review

Social media has become an essential tool for disseminating information, particularly during times of significant change, such as the COVID-19 pandemic. This literature review thoroughly examines how social media aids in exchanging information, engaging with public sentiment, and improving communication tactics during crises. It uncovers recurring themes and strategies used across different fields, such as the educational sector and institutional communication.

When examining how public institutions manage communication and the strategic potential of social media to influence public perceptions, it is important to use communication strategies that are tailored to the specific needs of the community. Studies by Ravenda et al. (2023), and Rivas-de-Roca et al. (2021) emphasize the necessity for interactive digital communication in governmental strategies. Also, the importance of digital diplomacy and crisis management strategies is demonstrated by Tasențe & Stan (2024) and Tasențe

et al. (2023). Their findings reveal the strategic communication techniques used by governments to manage international crises and build public trust through digital platforms.

Researchers such as Ali & Deswals (2023) and Amores et al. (2023) have highlighted the significance of social media platforms like Facebook and X in disseminating information during the pandemic. They suggest that the public increasingly relies on these platforms for updates and preventative measures during crises. Furthermore, the studies highlight a gender disparity in information-seeking behaviour and distinguish between streams of content that focus on political controversies and those that provide information. On the other hand, Arrufat Martin (2021) and Carvache-Franco et al. (2022) explore methods for increasing audience engagement and interaction with Covid-19 related information on social networks. The researches indicate that crisis communication strategies are influenced by the audience's perceived risks and the unique attributes of each social media platform.Additionally, Casalegno et al. (2021) and Castillo-Esparcia et al. (2020) examine the challenges and opportunities of public communication and government messaging during emergencies. The authors' analyses reveal a discrepancy between knowledge and behaviour, resulting from both excessive and insufficient communication. They also examine the tactics used by governments to influence narratives, emphasising the significance of authentic interactions between governments and citizens on social media.

Mendiz-Noguero et al. (2023) and Mori et al. (2021) explore the interrelation between misinformation, digital literacy, and the strategic application of social media. They highlight the challenges posed by the 'infodemic' and the evolving role of platforms such as Facebook in communications by local governments. These studies support the need for improved health literacy and collaborative efforts to counter misinformation, highlighting the essential role of clear and accessible communication in managing public health crises.

The case study conducted by Espino Gonzalez (2022) on public administration's transition to digital platforms during the pandemic exemplifies the adaptability of communication strategies during crises. It highlights the important role of digital platforms in sustaining public engagement and combating misinformation and also emphasizes the transformative effect of crises on communication strategies. Additional case studies demonstrate the diverse effects of social media on communication dynamics during the pandemic. Researches by Farinosi et al. (2022), Kaban & Asci (2022), and Kaur et al. (2021) illustrate how local governments, educators, and political leaders strategically use digital platforms to promote community resilience, improve digital literacy, and disseminate positive public messaging.

In conclusion, this review examines how social media plays a dual role in crisis communication, acting both as a platform for efficiently spreading information and as a source for the proliferation of misinformation. It highlights the increased dependence of government and public organizations on digital platforms, paralleling a strategic shift in communication tactics to better tackle contemporary crises. The interplay between technology and communication strategies emerges as a critical field of study, offering opportunities to enhance community resilience and readiness. A deeper comprehension and meticulous planning empower societies to navigate future crises with greater competence. Adopting this strategy ensures that communities are prepared and proactive in facing challenges, steering clear of the drawbacks associated with insufficient crisis management.

3. Research objectives

The study aims to analyse the sentiment of the discourse from the Ministry of Education in Romania and evaluate the engagement levels of its Facebook followers. The analysis will cover three distinct timeframes: pre-pandemic, during the pandemic, and post-pandemic. This will provide insights into how the Ministry's communication strategies and public engagement have evolved in response to changing circumstances.

Building on the main goal of the study, the research will focus on specific objectives to provide a clear picture of the Ministry of Education in Romania's social media interaction. Initially, the study will look at how often the Ministry posted on Facebook during the pre-pandemic, pandemic, and post-pandemic periods, to see if there were any changes in their posting habits.

Next, the study will measure how engaged the followers were with the page over these periods by looking at the engagement rates. This part of the research would try to understand if the followers interacted more or less with the page during certain times and why that might be.

Then, the research will analyze the sentiment of the comments and reactions to the posts. It aims to find out how the feelings and opinions of the followers might have changed during the different periods studied.

Also, the study will examine the types of reactions (like, love, haha, etc.) to the posts to see if there are any patterns or changes in how people react to different types of content.

Lastly, all these findings will help provide valuable information that the Ministry can use to improve how they communicate on social media. The study will give insights into what works well and what could be changed to make sure the Ministry's messages are effective, especially during important times like the COVID-19 pandemic.

4. Research methods

The study involved the collection and analysis of data regarding user interactions with the Facebook page of the Ministry of Education in Romania. Data collection was conducted using the Fanpagekarma platform, and their analysis was performed in RStudio, utilizing a diverse set of packages for data manipulation and visualization.

In the initial phase, the data were imported into R using the *readxl* package (Wickham, Bryan, et al., 2023). After loading, an initial processing step was carried out to classify the posts into three distinct periods:

pre-pandemic (from August 9, 2016 to March 10, 2020), pandemic (from March 11, 2020, to March 7, 2022), and post-pandemic (from March 8, 2022 to November 27, 2023). This categorization was accomplished using the 'mutate' and 'case_when' functions from the *dplyr* package (Wickham, François, et al., 2023), based on the date associated with each post. Subsequently, a descriptive analysis of the distribution of posts across these periods was performed. Using 'group_by' and 'summarise' from *dplyr*, the absolute number of posts and their percentage of the total dataset were calculated for each period.

