



Speaking as a woman: the political communication of Ursula von der Leyen

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Abstract

This study analyses the institutional and social media communication of Ursula von der Leyen during her first mandate as President of the European Commission, focusing on how political themes are articulated across platforms. Using Symmetric Non-Negative Matrix Factorization (SNMF), we extracted and compared thematic clusters from a corpus of official speeches, Instagram posts, and X (formerly Twitter) messages. Findings show that while core themes—such as the European Green Deal, international security, and democratic values—are consistently present, their framing varies significantly by platform. X emphasizes timely and policy-driven discourse; Instagram highlights personal leadership and symbolic presence; speeches develop complex programmatic arguments. These communicative variations align with existing theories of mediatized leadership and suggest a platform-sensitive rhetorical strategy. The study contributes to debates on political communication and digital leadership within EU institutions, offering a replicable method for cross-platform discourse analysis.

Keywords Ursula von der Leyen · Symmetric-non negative matrix factorization · Political communication · Female leadership

1 Introduction

Ursula von der Leyen's appointment as President of the European Commission marked a symbolic and strategic shift in the European Union's institutional profile—from a primarily technocratic entity to a more politicized and personalized leadership model. Her presidency has coincided with a series of global crises, including the COVID-19 pandemic, the war in Ukraine, and an energy emergency, which have accelerated the EU's transition toward more responsive, media-savvy forms of governance. This transformation has also had a gendered dimension: von der Leyen is the first woman to hold the Commission's highest office and has explicitly advanced a feminist agenda, both through institutional policies and through a rhetorical register that foregrounds care, resilience, and solidarity

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(Abels et al. 2020). She has sought to redefine leadership within the EU as both more emotionally attuned and visibly inclusive. This study contributes to debates on gendered leadership and political communication by analyzing how von der Leyen navigates institutional expectations and gendered constraints across different media environments. We focus on the content, and platform-specific variation of her public discourse to assess whether she articulates a coherent leadership identity or adapts strategically to context. In particular, we investigate how her position "as a woman" intersects with the communicative affordances and constraints of institutional speeches, Instagram, and X (formerly Twitter)—spaces with differing norms of authenticity, authority, and emotionality. This allows us to explore how women in positions of power manage the double bind (Jamieson 1995), balancing competence and warmth in order to be perceived as both credible and relatable. To do so, we introduce a novel methodological contribution: the application of Symmetric Non-Negative Matrix Factorization (SNMF) to a multimodal, cross-platform corpus. While SNMF has proven effective in unsupervised topic detection, it remains underutilized in political communication and gender studies. Prior research on EU leadership or digital political discourse has typically relied on frequency-based methods or qualitative frame analysis, often confined to a single communication medium (Rauh 2019). As a result, they struggle to capture the complex and dynamic structure of leadership performance across media ecosystems. Our framework addresses this limitation by extracting thematic clusters through SNMF across platforms and linking them to broader theories of mediatized leadership (Campus 2017), relational authority (Regalia 2012), and gendered communication styles (Carli & Eagly, 2011; Stalsburg & Kleinberg 2016).

We therefore seek to answer two main research questions:

- RQ1: How is Ursula von der Leyen's social and institutional communication structured?
- RQ2: Does the presence of certain themes in von der Leyen's speeches indicate a specific leadership style? Is this style well-defined or adaptive to circumstances?

The paper is organized as follows: Sect. 2 reviews the theoretical literature on mediatized and gendered leadership; Sect. 3 outlines von der Leyen's political trajectory and communication strategy; Sect. 4 presents the data and methodology; Sect. 5 discusses the main findings; and the final section reflects on the broader implications for political leadership, gender, and EU institutional visibility.

2 Female leadership in sociology

2.1 From positional to mediatized leadership

Contemporary theories of political leadership increasingly emphasize relational dynamics, mediatization, and personalization, moving beyond traditional, static models based solely on institutional roles. A central distinction in this literature is between positional leadership, where authority derives from formal hierarchical status (Edinger 1975; Blondel 1987), and relational leadership, in which leadership emerges from the interaction between leaders, followers, and contextual factors (Regalia 2012; Ventura 2019). This perspective highlights the performative and negotiated nature of political authority—especially relevant in democratic systems where legitimacy depends on recognition and trust rather than institutional

mandate alone (Strangio et al. 2013; Dowding 2013). This complexity has deepened with the presidentialization of parliamentary systems, characterized by growing personalization of politics and the expansion of executive visibility and autonomy (Poguntke & Webb 2005; Calise 2005). Within this framework, leadership is not only a matter of governance but also of individual political branding, image control, and emotional appeal. These dynamics are further amplified by the mediatization of politics, a process in which political communication becomes increasingly shaped by media logic—favoring speed, personalization, symbolic storytelling, and emotional resonance (Mazzoleni & Schulz 1999; Street 2004; Wheeler 2013). With the dominance of television and social platforms, leadership visibility, charisma, and authenticity have become critical resources (Walsh 2017). Campaigns are increasingly focused on individual leaders, whose image—shaped through direct digital engagement, viral content, and talk show appearances—serves as the primary vehicle for political messaging. In this environment, personal appeal often outweighs programmatic content, reinforcing the centrality of leaders in contemporary governance (Campus 2017). As leadership has become increasingly shaped by media logic and personalization, new challenges and opportunities have emerged—particularly for women in politics. While visibility, emotional engagement, and authenticity are now seen as assets in political communication, they also intersect with deeply rooted gender stereotypes that constrain the ways in which women leaders are perceived and evaluated. The mediatization of leadership, in this sense, does not merely reshape leadership styles in general—it also exposes the symbolic and structural barriers that persist for female leaders operating in traditionally masculine institutional environments. This makes the analysis of gendered leadership patterns especially relevant in the current digital and political landscape, where communicative strategies serve as both tools of empowerment and arenas of tension. Such frameworks are particularly useful for analyzing Ursula von der Leyen, who occupies a hybrid institutional role that combines technocratic authority with symbolic representation on the European and global stage. As the first female President of the European Commission, she must navigate the institutional complexity of EU governance, the affordances and constraints of social media platforms, and gendered expectations in how leadership is performed and perceived. Understanding her communication strategy thus requires a theoretical lens that accounts for how relational dynamics, mediatized visibility, and presidentialization trends shape contemporary political leadership—particularly in transnational, digital, and gendered environments. The next section explores how these dynamics affect the representation, style, and reception of women in power.