To analyze the *Engagement Rate* (ER) of the posts, the *ggplot2* (Wickham, Chang, et al., 2023) and *scales* (Wickham, Pedersen, et al., 2023) packages were employed. A scatter plot with a trend line was created, illustrating the ER's evolution over time, color-coded according to the temporal period.

Sentiment analysis was conducted using three methods: *NRC* and *AFINN*, utilizing the *tidytext* (Queiroz et al., 2023) and *SentimentAnalysis* (Proellochs & Feuerriegel, 2023) packages. In all cases, the text of the posts was first cleaned of *stop words* (e.g., "the", "and", "if", "but", "or", "as", "with", "without", "under", "over", "between", etc.), and then sentiment associated with words was extracted.

The analysis of user reactions to posts involved aggregating data for different types of reactions (e.g., "Like," "Love," "Haha"). 'Melt' from *reshape2* (Wickham, 2020) was used to transform the data into an appropriate format, and 'group_by' and 'summarise' from *dplyr* were employed to calculate the total for each reaction type.

By applying this methodology, the study provided a detailed analysis of how interactions on the Facebook page of the Ministry of Education in Romania evolved during different periods, thereby offering a valuable dataset for understanding the impact of different events on user digital behavior.

5. Results

Post Frequency: Pre-pandemic, pandemic, and post-pandemic phases

The data (Table 1) reveals the posting activity of the Ministry of Education in Romania on their official Facebook page, offering insights into their digital communication strategy across different phases of the COVID-19 pandemic.

Table 1. Post frequency

Period	Number of posts	% of posts
Pre-pandemic	829	26.96%
Pandemic	1241	40.37%
Post-pandemic	1004	32.67%
Total	3074	100%

Source: Authors' work

During the pre-pandemic phase, the frequency of posts was notably lower, with 829 posts accounting for approximately 27% of the total. This indicates a standard level of communication, in line with the Ministry's regular operational and informational output.

In contrast, due to the pandemic, there has been a significant increase in the frequency of posts, with the number rising to 1241, which accounts for over 40% of the total. This heightened activity can be attributed to the urgent need for timely and comprehensive communication from educational authorities during this unprecedented crisis. The increase in posting frequency is likely due to efforts to disseminate important information, guidelines, and responses to the rapidly changing educational sector.

The frequency of posts remains high in the post-pandemic period, with 1004 posts accounting for approximately 33% of the total. Although there has been a slight reduction from the pandemic period, the sustained high level of communication may suggest a continued focus on recovery efforts, adaptation to the 'new normal,' and perhaps the implementation of new educational strategies or reforms initiated by the pandemic experience.

Thus, the fluctuating posting frequency underscores the Ministry's adaptive communication strategy in response to the shifting challenges and demands of the pandemic. The data reflects the Ministry's commitment to keeping the public informed during these tumultuous times. It also highlights the impact of the pandemic on governmental communication strategies.

AFINN sentiment analysis distribution: Pre-pandemic, pandemic, and post-pandemic phases

The Ministry of Education's Facebook posts were analysed using the AFINN sentiment analysis tool to gain insight into their communication strategy before, during, and after the pandemic. The AFINN model assigns a score between -5 (very negative) and +5 (very positive) to each word in the text, which are then summed to determine the overall sentiment (Figure 1).

Figure 1. AFINN Sentiment Analysis
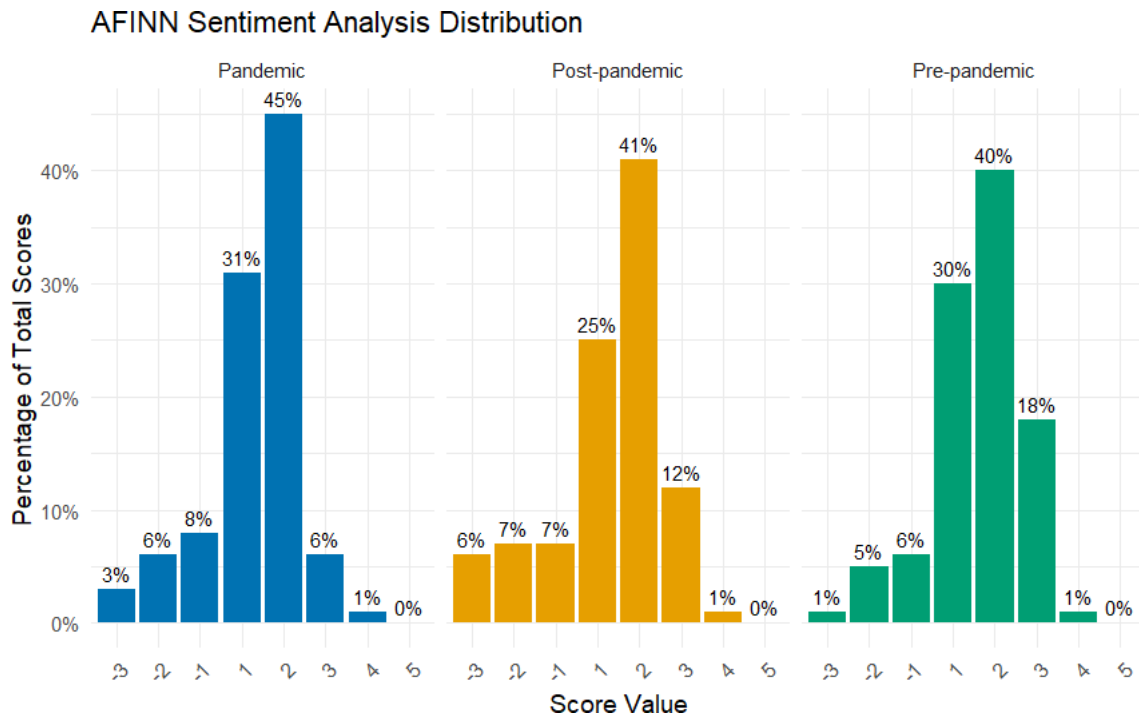
Source: Authors' work

During the pandemic period, the Ministry's communication on Facebook exhibited a predominantly positive sentiment profile. Scores of +2 and +1 accounted for 45% and 31% of the posts, respectively, despite the inherent challenges of the pandemic. This suggests a strategic emphasis on positive messaging, potentially aimed at fostering optimism and resilience within the educational community. The presence of negative sentiments, albeit less frequent, with -1, -2, and -3 making up 8%, 6%, and 3% respectively, could reflect the inevitable challenges and concerns addressed in the Ministry's communication, underscoring a balanced approach in addressing both achievements and obstacles during this tumultuous period.