2.2 Woman in power: the female leadership

Drawing from theories on status processes, gender stereotypes, and media representation, it highlights the persistent structural and symbolic barriers that women face in politics. Special attention is paid to how these dynamics influence campaign strategies, leadership styles, and public communication, particularly in mediatized contexts such as social media. Sociological theories on institutional status processes argue that ideology functions as a fundamental cultural criterion, through which an individual's social value is assessed (Metcalfe et al. 2022). Consequently, opportunities within any system are deeply intertwined with social hierarchy, and gender is one of the many social constructs that determine a person's position in this hierarchy (Correll & Ridgeway 2006). These social perceptions shape beliefs about the competence and leadership abilities of men and women, leading to distinct gendered representations of leadership (Carli & Eagly, 2011). Despite the dominant

male image of power (Keohane 2010), a growing debate has emerged about gender differences in leadership styles. This association between masculinity and leadership has been encouraged by traditional leadership theories, which emphasize distinctive individual traits as the foundation of leadership (Haslam et al. 2020). Even after moving beyond the concept of the charismatic leader, leadership research has continued to focus on personal characteristics, reinforcing the notion that individuals who lack specific leadership traits—often associated with masculinity—are less suited to leadership roles. This has created barriers for women in politics, where they have historically been required to emphasize personal traits that deviate from feminine stereotypes to be considered viable leaders (Haslam et al. 2020). In electoral campaigns, these gendered perceptions translate into thematic expectations and communication strategies. Women candidates are often associated with so-called *compassion issues*—such as education, healthcare, and poverty—while men are considered more credible when addressing *hard issues* like defense, foreign policy, and the economy (Bystrom et al. 2013; Dittmar 2015). These expectations affect both voter perceptions and media coverage, which tend to privilege male politicians when reporting on high-stakes topics (Kittilson & Fridkin 2008). Moreover, media representations of female candidates frequently focus on appearance, family life, and personality traits rather than on their policy platforms (Bystrom et al. 2004; Fowler & Lawless 2009). Faced with such constraints, women often adopt different strategic approaches in their campaigns. Some embrace gender stereotypes, others challenge them directly, and many seek to balance masculine and feminine traits or avoid gender-based narratives altogether. However, violating these expectations can generate backlash: competent women may be perceived as cold or unlikeable, while men exhibiting similar traits are praised for their strength. This tension is encapsulated in the *double bind* effect: female candidates must appear strong and decisive to gain credibility, but not so assertive as to be perceived as aggressive (Jamieson 1995). While male politicians can use elements of feminine style to humanize their public image, for women this style is still tightly connected to traditional gender roles and therefore riskier to employ (Eagly & Karau 2002). Nevertheless, some women have successfully used storytelling, emotional tone, and self-revelation as tools to foster relatability, particularly in media environments such as television and social media, which favor intimacy and personal narratives (Jamieson 1995; Campbell 1998; Stalsburg & Kleinberg 2016). Recent scholarship has shifted attention toward digital political communication and the specific affordances of platforms like Instagram and X (formerly Twitter). Social media, in particular, has emerged as a vital space where female candidates can bypass traditional media biases and cultivate direct relationships with voters. Unlike mainstream media, social platforms allow women to strategically manage their public image, often emphasizing authenticity, empathy, and narrative consistency (Yarchi & Samuel-Azran 2018; Goodyear-Grant & Tolley, 2019). However, even here, women tend to avoid highlighting their roles as mothers, aware that public scrutiny over work–family balance disproportionately affects them (Stalsburg & Kleinberg 2016). Specifically, Instagram, with its visual and affective grammar, allows women to perform authority and relatability simultaneously through curated self-presentation (Caldeira et al. 2020; Brands et al. 2023). Studies show that female leaders strategically balance professional competence and emotional warmth through images, behind-the-scenes content, and ephemeral formats like Stories, navigating gendered expectations while reinforcing authenticity (Brands et al. 2021; Caldeira 2024). This visual self-presentation enables women to bypass mainstream media filters and craft hybrid identities that blend public office with personal accessibility. Here, female politicians must craft concise, authoritative messaging while contending with visibility gaps and heightened scrutiny. Navigating the *double bind* thus remains a central challenge, now mediated by

the technical and cultural specificities of each platform. In response, women deploy multimodal strategies—blending visual symbolism, storytelling, emotional tone, and agenda-setting—to perform legitimacy in digitally mediatized leadership (Timperley et al. 2025; Caldeira et al. 2020). These evolving digital tactics underscore the importance of analyzing platformed political communication not just as a continuation of traditional media dynamics, but as a distinct terrain where gendered leadership is continuously rearticulated.

3 The European leadership of Ursula von der Leyen

This section offers a contextual overview of Ursula von der Leyen's political trajectory, focusing on her rise to the presidency of the European Commission and the distinctive leadership style she developed during her first mandate. To better understand the evolution of her leadership and communication strategy, the section is divided into two parts: the first traces her political career and initial policy commitments, while the second explores the main characteristics of her leadership model, including comparisons with Angela Merkel and her positioning in the European and global political arenas.

3.1 Career path and policy priorities

Born in Ixelles, Belgium, in 1958, Ursula von der Leyen spent her childhood between Brussels and Hanover due to her father Ernst Albrecht's work in European institutions. She studied at the London School of Economics under the pseudonym Rose Ladson to protect herself from the Rote Armee Fraktion (RAF), a left-wing terrorist group. Her political career began in 1990 with her membership in the Christlich Demokratische Union Deutschlands (CDU), leading to a series of ministerial roles under Angela Merkel, including Minister for Family Affairs, Minister of Labor and Social Affairs, and Minister of Defense. Her tenure in these roles was marked by policy initiatives supporting parental leave, social reforms, and Germany's stronger involvement in NATO (Müller 2022). Von der Leyen's appointment as Commission President was the result of an inter-party compromise brokered by Emmanuel Macron, despite initial resistance from many within the European Parliament. She secured the position by making a series of strategic commitments, including the appointment of a diverse leadership team—featuring two executive Vice Presidents: Frans Timmermans from the Progressive Alliance of Socialists and Democrats (S&D) and Margrethe Vestager from Renew Europe. She also pledged to strengthen the legislative powers of the European Parliament and championed key initiatives such as the European Green Deal, the Just Transition Fund, and championed economic policies aimed at strengthening social welfare and reducing inequality (Hutchinson 2019). However, her confirmation was only narrowly approved with 383 votes—less than her predecessors Barroso and Juncker. Her presidency has been shaped by a series of crises. The COVID-19 pandemic required decisive action, and von der Leyen leveraged the Commission's regulatory power to negotiate vaccine purchases on behalf of EU member states and secure an unprecedented €750 billion recovery fund, integrated into the Multiannual Financial Framework (Smeets & Beach 2022). She positioned the Green Deal as an essential component of the EU's recovery, using the crisis as a political opportunity to advance climate policies (Bongardt & Torres 2022). The war in Ukraine further cemented her role as an agenda-setter, defining the EU's response through economic sanctions on Russia, support for Ukrainian refugees, and diplomatic coordination with the U.S. and G7 (Baracani 2023). She framed