Transitioning into the post-pandemic period, the sentiment distribution further evolves. Positive sentiments continue to dominate, with +2 and +1 scores representing 41% and 25% of the posts. This consistency in positive messaging may indicate a continued commitment to encouraging and constructive communication. However, there is a noticeable increase in posts with negative sentiment scores (-3, -2, and -1 accounting for 6%, 7%, and 7%, respectively), possibly signifying a more open acknowledgment of the lingering challenges or the complexities of the post-pandemic recovery phase.

In contrast to the pandemic period, the pre-pandemic period was characterized by a sentiment distribution that leaned heavily towards positive scores. Specifically, +2 and +1 represented 40% and 30% respectively. This reflects a period of relative stability and normalcy. The lower frequency of negative sentiments during this period aligns with a typical communication approach that focuses on positive developments and accomplishments within the educational sector.

Overall, the sentiment analysis of these periods demonstrates a dynamic and responsive communication strategy by the Ministry. The gradual shift in sentiment distribution, particularly the nuanced balance of positive and negative tones during the pandemic and post-pandemic periods, highlights the Ministry's adaptive approach in addressing the evolving challenges, achievements, and sentiments within the educational sector. This analysis highlights the Ministry's communication strategy and reflects broader societal and educational sentiments during distinct phases.

NRC sentiment analysis distribution: Pre-pandemic, pandemic, and post-pandemic phases

The NRC (National Research Council) sentiment analysis of the Ministry of Education's Facebook posts provides valuable insights into the emotional nuances of their communication strategy during the pre-pandemic, pandemic, and post-pandemic periods. The analysis considers two primary sentiments, positive and negative, along with eight specific emotions (Figure 2).

During the pre-pandemic period, the Ministry's Facebook posts conveyed a generally optimistic and constructive tone, with positive sentiments accounting for 36% of the total. Negative sentiments were relatively low at 4%, indicating a minimal focus on negative messaging.

When examining specific emotions, the Ministry's communication strategy emphasised 'trust' (27%) and 'anticipation' (13%). This indicates efforts to build trust with the audience and create anticipation for educational initiatives. The presence of 'joy' (9%) and 'surprise' (4%) also contributed positively to the emotional

Figure 2. NRC Sentiment Analysis

Source: Authors' work
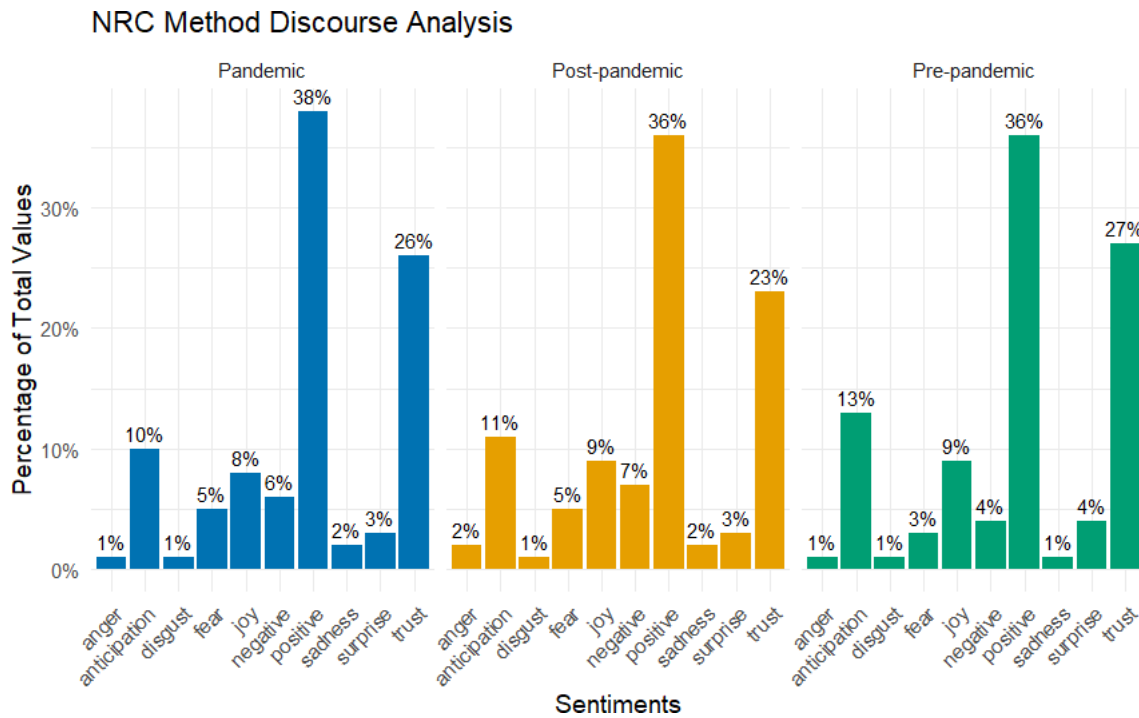
spectrum, suggesting an engaging and upbeat style of communication. Negative emotions such as 'anger' (1%) and 'disgust' (1%) were almost negligible, indicating a lack of strong negative emotions in the posts.