the war as a fundamental challenge to European democracy, arguing that Ukraine belongs to the European family and actively pushing for accelerated EU accession talks. Von der Leyen's leadership can be described as ideational agenda-setting leadership (Müller 2020), using ideas to shape political discourse and decision-making. This involves diagnosing situations, crafting policy responses, and mobilizing political support (Young 1991). The European Commission, historically a technocratic body, has increasingly assumed a more strategic and political function under von der Leyen's leadership. She has centralized decision-making authority through a tightly controlled advisory circle and demonstrated strong personal involvement in key policy directions (Von der Burchard et al. 2020). This contrasts with her predecessors and aligns more with a presidential model of governance. Under von der Leyen's leadership, the Commission has prioritized six key areas: the Green Deal, digital transformation, an economy that works for people, a stronger Europe in global affairs, the promotion of the European way of life, and democratic reforms (European Commission 2019a). Unlike the Juncker Commission, which focused primarily on institutional reform and economic governance, von der Leyen has emphasized climate action and digital innovation. The Green Deal aims to make Europe climate-neutral by 2050, integrating policies across industries, transport, energy, and biodiversity (European Commission 2019b). Subsequent initiatives, such as the "Fit for 55" package, have sought to translate these ambitions into concrete regulations, including emissions trading expansions, carbon border adjustments, and energy efficiency standards (European Commission 2021). Her gender equality agenda has also been a defining feature of her leadership. She insisted on gender parity within the Commission, leading to a nearly equal composition of men and women, and launched the Gender Equality Strategy (GES) in 2020. This strategy integrates gender mainstreaming into EU policymaking, pushes for increased representation of women in leadership roles, and addresses gender-based violence as a European crime (Abels et al. 2020). She has sought to position the Commission as a global leader in gender equality, aligning with broader EU commitments to social inclusion and diversity (Pradel 2021). Given her political trajectory—from a centrist CDU background to her role as the first female Commission President—one might expect a communicative style that combines technocratic authority with narrative personalization. Her ministerial experience in social affairs and her visible commitment to gender parity suggest thematic attention to social cohesion, solidarity, and inclusion. Additionally, given the controversies surrounding her appointment and the pressure of scandals like 'Pfizergate', we anticipate a strategic emphasis on transparency, legitimacy, and institutional trust. These expectations provide a basis for exploring how her leadership style manifests across platforms and evolves in response to external shocks.

3.2 Strategic and gendered leadership: style, comparison, and public perception

In this study, we define strategic leadership as the use of long-term policy vision, crisis management, and institutional leverage to shape political direction and public discourse (Baracani 2023; Müller 2020), while gendered leadership refers to the communication styles, symbolic choices, and constraints shaped by gender norms and expectations (Carli & Eagly, 2011; Jamieson 1995). In Table 1 we present a comparison between von der Leyen and Angela Merkel that highlights similarities and differences in their leadership trajectories. Both women entered politics later in life, had scientific backgrounds, and rose within the CDU without explicitly embracing feminist labels. Merkel, however, governed through a pragmatic, consensus-driven leadership style, often avoiding strong ideological

Table 1 Comparison from Angela Merkel and Ursula von der Leyen (Comparison made by the author)

	<i>Angela Merkel</i>	<i>Ursula Von der Leyen</i>
Age	69	65
Party	CDU	CDU, PPE
Education	PhD in Physical Chemistry	Degree in Medicine
Private life	First marriage with Ulrich Merkel, second marriage with Joachim Sauer	Married to Heiko Echter von der Leyen, mother of 7 children
Religion	Christian-Lutheran	Christian-Catholic
Political career	1989: Member of "Democratic Awakening 1990: Joins the CDU party 1991–1994: Minister for Women and Youth 1994–1998: Minister for the Environment, Nature Conservation, and Nuclear Safety 1991–1998: Vice President of the CDU 1993–2000: President of CDU Mecklenburg-Vorpommern 2000–2018: Leader of the CDU 2005–2021: Chancellor of Germany	1989: Becomes a member of the CDU 2003–2005: Minister for Social Affairs, Family, and Health 2005–2009: Federal Minister for Family Affairs, Senior Citizens, Women, and Youth 2009–2013: Federal Minister of Labor and Social Affairs 2013–2019: Minister of Defense of Germany 2019: President of the European Commission
Scandals	Wirecard	Investigation "affair succulenti", Pfizergate
Feminist leadership	No	No
Firsts in top roles	First female President of the CDU; First female Chancellor of Germany	First female Minister of Defense in Germany; First woman to lead the European Commission

stances and prioritizing political stability (Campus 2016). Von der Leyen, by contrast, has adopted a more ideational and strategic leadership (Baracani 2023), shaping EU policy through bold initiatives such as the Green Deal, and through decisive responses to crises including the COVID-19 pandemic and the war in Ukraine. While Merkel was reluctant to embrace gender quotas, von der Leyen actively promoted them, reflecting a shift in CDU gender politics over time (Mushaben 2022). In Table 1, we reported a comparison between the figure of Angela Merkel and Ursula von der Leyen. The media's portrayal of female leaders remains a crucial aspect of their political trajectory. Merkel, despite her longevity in office, faced persistent commentary on her appearance, while von der Leyen has encountered similar scrutiny, including controversies surrounding her handling of the Pfizer vaccine contracts and defense procurement scandals in Germany (Bennhold 2021). The *double bind* remains a challenge for women in leadership: they must balance assertiveness with warmth to avoid being perceived as either too weak or too aggressive (Jamieson 1995). Von der Leyen's communication strategy has evolved to navigate these constraints, blending elements of traditional authority with a modernized, inclusive European narrative. Recent analyses of von der Leyen's online communication confirm this evolution. For

instance, Pérez-Curiel et al. (2023) highlight her strategic use of X (formerly Twitter) during the Ukraine and Afghanistan crises, emphasizing timing, personalization, and issue framing to enhance visibility and engagement. Similarly, Moreno (2024) demonstrates how the European Commission's Instagram strategy reinforces gender equality narratives, aligning with von der Leyen's emphasis on inclusive leadership and visibility across digital platforms. While these studies provide valuable insights into specific crisis communication episodes (Pérez-Curiel et al. 2023) or visual strategies on Instagram (Moreno 2024), they do not offer a systematic comparison across platforms nor do they evaluate the internal coherence and evolution of thematic clusters over time. Throughout her presidency, von der Leyen has framed the EU's geopolitical role more assertively, promoting European strategic autonomy, deepening transatlantic ties, and expanding the EU's global influence. Her response to the Ukraine war underscores her capacity for normative leadership, using EU values as a foundation for policy decisions. She has leveraged institutional mechanisms to advance the EU's role in security, energy independence, and migration, positioning the Commission as a key factor in international affairs (Baracani 2023). Her tenure marks a decisive shift in the European Commission's evolution from a regulatory body to a political force, reinforcing the EU's identity in an era of global uncertainty (Kassim 2022).

4 Materials and methods

4.1 Data collection

This study aims to analyze Ursula von der Leyen's social and institutional communication during her mandate, with the objective of identifying the main themes of discourse and defining the core topics that highlight her communication strategy. We define the following research questions:

- RQ1: How is Ursula von der Leyen's social and institutional communication structured?
- RQ2: Does the presence of certain themes in von der Leyen's speeches indicate a specific leadership style? Is this style well-defined or adaptive to circumstances?