During the pandemic period, the Ministry maintained a positive outlook, with positive sentiment accounting for 38% of their posts. This demonstrates a deliberate effort to convey a sense of hope and positivity during challenging times. Negative sentiment accounted for only 6% of the content, with specific negative emotions such as anger, disgust, and sadness each representing 1-2%. This indicates a balanced approach to addressing challenges without overwhelming the audience with negative content.

The emotion of trust, which accounted for 26% of the content, remained a significant focus, demonstrating the Ministry's commitment to maintaining the trust and confidence of the public during a crisis. "Anticipation" (10%) and "joy" (8%) were used to keep the audience engaged and hopeful, providing a sense of anticipation for better days. Emotions such as "fear" (5%), "surprise" (3%), and "sadness" (2%) were present but not dominant, indicating a measured acknowledgment of the emotional complexities of the pandemic.

Transitioning into the post-pandemic phase, the Ministry's positive sentiment remained consistent at 36%, reflecting their commitment to a positive and constructive tone. Negative sentiment increased slightly to 7%, with specific negative emotions such as 'anger' at 2%, 'disgust' at 1%, and 'sadness' at 2% compared to the pandemic period. This may indicate a more open acknowledgment of post-pandemic challenges and complexities, likely due to the continuation of restrictive measures within the educational sector.

Chronological evolution of sentiment analysis in Facebook posts
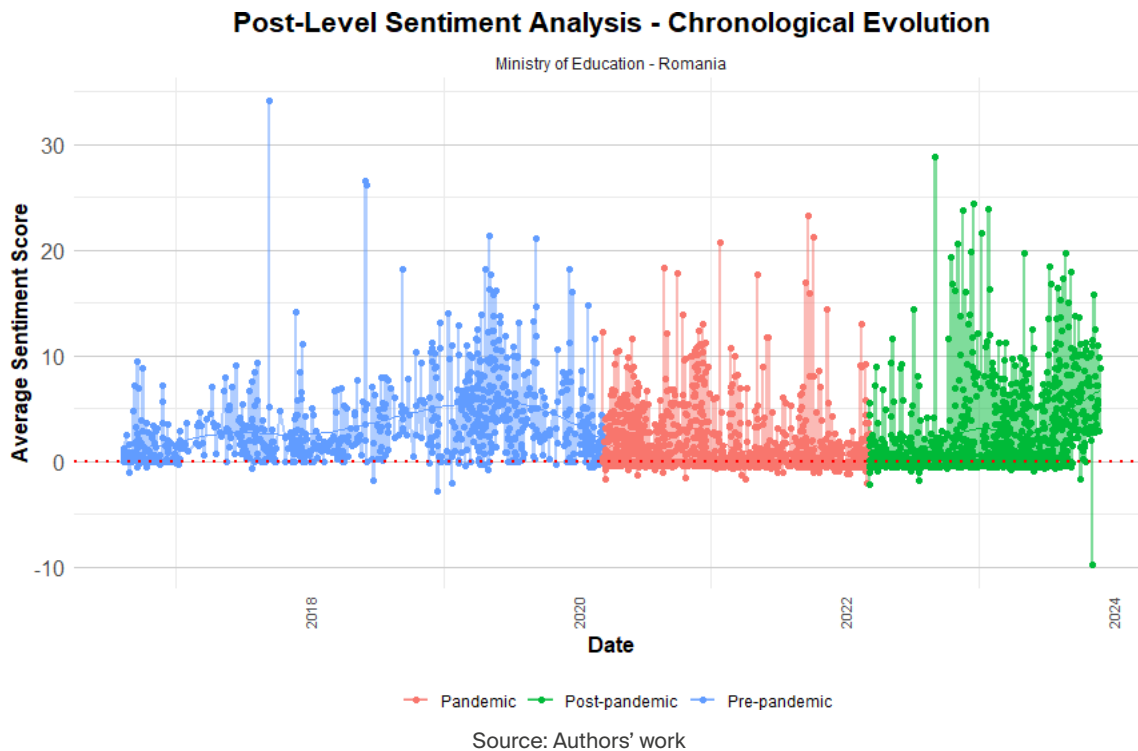
The sentiment analysis of the Romanian Ministry of Education's discourse on Facebook, structured over three temporal segments - pre-pandemic, pandemic, and post-pandemic - presents a quantitative reflection of the tonality embedded within the Ministry's communications (Figure 3).

During the pre-pandemic phase, the Ministry's discourse was marked by a moderately positive sentiment, as indicated by an average sentiment score of 2.6. The breadth of sentiment scores, ranging from -2.85 to 34.1, and a standard deviation of 3.89, points to a discourse that oscillated between neutral to highly positive lexicon usage. The interquartile range with Q1 at 0.85 and Q3 at 5.3 signifies that the Ministry's communications largely veered towards positivity in their linguistic construction.

With the onset of the pandemic, there was a discernible shift towards a more restrained sentiment in the Ministry's communications, evidenced by a lower average sentiment score of 0.55. The range narrowed to -2.1 to 23.3, with a standard deviation of 3.01, reflecting a concentrated use of more sober and measured language. The distribution, with Q1 at 0 and Q3 at 2.45, indicates a strategic shift towards more cautious and possibly less emotive language, likely aiming to convey seriousness and significance in the context of a global crisis.

In the post-pandemic period, the Ministry's communication strategy seems to have adopted a broader lexical range, as the average sentiment score rose to 1.2, featuring a wider spread from -9.8 to 28.8 and the highest standard deviation recorded at 4.11. This suggests a diversification in the emotional tone of the Ministry's messaging, spanning from cautiously optimistic to critically evaluative. The first quartile (Q1) sentiment score at 0.1 and the third quartile (Q3) at 4.45 indicate a heterogeneous mix of messages, encompassing both the challenges of the post-pandemic recovery and the strides made in education during this period.