Figure 1 illustrates the workflow of the methodological strategy. Specifically, we collected a total of 996 Instagram posts in English using CrowdTangle, 3517 English-language posts from X (formerly Twitter) via Web Research Assistant, and 196 institutional speeches in English from the Multimedia Centre of the European Parliament. The data collection spans from July 2, 2019—the date on which Ursula von der Leyen was nominated by the European Council as President of the European Commission—through July 17, 2024, when she was confirmed for a second term. The selection of these three platforms is not merely based on data availability but grounded in theoretical considerations on mediatized leadership, platform affordances, and gendered political communication. Institutional speeches represent the traditional, high-formality channel through which leaders perform institutional authority and engage in agenda-setting. They are designed to articulate the policy vision and normative direction of the EU but are increasingly distributed and recontextualized in digital ecosystems (Esser & Ström-bäck 2014). They serve as the cornerstone for understanding leadership narrative and

long-term positioning. X functions as a fast-paced, dialogical platform, where political figures engage in real-time commentary, respond to crises, and amplify messages. Its design promotes visibility and performativity, making it ideal for strategic framing and agenda surfacing (Enli & Rosenberg 2018). X enables leaders to rapidly react to events, often shaping media narratives and citizen engagement. Instagram, by contrast, emphasizes visual storytelling and affective framing, offering leaders the opportunity to construct a curated and emotionally resonant public image (Lalancette & Raynauld 2020; Moreno 2024). For female leaders, it serves both as an opportunity and a constraint: while it allows for expressions of empathy, authenticity, and inclusivity—traits often associated with female political style—it also carries risks tied to gendered expectations and the double bind effect (Jamieson 1995; Kampka & Molek-Kozakowska 2020). Von der Leyen’s use of Instagram has notably emphasized stylized visuals and inclusive rhetoric, balancing authority with relatability (Sonnevend & Steiert 2022). These three platforms reflect the triangulation of leadership performance across formal and informal spaces, allowing us to capture the von der Leyen’s communication strategies (Slimovich 2022).

4.2 Data preparation

Once the textual elements were extracted, a series of cleaning and pre-processing operations were necessary to transform the unstructured textual data into structured data. For all pre-processing operations—including tokenization, POS-tagging, and lemmatization—we used the *udpipe* package in R with the pre-trained English model from the Universal Dependencies project (Straka et al. 2016). Specifically, the documents underwent a process of parsing and tokenization, resulting in a set of distinct strings (tokens) separated by spaces, punctuation marks, or other special characters. So, the text is decomposed into its constituent components according to a particular encoding, known as the Bag-of-Words (BoW). The text data was represented as a multiset of words, meaning that it allowed for repeated occurrences of terms while disregarding word order, grammar, and syntax. To reduce linguistic variability and ensure consistency, several pre-processing steps were applied (Frigau et al., 2023). Although alternative models based on semantic embeddings (e.g., Word2Vec, BERT) are commonly used in text mining, we opted for the Bag-of-Words (BoW) approach. While embeddings are effective in capturing latent semantic structures, they introduce a level of abstraction that complicates interpretability. Given the political nature of the data and the aim to identify thematically coherent yet transparent clusters, BoW was preferred. Its compatibility with

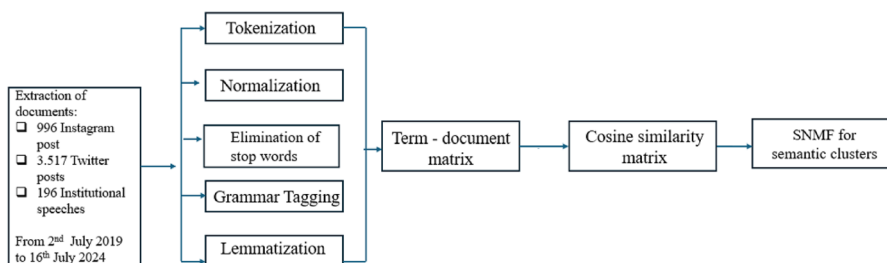


Fig. 1 Methodological workflow

the SNMF algorithm, which relies on non-negative term-frequency representations, ensures that each thematic cluster can be directly traced back to interpretable lexical items, thus facilitating qualitative interpretation across platforms. This trade-off prioritizes transparency over semantic nuance, in line with similar applications in political text analysis (Frigau et al., 2023). Initial normalization procedures included correcting misspelled terms, adjusting word accents, removing numeric characters, and converting all text to lowercase to standardize the corpus (Misuraca & Spano 2020). One step involved Part of Speech (POS) tagging, which assigned each term its grammatical category—specifically identifying nouns, adjectives, and verbs. Following POS tagging, lemmatization was conducted to reduce words to their canonical forms. Verbs were converted to their present infinitive form, while nouns and adjectives were standardized to the masculine singular. The lemmatization provides more precise outcomes by leveraging morphological analysis and ensuring that terms retain their semantic integrity. Unlike stemming—which indiscriminately truncates words—lemmatization minimizes common errors such as over-stemming and under-stemming, leading to higher-quality results (Khyani et al. 2021). Although some studies have debated the comparative accuracy of stemming and lemmatization, some works consistently support the effectiveness of lemmatization for tasks that require semantic precision (Alhawarat et al. 2021; Arimbawaa & Era 2017; Flores & Moreira 2016). Once pre-processing was complete, the vocabulary was constructed by counting the occurrences of each unique term (*type*) across the document collection. From the list of terms, stop-words (such as prepositions, conjunctions, adverbs, etc.) were removed, and a cut-off of occurrences was performed, eliminating all terms that appeared with a frequency lower than 5. After preprocessing, we constructed the **T** term-document matrix, where each row corresponds to a type and each column to a document. This matrix captures the frequency of each term in each document. Specifically, we generated three matrices: the term-document matrix for Instagram posts consists of 5620 unique terms (types) across 996 documents; for the platform X, the matrix includes 4302 unique terms across 3517 documents; and lastly, the matrix for the 196 speeches comprises 7845 unique terms. To assess semantic similarity between texts, a cosine similarity matrix **A** is computed. This metric quantifies how similar two documents are based on their vectorized representations, facilitating the identification of thematic patterns (Deerwester et al. 1990). The similarity matrix **A** is then used as the input to the Symmetric Non-Negative Matrix Factorization (SNMF). The choice of SNMF is particularly suitable for analyzing cross-platform political discourse due to its ability to process similarity matrices, capture fuzzy memberships, and uncover overlapping discursive patterns. Unlike probabilistic models like LDA, SNMF enables direct interpretation of clusters from cosine-based similarity structures, making it ideal for identifying recurring themes that cut across platforms with varying stylistic conventions. The symmetric structure of SNMF reinforces topical coherence while accommodating the hybrid and fluid nature of political messaging in digital contexts (Kuang et al. 2015).

4.3 Symmetric non-negative matrix factorization

The aim of Symmetric Non-Negative Matrix Factorization (SNMF) is to approximate a symmetric non-negative matrix **A** as the product of a non-negative matrix **H** (cluster assignment matrix) and its transpose **H^T**, such that $\mathbf{A} \approx \mathbf{H}\mathbf{H}^T$. The formulation of SNMF is represented by the following equation:

$$\min_{\mathbf{H} \geq 0} \left\| \mathbf{A} - \mathbf{H}\mathbf{H}^T \right\|_F^2 \quad (1)$$

This formulation seeks to find a low-rank approximation of the similarity matrix $\mathbf{A}$, where is a non-negative matrix of dimensions $\mathbf{n} \times \mathbf{k}$, and $\mathbf{k}$ is the required number of clusters (Kuang et al. 2015). The core idea of SNMF is that data points within the same cluster should exhibit high similarity, while those in different clusters should have low similarity. The matrix $\mathbf{H}$ plays a central role in this process: each row of $\mathbf{H}$ corresponds to a data point, and each column corresponds to a cluster. The entry h_{ij} in matrix $\mathbf{H}$ denotes the degree of association—or membership value—of data point i to cluster j . Due to the non-negativity constraint on $\mathbf{H}$, the cluster assignment of a data point is typically determined by identifying the maximum value in its corresponding row, i.e., the cluster in which the data point has the highest membership value (Kuang et al. 2012). Unlike classic hard graph clustering methods—such as kernel k-means and spectral clustering—SNMF relaxes the orthogonality constraint on the $\mathbf{H}$ matrix, making it approximately orthogonal and thus achieving fuzzy clustering results (Ding et al. 2008). This relaxation allows for greater flexibility and often leads to better clustering outcomes in terms of interpretability and accuracy. To determine the optimal number of clusters, we apply a strategy based on the evaluation of term memberships. For each term, we compute the membership values—i.e., the corresponding weights across all clusters in matrix $\mathbf{H}$. A term is considered part of a cluster if its highest membership value lies in that cluster. If another cluster's value exceeds it, a cut-off point is reached, and the term is reassigned. Once the clusters were formed, the variance of each was calculated using the following formula.

$$V_t = \frac{\sum_{i=1}^k \sum_{j=1}^{n_i} (d_{ij} - \bar{d})^2}{N - 1} \quad (2)$$

where N is the total number of terms across all clusters, d_{ij} is membership degree value of j -th term within cluster i and $\bar{d}$ is the overall mean of all membership degree values d_{ij} . According to the Eq. (2), the smaller the value of V_t , the better the quality of the clustering.

Firstly, we demonstrate that SNMF produces better results than other topic modeling techniques, calculating the topic coherence across Latent Dirichlet Allocation (LDA), Non-Negative Matrix Factorization (NMF), and Symmetric Non-Negative Matrix Factorization (SNMF). To compare the quality of the themes extracted by the models, a coherence measure (Röder et al. 2015) was used. NMF was selected as a baseline model since SNMF is an extension of NMF that incorporates symmetry constraints to enhance interpretability and stability (Kuang et al. 2012, 2015). Including NMF allows us to isolate the contribution of the symmetric constraint in SNMF and assess its added value over the standard non-negative factorization. However, traditional NMF suffers from certain limitations: it does not guarantee consistent clustering across different runs due to the non-uniqueness of the factorization, and it lacks an inherent mechanism to enforce symmetry in the similarity structure of terms or documents, which is often desirable in topic modeling.

To overcome these issues, SNMF introduces a symmetric decomposition of the input matrix, typically applied to a similarity matrix. This approach has been shown to improve clustering consistency and topic compactness, as it simultaneously enhances the sparsity and discriminative power of the resulting topics (Kuang et al. 2012). On the other hand, LDA was included in the comparison as it remains the most widely used topic modeling approach in the literature, based on probabilistic generative assumptions (Blei et al. 2003). To compare the quality of the themes extracted by the models, a coherence measure (Röder

et al. 2015) was used. Topic coherence is quantified by calculating the mean similarity between word pairs within a theme, typically using measures like Pointwise Mutual Information (PMI). This involves comparing the co-occurrence probability of word pairs to the probabilities of their individual occurrences. A higher coherence value suggests that the words frequently appear together in documents, indicating a semantically meaningful theme. Figure 2 displays the coherence scores of the number of topics (ranging from 5 to 100) for each of the three models. The results are reported separately for the three corpora analyzed: (1) Instagram posts (top-left), (2) X posts (top-right), and (3) institutional speeches (bottom). Each subplot contains three line charts comparing the coherence scores of NMF (red), LDA (green), and SNMF (blue). In all three cases, SNMF consistently achieves higher coherence scores, particularly in the range between 10 and 30 topics, indicating that it generates more coherent and thematically compact clusters than the alternatives. Although the increase in coherence may appear modest (e.g., $\Delta=0.05$), such gains are meaningful in topic modeling, as even small improvements in coherence often reflect substantial enhancements in semantic interpretability (Röder et al. 2015).

4.4 Operationalizing leadership style and gendered communication

To interpret the emergent thematic clusters in terms of leadership style and gendered communication, we adopted a dual-layered analytical framework informed by established models in political communication and leadership theory. In line with classical frameworks (Bass 1990; Bligh et al. 2004), leadership style was classified along a continuum between transformational and transactional approaches. Transformational leadership was inferred from clusters and terms associated with visionary appeals, collective identity, and long-term EU objectives (e.g., “future,” “together,” “unity”), while transactional leadership was

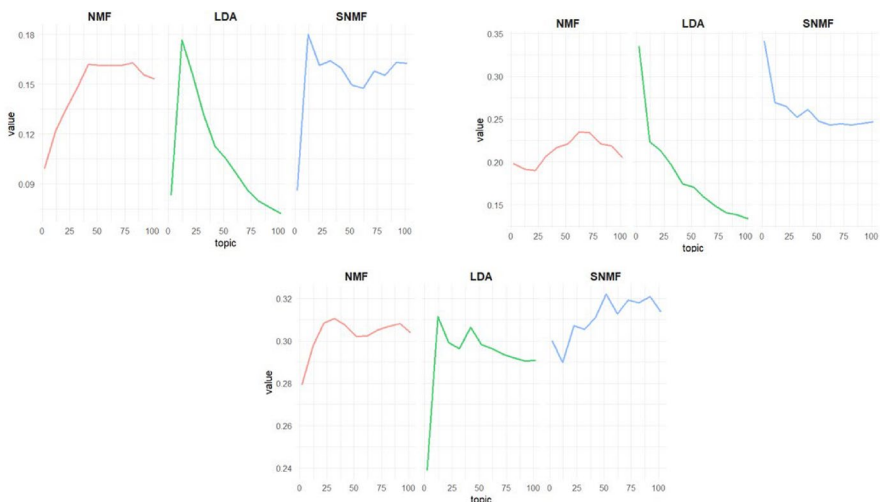


Fig. 2 Comparison of LDA, NMF, and SNMF for Instagram posts, X post and institutional speeches, respectively ("Value" indicates the topic coherence score; "Number of topics" (x-axis) refers to the number of topics extracted by the model)

associated with procedural language, institutional focus, and policy delivery (e.g., “implementation,” “funding,” “legal framework”).

Each topic cluster extracted via SNMF was evaluated on three dimensions:

- Dominant terms (from matrix **H**) and their semantic field;
- Platform-specific tone and purpose (e.g., narrative vs. formal);
- Pronoun usage, to identify relational or directive stances.

To operationalize gendered communication, we built on theoretical models that define it as the adoption of discursive, thematic, and stylistic elements associated with traditionally feminine traits—such as empathy, relational framing, emotional expression, and focus on so-called compassion issues (e.g., healthcare, education, equality) (Eagly & Karau 2002; Campus 2013; Dittmar 2015). In this study, gendered communication was identified through a multi-indicator coding scheme, based on three analytic components:

(1) Topic selection and framing.

Themes that aligned with “compassionate” or human-centered policy domains—such as health, social justice, gender equality, youth and education—were interpreted as reflecting gendered issue ownership (Bystrom et al. 2013; Kittilson & Fridkin 2008). Conversely, topics focusing on security, economics, and defense were considered “masculinized” domains.

(2) Linguistic markers and pronouns.

As shown in Table 2, von der Leyen’s consistent use of collective pronouns (“we”, “our”) over individual or adversarial forms (“I”, “they”) was interpreted as a form of inclusive and relational leadership, a trait frequently associated with female leadership styles (Stalsburg & Kleinberg 2016). Platform-specific shifts—such as the slightly higher use of “I” on Instagram—were used to detect adaptive communicative strategies responsive to gendered expectations and affordances.