Figure 3. Chronological evolution of sentiment analysis in Facebook posts

Source: Authors' work

The sentiment analysis of the Ministry's communications on Facebook reveals a deliberate shift in linguistic strategy, mirroring changes in the social and global environment. This variation in sentiment scores through three different phases—stability, crisis, and recovery—underscores the Ministry's attunement to the public's shifting moods and necessities. It evidences a nuanced approach to engagement with the populace, marking a blend of responsiveness and strategic communication adaptability in diverse circumstances.

Engagement rate trend: Pre-pandemic, pandemic, and post-pandemic phases

The analysis of engagement rates for the Ministry of Education's Facebook posts during the pre-pandemic, pandemic, and post-pandemic periods provide valuable insights into how the audience responded to their content. Engagement rates are calculated as a percentage of reactions (likes, comments, shares) relative to the total number of followers (Figure 4).

During the pre-pandemic period, the Ministry's Facebook posts exhibited a wide range of engagement rates, with a minimum of 0.0021% and a maximum of 22.65%. The average engagement rate during this period was approximately 0.573%, with a standard deviation of 1.276.

These figures indicate that the Ministry's engagement rates varied significantly, with some posts generating relatively high levels of interaction from their audience. The range of engagement rates varied during the pre-pandemic phase, indicating differing levels of interest and response from followers. The higher standard deviation also suggests greater variability in engagement across posts.

In contrast, during the pandemic period, engagement rates showed a narrower range, with a minimum of 0.0011% and a maximum of 7.773%. During the pandemic phase, the Ministry's posts received a consistently higher level of engagement compared to the pre-pandemic period, with an average engagement rate of approximately 0.283% and a standard deviation of 0.545. Although there was still some variability in engagement rates, it was less pronounced. The consistent response from the audience during the pandemic could be attributed to the increased focus on critical pandemic-related information and communication.

During the post-pandemic period, engagement rates remained within a narrower range, ranging from 0.0006% to 2.152%. The average engagement rate during this period was approximately 0.103%, with a standard deviation of 0.214.

As in the pandemic period, the post-pandemic phase showed a narrower range and lower standard deviation in engagement rates, indicating a more consistent level of interaction with the Ministry's content. It is suggested that relevant and engaging communication should remain a continued focus even as the pandemic's immediate impact wanes.

The analysis indicates that the Ministry's Facebook posts had varying levels of audience interaction across different phases. The period before the pandemic had the widest range and highest standard deviation, indicating greater variability in engagement. However, in the pandemic and post-pandemic periods, engagement rates remained consistent. This may reflect a more focused and responsive communication strategy during times of crisis and recovery.

Figure 4. Engagement rate trend
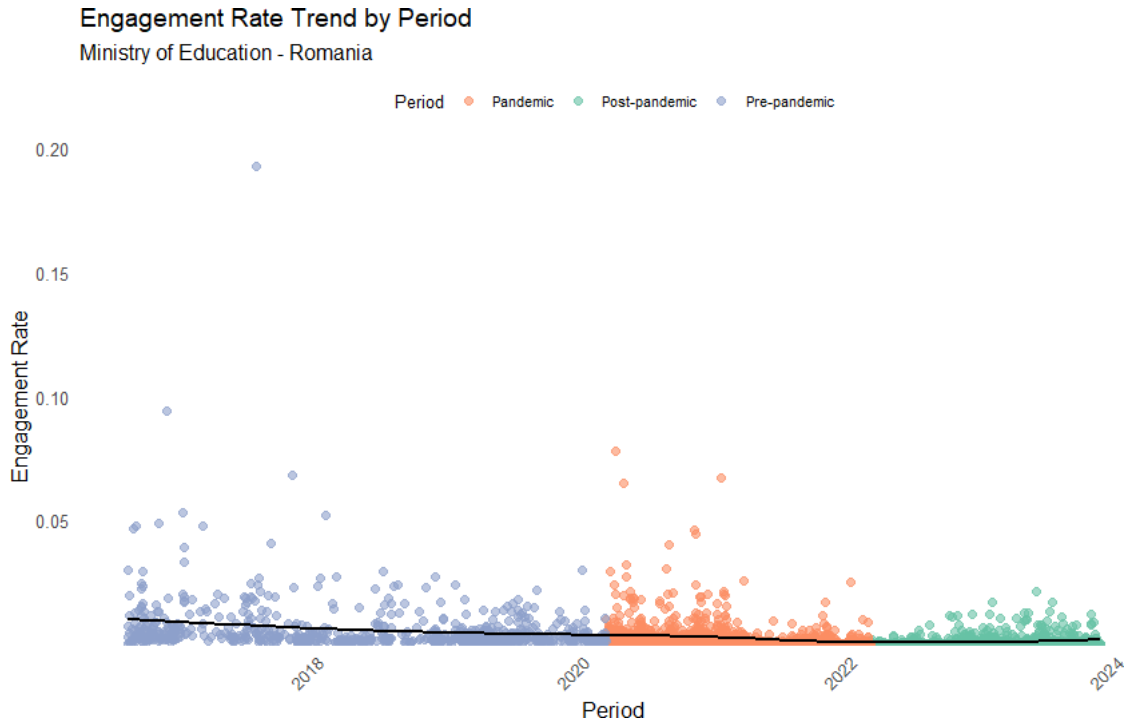
Source: Authors' work

Reactions type: Pre-pandemic, pandemic, and post-pandemic phases

Examining the variety of reactions to the Ministry of Education's Facebook posts across pre-pandemic, pandemic, and post-pandemic periods provide significant insights into audience engagement with their content (Figure 5).