(3) Affective tone and narrative strategy.

Clusters were also evaluated based on affective or emotional tone, using a lexicon-based affect detection (not shown here but available in supplementary analysis). Emotional and narrative-rich clusters—especially those containing terms related to empathy, solidarity, or lived experience—were considered reflective of a feminine communication register (Jamieson 1995; Goodyear-Grant & Tolley 2019).

5 Results

5.1 The determination of the optimal number of clusters

To identify the optimal number of clusters, we computed the total intra-cluster variance V_t for a range of cluster counts, from 2 to 10. As defined earlier (Eq. 2), V_t measures the dispersion of membership values within each cluster: lower values indicate tighter, more coherent clusters and thus better clustering quality. Figure 3 shows the trend of V_t as a function of the number of clusters, for each of the three corpora under analysis: Instagram posts (left), X posts (center), and institutional speeches (right). In each subplot, the x-axis represents the number of clusters, and the y-axis represents the corresponding total intra-cluster variance V_t . In each case, we observed the inflection point in the value V_t , identifying where further increases in the number of clusters led to marginal gains in cohesion. For Instagram, the curve plateaued at 8 clusters, after which additional topics became

Table 2 Personal pronouns and adjectives from Instagram, X and institutional speeches

Pronoun and adjectives	Frequency Instagram	Frequency X	Frequency speeches
we	969	882	4605
Our	641	741	2190
I	500	309	1578
my	150	100	207
They	113	119	822
Their	89	120	425
them	4	12	20
Us	2	3	14
me	2	2	5

semantically redundant or too fragmented. For X, a similar trend was observed with a stable and interpretable configuration at 7 clusters. In the case of institutional speeches, 9 clusters offered a good trade-off between internal coherence and thematic distinctiveness.

5.2 Principal themes of Ursula von der Leyen across platforms

The thematic analysis of Ursula von der Leyen's communication across Instagram, X, and institutional speeches was based on the clustering output of the Symmetric Non-Negative Matrix Factorization (SNMF) model. For each platform, we identified semantic clusters using the matrix of membership values, assigning each term to the cluster where it exhibited the highest membership value (subject to a cutoff threshold). Topic labels were derived by interpreting the top-weighted terms (Kennedy et al. 2021) and reviewing the posts and speeches associated with each cluster. A first transversal theme is international diplomacy and geopolitical security. Although present on all platforms, it is articulated differently. On Instagram (Table 3, Cluster 1), diplomacy is communicated symbolically, emphasizing proximity to leaders through curated imagery and affective language—e.g., “With President Zelensky in Kyiv today. Europe stands by Ukraine. We will rebuild together.” (Instagram,

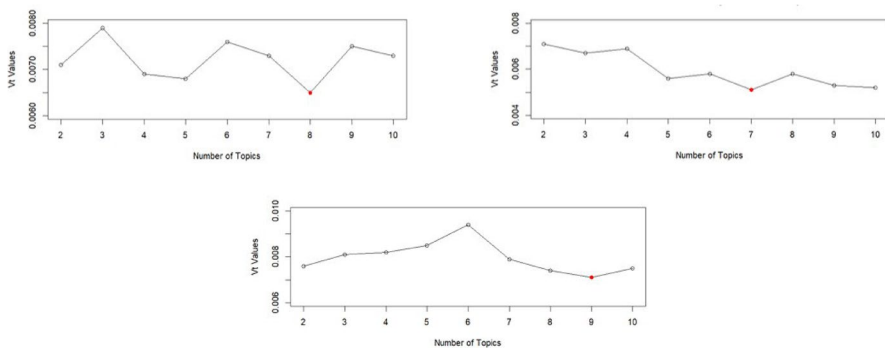


Fig. 3 Intra-cluster variance (V_i) as a function of the number of clusters for Instagram posts, X posts, and institutional speeches

15 Sep 2022). The visual-emotional framing reinforces relational and ideational leadership traits. On X (Table 4, Cluster 2), the tone shifts toward declarative, action-oriented updates: “We will mobilize up to €18 billion for Ukraine in 2023...” (X, 9 Nov 2022), illustrating transactional leadership via policy deliverables. In speeches (Table 5, Cluster 1), the discourse becomes more abstract and strategic: “We have to reduce our dependency on Russian gas...” (Speech, 14 Sep 2022), pointing to transformational and positional leadership. The variation in framing reflects not just platform affordances, but also the shifting registers of authority—from empathy and solidarity (Instagram), to action (X), to institutional vision (speech). Environmental sustainability, especially the European Green Deal, is another cross-platform theme. On Instagram (Cluster 5), the framing is motivational and emotive—“It’s about jobs, innovation and a better future for our children.” (Instagram, 18 Jul 2023)—emphasizing normative appeals consistent with ideational and transformational leadership. On X (Cluster 4), the emphasis is more technocratic and outcome-based, with quantified targets: “Our goal: Europe to become the first climate-neutral continent by 2050...” (X, 4 Feb 2023), suggesting a blend of transformational (vision) and transactional (deliverables) style. In speeches (Clusters 1 and 5), the theme is integrated into EU-wide legislative and planning instruments—“NextGenerationEU... is a once-in-a-lifetime opportunity...” (Speech, 16 Sep 2020)—clearly articulating transformational leadership through long-term normative framing. Digital innovation and technological sovereignty are central on X (Cluster 1): “Our Digital Compass sets clear goals: secure 5G, digital skills...” (X, 8 Mar 2021). The presence of terms such as “compass,” “goals,” and “secure” signals a strategic tone grounded in deliverable-based and future-oriented logic (transactional + transformational). On Instagram, the theme connects with youth and emotion: “Meeting young entrepreneurs in Tallinn...” (Instagram, 1 Feb 2022), where visual narrative and personalization signal ideational and relational dimensions. In speeches (Clusters 3 and 4), digital themes are embedded in inclusive narratives: “It’s about inclusion, education, and values.” (Speech, 15 Sep 2021), reaffirming ideational leadership grounded in EU values. Gender equality and social cohesion diverge in prominence and tone. Instagram (Cluster 2) foregrounds emotional resonance and expressive leadership: “Equality is at the heart of our Union...” (Instagram, 8 Mar 2023), using first-person plural pronouns (“we,” “our”) and inclusive, emotive language. X treats these themes episodically, often limited to hashtags or commemorative mentions: “Today, we celebrate International Women’s Day...” (X, 8 Mar 2022). In speeches (Clusters 2 and 8), gender is integrated into structural policy language: “We will propose binding pay transparency measures...” (Speech, 4 Mar 2020). This combination suggests a platform-specific negotiation of the double bind, where feminine-coded empathy is visible on Instagram, while authority and policy specificity are emphasized in speeches (Jamieson 1995; Campus 2013), aligning with ideational and strategic feminine leadership. The theme of crisis management—especially COVID-19—illustrates similar modulation. Instagram (Cluster 3) emphasizes solidarity and hope: “Vaccines save lives...” (Instagram, 10 Aug 2021), underscoring values and care. On X, the tone is logistical: “We have secured 4.4 billion doses...” (X, 6 Dec 2021), reflecting transactional communication aimed at accountability. Speeches reframe the crisis as an institutional turning point: “With NextGenerationEU, we are building the Europe of tomorrow.” (Speech, 16 Sep 2020), signaling strategic, transformational leadership. The framing shift from emotion to action to vision across platforms supports the hypothesis of adaptive leadership. Platform-specific themes also emerged. On X (Table 4, Cluster 5), humanitarian responses dominate, shaped by the platform’s real-time pace: “We are stepping up humanitarian aid for Gaza...” (X, 24 Oct 2023). Speeches address these topics in normative terms: “Our actions... are guided by our values: peace, security, and dignity.” (Speech, 19 Oct 2023), while Instagram largely

Table 3 Topics from Instagram

Degree	Cluster 1	Degree	Cluster 2	Degree	Cluster 3	Degree	Cluster 4	Degree	Cluster 5	Degree	Cluster 6	Degree	Cluster 7	Degree	Cluster 8
0.482	Summit	0.240	Right	0.349	Vaccination	0.290	Russian	0.438	Greenland	0.464	Intelligence	0.377	Implementation	0.360	Green
0.482	Bilateral	0.234	Human	0.311	Safevaccine	0.262	Sanction	0.391	Education	0.450	Silence	0.351	Albania	0.339	Plan
0.482	Duchesse	0.221	Europe	0.304	Dose	0.244	Belarus	0.361	Signature	0.444	Nation	0.285	School	0.271	Resilience
0.460	Dialogue	0.211	Confirm	0.300	Vaccine	0.221	Ukraine	0.349	Strategic	0.426	Distinct	0.281	Earthquake	0.263	Digital
0.392	Engagement	0.185	Promote	0.264	Vaccinate	0.221	Respond	0.343	Worth	0.425	Visionnaire	0.273	Government	0.252	Invest
0.376	Relation	0.180	Champion	0.261	Population	0.194	Territorial	0.341	Facilitate	0.400	Visionary	0.257	Western	0.249	Recovery
0.341	Future	0.172	Democracy	0.245	Adult	0.188	Integrity	0.306	Field	0.386	Advocate	0.254	Inaugurate	0.243	Nextgeneration
0.318	Economy	0.166	Week	0.232	BioNTech	0.185	Bank	0.302	Preserve	0.374	Leadership	0.252	Reminder	0.231	Power
0.279	Politics	0.163	Livelihood	0.232	Pfizer	0.184	Attack	0.300	Empower	0.339	Identity	0.249	Destroy	0.228	Project
0.263	Global	0.160	Pacific	0.232	Test	0.184	Russia	0.292	Diversify	0.305	Humanity	0.241	Foster	0.221	Technology
0.178	Geopolitics	0.160	Opportunity	0.231	Delivery	0.183	Dependency	0.290	Wide	0.303	Staff	0.233	Family	0.217	Light
		0.158	Woman	0.211	Pandemic	0.182	Latvia	0.280	Raw	0.303	Former	0.224	Rebuild	0.214	Tour
		0.157	Globe	0.206	Contract	0.179	Eastern	0.273	Industry	0.303	Endure	0.223	Child	0.204	Excellence
		0.156	Poverty	0.194	Variant	0.171	Belarusian	0.269	Office	0.265	Tribute	0.216	Process	0.204	Energy
		0.156	Direct	0.186	Booster	0.170	Lithuania	0.261	Growth	0.245	Legacy	0.206	Local	0.201	Sustainable
		0.149	Rule	0.179	Covid	0.169	Supply	0.261	Material	0.244	Development	0.201	Express	0.197	Innovation
		0.141	Europe-anunion	0.174	Speed	0.165	Fossil	0.251	Arctic	0.233	Commission	0.200	National		

Table 3 (continued)

Degree	Cluster 1	Degree	Cluster 2	Degree	Cluster 3	Degree	Cluster 4	Degree	Cluster 5	Degree	Cluster 6	Degree	Cluster 7	Degree	Cluster 8
0.140	Aggression	0.170	Campaign	0.159	Propose	0.246	Hydrogen	0.232	Pay	0.198	Balkan				
0.140	Ambition	0.167	Control	0.159	Support	0.241	Peaceful	0.226	Impact	0.198	Capital				
0.139	Pace	0.165	Virus	0.159	Putin	0.219	Boost	0.213	Leader	0.195	Lose				
0.138	Mission	0.148	Safe	0.157	Poland	0.215	Sector	0.209	Unite	0.190	Heritage				
0.137	Million	0.134	Deliver	0.157	Chair	0.175	Globalgate-way	0.183	Community	0.186	Friendship				
0.134	State	0.132	Health	0.155	partner	0.160	Agreement	0.180	College	0.183	House				
						0.158	Partnership	0.163	President						
						0.151	Economic								
						0.150	Biodiversity								
						0.150	Gateway								

Table 4 Topics from X

Degree	Cluster 1	Degree	Cluster 2	Degree	Cluster 3	Degree	Cluster 4	Degree	Cluster 5	Degree	Cluster 6	Degree	Cluster 7
0.457	Digital	0.307	Ukraine	0.172	Peace	0.244	Energy	0.3759	Gaza	0.2924	Sanction	0.295	Victim
0.426	Identity	0.282	Billion	0.155	Security	0.217	Green	0.336	Humanitarian	0.2182	Circumvention	0.287	Thought
0.426	Cooperation	0.253	Financial	0.1538	Integrity	0.194	Material	0.239	Civilian	0.2162	Russia	0.27,594	Family
0.395	Strategic	0.2416	Disburse	0.1531	President	0.190	Raw	0.2158	Hostage	0.1972	Russian	0.2594	Attack
0.387	Sustainable	0.223	Support	0.147	Migration	0.1873	Transition	0.2061	Palestinian	0.1946	War	0.2085	Mourn
0.346	Innovation	0.2117	Macro	0.1464	Territorial	0.1823	Job	0.1878	Corridor	0.1944	Ban	0.1974	Shock
0.297	Gateway	0.202	Assistance	0.145	Europe	0.1819	Create	0.185	Release	0.18,978	Import	0.18,927	Lose
0.278	Tech	0.1865	Help	0.144	Sovereignty	0.18,136	Investment	0.180	Hamas	0.1832	Machine	0.16,795	People
0.240	Project	0.186	Service	0.138	Challenge	0.1724	Climate	0.1797	Egypt	0.1764	Tighten	0.1631	Senseless
0.2401	Europe	0.1646	Rebuild			0.171	Industry	0.1681	Maritime	0.1734	Package	0.1597	Sadden
0.239	Tech	0.1438	Fund			0.1687	Hydrogen	0.1523	Pause	0.1688	Putin	0.15,763	Terror
0.207	Skill	0.1307	Solidarity			0.1682	Invest	0.1468	Barbarism	0.1603	Oil	0.15,619	Despicable
0.206	Finance	0.1283	War			0.1672	Supply	0.1387	Rafah	0.15,917	Export	0.1513	Express
		0.122	Ukrainian			0.1631	Partnership	0.1377	Hostility	0.1494	Feed	0.14,977	Claim
		0.1217	Brave			0.1591	Renewable	0.1356	Effort	0.1493	Revenue	0.139	Cowardly
		0.1163	Reform					0.1341	Route	0.1456	Aggression	0.1378	Passing
		0.1144	Facility					0.1329	Israel	0.14,536	Wage	0.1374	Condemn
		0.1130	Reconstruction					0.1286	Bridge	0.1407	Pressure	0.1372	Terrorist
		0.110	Infrastructure					0.1275	Reach	0.1324	Crack	0.13,510	Injure
		0.1095	Cohesion					0.1253	Channel	0.127	Price		
		0.1011	State					0.1237	Establish	0.1261	Enforcement		
		0.0979	Windfall					0.1228	Air	0.1185	Measure		
		0.0978	Haul							0.1187	Port		
		0.0940	Money							0.1060	Crime		
		0.093	Profit							0.1015	Grain		
										0.09967	Adoption		
										0.09842	Product		