Figure 5. Reactions type
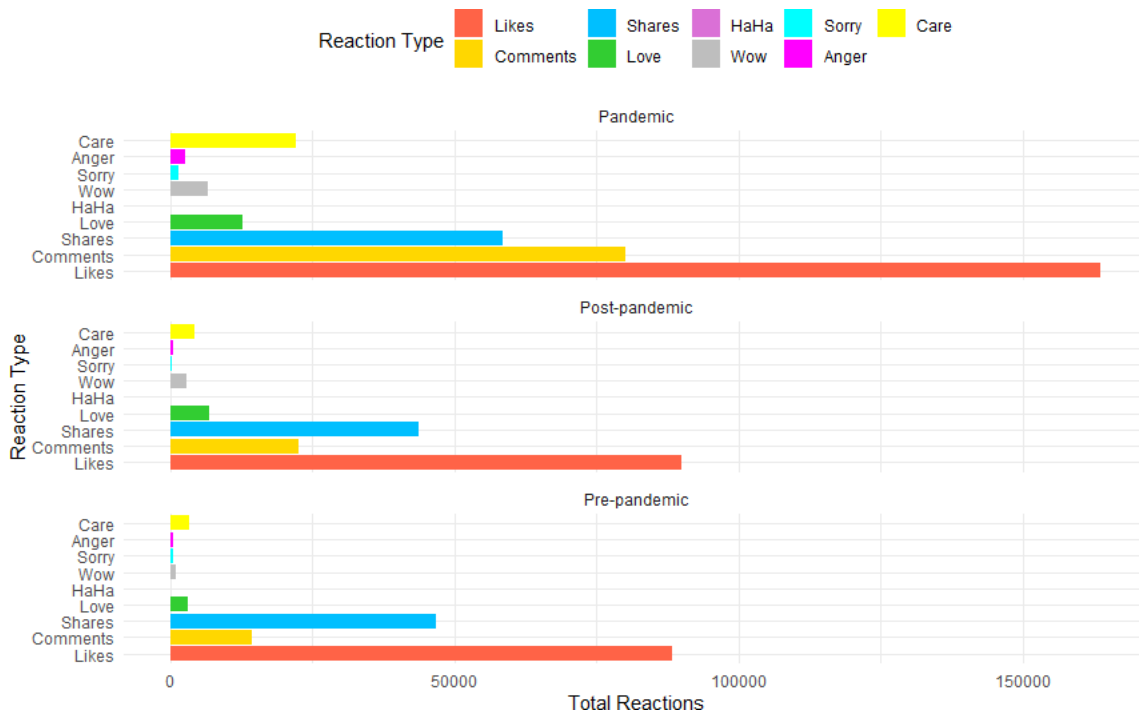
Source: Authors' work

During the pre-pandemic period, the Ministry of Education's Facebook posts received 88,309 likes, indicating a positive response from the audience. There were 14,392 comments, demonstrating active

engagement and participation in discussions. Additionally, the content received 46,859 shares, indicating its shareability and resonance with the audience, resulting in a wider reach. Although other reactions such as 'Love,' 'Wow,' 'Sorry,' 'Anger,' and 'Care' were present, their numbers were relatively lower, suggesting that most reactions were positive.

Throughout the pandemic period, the Ministry received a high number of likes, totaling 163,749. The data suggests that the audience maintained a positive sentiment towards the content even during the crisis. The high number of comments (80,149) indicates ongoing engagement and interaction with the posts, demonstrating an engaged and responsive audience. Furthermore, the fact that the content was shared 58,404 times highlights its relevance and shareability, extending its reach. During this period, there was an increase in emotional reactions such as 'Love,' 'Wow,' 'Sorry,' 'Anger,' and 'Care.' This is likely due to the challenging and emotional nature of the pandemic.

In the post-pandemic period, the Ministry continued to receive a high level of likes, totaling 89,922. This suggests that the positive engagement observed during the pandemic phase continued as the situation evolved. The post received 22,659 comments, indicating continued interaction and engagement. Additionally, it was shared 43,623 times, demonstrating its shareability and continued resonance with the audience. Although the number of reactions such as 'Love,' 'Wow,' 'Sorry,' 'Anger,' and 'Care' were relatively low, the overall sentiment and engagement remained positive.

In summary, the Ministry's Facebook posts consistently received positive engagement in the form of likes, comments, and shares across all three periods. The pandemic phase saw increased engagement in various emotional reactions, reflecting the evolving emotional dynamics during a crisis. Despite the challenges, the Ministry maintained a positive and engaged online community throughout these phases.

6. Discussion and conclusions

This study examines the engagement and sentiment dynamics on the Romanian Ministry of Education's social media presence across three distinct periods: pre-pandemic, pandemic, and post-pandemic. The investigation highlights the important role of social media as a tool for institutional communication, especially in times of significant societal change.

One of the main findings of our research is that the Ministry was able to adapt its communication strategies to meet the changing needs of its audience. During the pandemic, the Ministry increased the frequency of its posts and focused on positive messaging. This aligns with Ali & Deswals' (2023) observations on the significance of social media platforms in disseminating information during crises. This strategy was likely intended to provide reassurance and maintain a sense of normalcy amidst the upheaval. It echoes the emphasis on positive messaging to foster optimism identified by Aksak et al. (2023) in their analysis of digital communication by ministries of health during the COVID-19 pandemic. The pandemic has highlighted the public's dependence on official sources for timely and accurate information, as evidenced by the increase in engagement. This supports the findings of Casalegno et al. (2021), who studied the challenges and opportunities of government messaging during emergencies.

Our sentiment analysis also reveals the effect of message tonality on public engagement. During the pandemic period, there was a predominance of positive sentiments, which may suggest an intentional strategy to foster hope and resilience. This reflects the strategic emphasis on positive messaging discussed by Zeru (2021) in the context of Facebook use in Romanian public administration. It is interesting to note that in the post-pandemic period, there was a slight increase in negative sentiments, which could reflect a more open dialogue about the challenges that lie ahead. This shift in the distribution of sentiment indicates a strategic communication approach that is tailored to the specific phase of the crisis. It demonstrates the Ministry's responsiveness to public sentiment and the contextual demands of each period, as highlighted by Mendiz-Noguero et al. (2023) in their discussion on misinformation and digital literacy.

The findings reinforce the important role of social media in crisis communication. The increased engagement rates during the pandemic demonstrate social media's effectiveness in reaching and engaging audiences during critical times. Furthermore, the diverse responses to the posts at different times demonstrate the platform's ability to capture a broad spectrum of public emotions, ranging from solidarity and appreciation to concern and criticism. This highlights the significance of social media as a versatile tool for government institutions, as noted by Espino Gonzalez (2022) in their analysis of digital platform transitions during crises.

Based on our findings, we recommend that institutions such as the Ministry of Education continue to utilise social media as a key element of their communication strategy. This will enable them to maintain the adaptability and responsiveness demonstrated during the pandemic, and to address future challenges. This aligns with Tasențe & Stan's (2024) advocacy for tailored communication strategies to enhance public trust through digital platforms. Institutions should strive to achieve a balance between positive messaging and transparent communication regarding challenges, in order to foster an environment of trust and engagement with their audience.

Additionally, our analysis indicates the necessity of continuous monitoring and analysis of social media engagement and sentiment. By comprehending the changing dynamics of public engagement and sentiment, institutions can more effectively customize their communication strategies to meet the needs of their audience. This proactive approach to social media communication can improve the effectiveness of institutional messaging and strengthen the relationship between government entities and the public. This echoes the findings of Kaur et al. (2021), who illustrated how digital platforms promoted community resilience during the pandemic.

In summary, this research underscores the pivotal function of social media in revolutionizing communication within institutions, especially amidst periods of transition. Through the lens of the Romanian Ministry of Education, this study showcases how social media platforms can enable significant interaction, disseminate crucial information, and adeptly manage communication during crises. As we advance, the insights derived from our analysis lay the groundwork for the creation of more refined and influential communication tactics. Leveraging the benefits of social media, we are poised to move towards a society that is more informed, participatory, and robust.

Limitation of the study

The study is limited to the Facebook page of the Romanian Ministry of Education, excluding other social media platforms and channels. It focuses on the COVID-19 pandemic, which may limit generalizability to other periods or crises. Sentiment analysis tools like AFINN and NRC have limitations in accurately capturing nuances, especially in non-English texts. The study emphasizes quantitative metrics and does not deeply explore qualitative user interactions. Its findings are specific to the Romanian context and may not apply to other countries.

Relevance of the research for the scientific community

This research offers valuable insights for comparative studies with other countries, helping identify effective social media strategies during the COVID-19 pandemic. It contributes to crisis communication research by providing data on how government institutions adapt their strategies in crises. The study's methodology can be refined for future research, improving sentiment analysis accuracy. Findings can inform policymakers and educational administrators on maintaining a robust social media presence and adapting communication strategies to meet public needs during crises and beyond, aiding policy development and effective public communication.

7. References

Aksak, E. O., Dikmen, E. S., & Kilic, N. P. (2023). Managing Pandemic Communication Online: Turkish Ministry of Health's Digital Communication Strategies During COVID-19. *International Journal of Communication*, *17*, 1551–1572.

Ali, Z. S., & Deswals, J. (2023). Use of social media for seeking information about COVID-19 and people's preventive behaviour: Managing the pandemic in Aotearoa New Zealand. *Connectist-Istanbul University Journal of Communication Sciences*, *64*, 1–36. https://doi.org/10.26650/CONNECTIST2023-1023972

Amores, J. J., Blanco-Herrero, D., & Arcila-Calderon, C. (2023). The Conversation around COVID-19 on Twitter-Sentiment Analysis and Topic Modelling to Analyse Tweets Published in English during the First Wave of the Pandemic. *Journalism and Media, 4*(2), 467–484. https://doi.org/10.3390/journalmedia4020030

Arrufat Martin, S. (2021). The spanish media in times of pandemic: News generation on social media during COVID-19. *Vivat Academia*, 154, 107-122. https://doi.org/10.15178/va.2021.154.e1309

Carvache-Franco, O., Gabriela Viquez-Paniagua, A., Carvache-Franco, M., Perez-Orozco, A., & Carvache-Franco, W. (2022). Risk perception and crisis communication during the Covid-19 pandemic: Analysis based on Twiter hashtags. *Tec Empresarial*, *16*(3), 72–91. https://doi.org/10.18845/te.v16i3.6372

Casalegno, C., Civera, C., & Cortese, D. (2021). COVID-19 in Italy and issues in the communication of politics: Bridging the knowledge-behaviour gap. *Knowledge Management Research & Practice*, *19*(4), 459–467. https://doi.org/10.1080/14778238.2020.1860664

Castillo-Esparcia, A., Fernandez-Souto, A.-B., & Puentes-Rivera, I. (2020). Political communication and Covid-19: Strategies of the Government of Spain. *Profesional De La Informacion*, *29*(4). https://doi.org/10.3145/epi.2020.jul.19

Du, R., Grigorescu, A., & Aivaz, K.-A. (2023). Higher Educational Institutions' Digital Transformation and the Roles of Digital Platform Capability and Psychology in Innovation Performance after COVID-19. *Sustainability*, *15*(16), 12646. https://doi.org/10.3390/su151612646

Espino Gonzalez, J. (2022). Institutional communication in the Covid-19 crisis: The Case of Malaga City Council. *Revista de Comunicacion de la Seeci, 55*, 67-92. https://doi.org/10.15198/seeci.2022.55.e774

Farinosi, M., Cirulli, A., & Fortunati, L. (2022). The impact of the pandemic on communication between local government and citizens in a small village in Tuscany: From the 2021 Community Informatics Research Network (CIRN) Conference. *The Journal of Community Informatics*, *18*(1). https://openjournals.uwaterloo.ca/index.php/JoCI/article/view/4749

Istrate, G.-A., Budu, R. A., & Popa, C. A. (2022). Institutional communication in the digital age. *Journal of Financial Studies*, *7*(13), 104–119.

Kaban, A. L., & Asci, S. (2022). Covid-19 chronicles in education: Overcoming global pandemic challenges in Turkey by empowering educators to become digitally literate. In E. Sengupta & P. Blessinger (Eds.), *New student literacies amid Covid-19: International Case Studies*, *41*, 115–134. *Emerald Group Publishing Ltd*. https://doi.org/10.1108/S2055-364120210000041016

Kaur, M., Verma, R., & Ranjan, S. (2021). Political Leaders' Communication: A Twitter Sentiment Analysis during Covid-19 Pandemic. *Jurnal the Messenger*, *13*(1), 45–62. https://doi.org/10.26623/themessenger.v13i1.2585

Mendiz-Noguero, A., Wennberg-Capellades, L., Regadera-Gonzalez, E., & Goni-Fuste, B. (2023). Public health communication and the Covid-19: A review of the literature during the first wave. *Profesional De La Informacion*, *32*(3). https://doi.org/10.3145/epi.2023.may.13

Micu, A., Capatina, A., Micu, A.-E., Geru, M., Aivaz, K. A., & Muntean, M.-C. (2021). A New Challenge in Digital Economy: Neuromarketing Applied to Social Media. *Economic Computation and Economic Cybernetics Studies and Research*, *55*(4), 133–148. https://doi.org/10.24818/18423264/55.4.21.09

Mori, E., Barabaschi, B., Cantoni, F., & Virtuani, R. (2021). Local governments' communication through Facebook. Evidences from COVID-19 pandemic in Italy. *Journal of Public Affairs*, *21*(4), e2551. https://doi.org/10.1002/pa.2551

Proellochs, N., & Feuerriegel, S. (2023). *SentimentAnalysis: Dictionary-Based Sentiment Analysis* (1.3-5) [Computer software]. https://cran.r-project.org/web/packages/SentimentAnalysis/index.html

Queiroz, G. D., Fay, C., Hvitfeldt, E., Keyes, O., Misra, K., Mastny, T., Erickson, J., Robinson, D., Silge [aut, J., & cre. (2023). *tidytext: Text Mining using 'dplyr', 'ggplot2', and Other Tidy Tools* (0.4.1) [Computer software]. https://cran.r-project.org/web/packages/tidytext/index.html

Ravenda, D., Valencia-Silva, M. M., Argiles-Bosch, J. M., & Garcia-Blandon, J. (2023). COVID-19 Communication Management on Facebook Pages of Local Governments. *Administration & Society*, *55*(7), 1290–1333. https://doi.org/10.1177/00953997231165258

Rivas-de-Roca, R., Garcia-Gordillo, M., & Luis Rojas-Torrijos, J. (2021). Communication strategies on Twitter and institutional websites in the Covid-19 second wave: Analysis of the governments of Germany, Spain, Portugal, and the United Kingdom. *Revista Latina De Comunicacion Social*, *79*. https://doi.org/10.4185/RLCS-2021-1517

Tasenţe, T., Rus, M., & Opariuc-Dan, C. (2023). Analysis of the online communication strategy of world political leaders during the War in Ukraine (February 24, 2022—January 23, 2023). *Vivat Academia. Revista de Comunicación, 156*, 246–270. https://doi.org/10.15178/va.2023.156.e1471

Tasenţe, T., & Stan, M.-I. (2024). South American digital diplomacy: Approaches before and after the Russian-Ukrainian crisis. *Cuadernos.Info*, *57*, 46–68. https://doi.org/10.7764/cdi.57.66393

Wickham, H. (2020). *reshape2: Flexibly Reshape Data: A Reboot of the Reshape Package* (1.4.4) [Computer software]. https://cran.r-project.org/web/packages/reshape2/index.html

Wickham, H., Bryan, J., Posit, attribution), P. (Copyright holder of all R. code and all C. code without explicit copyright, code), M. K. (Author of included R., code), K. V. (Author of included libxls, code), C. L. (Author of included libxls, code), B. C. (Author of included libxls, code), D. H. (Author of included libxls, & code), E. M. (Author of included libxls. (2023). *readxl: Read Excel Files* (1.4.3) [Computer software]. https://cran.r-project.org/web/packages/readxl/index.html

Wickham, H., Chang, W., Henry, L., Pedersen, T. L., Takahashi, K., Wilke, C., Woo, K., Yutani, H., Dunnington, D., Posit, & PBC. (2023). *ggplot2: Create Elegant Data Visualisations Using the Grammar of Graphics* (3.4.4) [Computer software]. https://cran.r-project.org/web/packages/ggplot2/index.html

Wickham, H., François, R., Henry, L., Müller, K., Vaughan, D., Software, P., & PBC. (2023). *dplyr: A Grammar of Data Manipulation* (1.1.4) [Computer software]. https://cran.r-project.org/web/packages/dplyr/index.html

Wickham, H., Pedersen, T. L., Seidel, D., Posit, & PBC. (2023). *scales: Scale Functions for Visualization* (1.3.0) [Computer software]. https://cran.r-project.org/web/packages/scales/index.html

Zeru, F. (2021). The use of Facebook in Romanian public administration, factors that influence engagement. *Revista Română de Studii Eurasiatice*, *17*(1+2), 213–238.