omits them. Conversely, themes such as rule of law and institutional governance—absent from Instagram and X—are central to speeches (Clusters 6, 7, 9): “We will never allow the independence of the judiciary to be compromised.” (Speech, 15 Sep 2021), expressing positional leadership grounded in office authority. To further validate the stylistic differentiation across platforms, we conducted a frequency analysis of personal and collective pronouns and possessive adjectives. The total counts and relative proportions confirm that Instagram emphasizes a more personalized and relational tone, while speeches are dominated by collective and institutional language. As shown in Table 3, on Instagram, “I” and “my” account for 29.8% of total pronouns, whereas on X they drop to 19.2%, and only 9.6% in institutional speeches. Conversely, the pronouns “we” and “our” account for over 76% of all pronouns in speeches, compared to 66.5% on Instagram and 73.4% on X. This distribution reinforces platform-specific styles: Instagram fosters personal connection and emotional resonance, X maintains a balance between personalization and policy updates, and speeches consistently invoke collective institutional responsibility. The higher prevalence of personal pronouns on Instagram aligns with the platform’s visual and relational affordances and supports the interpretation of a strategic personalization in von der Leyen’s leadership communication. This pattern quantitatively supports the earlier qualitative insights into platform-specific framing and confirms the stylized adaptation of discourse to medium and audience.

Lastly, we perform a quantitative assessment of lexical overlap between platforms using the Jaccard similarity index (Ivchenko & Honov 1998). This metric measures the proportion of shared terms between two sets relative to their union, with values ranging from 0 (no overlap) to 1 (complete identity). For each pair of platforms, we computed the mean Jaccard similarity across all combinations of thematic clusters extracted through SNMF. The results reveal that the score is 0.096 between Instagram and X, 0.104 between Instagram and institutional speeches, and 0.067 between X and speeches. These values underscore a significant divergence in lexical content, supporting the interpretation that von der Leyen adapts both tone and vocabulary to the functional affordances of each platform: affective and symbolic on Instagram, reactive and issue-specific on X, and formal and strategic in speeches.

6 Discussion

This study examined Ursula von der Leyen’s political communication across three platforms—Instagram, X, and institutional speeches—during her first mandate as President of the European Commission. Using Symmetric Non-Negative Matrix Factorization (SNMF) to extract thematic clusters, we aimed to understand how communication style and leadership framing adapt across digital and institutional environments, and how these patterns reflect both leadership strategies and gendered positioning. Our results confirm that von der Leyen’s communication is platform-specific, strategically aligned to the affordances of each medium. Instagram posts emphasize affective language and visual symbolism, privileging emotional resonance and personalization (e.g., solidarity with Ukraine, celebration of gender equality). X is characterized by declarative, real-time messaging, oriented toward issue announcements and public positioning (e.g., sanctions, climate goals). Institutional speeches, by contrast, are dense and policy-oriented, allowing for complex narrative construction and long-term vision framing. This differentiation supports the notion of adaptive

Table 5 Topics from institutional speeches

Degree	Cluster 1	Degree	Cluster 2	Degree	Cluster 3	Degree	Cluster 4	Degree	Cluster 5	Degree	Cluster 6	Degree	Cluster 7	Degree	Cluster 8	Degree	Cluster 9
0.39	Russian	0.42	Minimum	0.47	Presidency	0.45	Speaker	0.27	Term	0.48	China	0.42	Connect	0.34	Father	0.31	Law
0.39	Ukrainian	0.41	Wage	0.42	Choice	0.43	Digitalization	0.27	Production	0.47	Trip	0.39	Cyber	0.33	Training	0.28	Government
0.38	Supplier	0.40	Worker	0.41	Candidate	0.41	Team	0.27	Chain	0.46	Beijing	0.37	Gateway	0.30	Mother	0.27	Protection
0.37	Electricity	0.38	Italy	0.39	Driver	0.41	Culture	0.26	State	0.45	Chinese	0.34	Information	0.30	Youth	0.25	Judiciary
0.36	Gas	0.38	Uncertainty	0.37	Hybrid	0.40	Datum	0.26	Dose	0.44	Changed	0.32	Ally	0.27	Lady	0.25	Justice
0.36	Russia	0.38	Bargaining	0.37	Agriculture	0.39	Cancer	0.26	Depend	0.35	Trade	0.31	Major	0.26	Healthy	0.24	Judicial
0.35	War	0.37	Health	0.37	Mediterranean	0.32	Competitive	0.26	Billion	0.35	Economic	0.30	Partnership	0.26	Education	0.24	Legal
0.34	Russum	0.36	Competence	0.37	Competitiveness	0.32	Spirit	0.26	Vaccine	0.35	Relationship	0.29	Product	0.26	Duty	0.24	Progress
0.34	Price	0.36	Scheme	0.36	Prosperity	0.30	Language	0.25	Invest	0.35	Trading	0.29	Warning	0.26	Preserve	0.24	Negotiate
0.34	Cap	0.36	Stability	0.36	Shape	0.30	Framework	0.24	Transition	0.35	Interests	0.28	Soldier	0.25	Ambitious	0.24	Robust
0.34	Ukraine	0.33	Fragility	0.36	Mission	0.29	Street	0.24	Michel	0.32	Policy	0.28	Era	0.25	Kingdom	0.23	Union
0.34	Putin	0.33	Dignity	0.35	Neighborhood	0.29	Succeed	0.23	Course	0.31	Strategy	0.28	Missile	0.25	Burden	0.23	Court
0.34	Pipeline	0.33	Record	0.34	Food	0.29	Atlantic	0.23	Crisis	0.30	Military	0.28	Forces	0.25	Just	0.23	Mechanism
0.31	Sanction	0.32	Medical	0.34	Clean	0.28	Job	0.23	Covid	0.29	Engagement		Pay	0.25	Pay	0.23	Independence
0.30	Fuel	0.32	Fiscal	0.34	Pain	0.27	Strike	0.23	Tax	0.29	Seen		Story	0.25	Story	0.23	Assure
0.30	Energy	0.31	Lesson	0.33	Board	0.27	Gender	0.22	Green	0.29	Status		Save	0.24	Save	0.23	Negotiation

Table 5 (continued)

Degree	Cluster 1	Degree	Cluster 2	Degree	Cluster 3	Degree	Cluster 4	Degree	Cluster 5	Degree	Cluster 6	Degree	Cluster 7	Degree	Cluster 8	Degree	Cluster 9
0.30	Heat	0.31	Drop	0.33	Destiny	0.22	Recovery	0.28	Respect	0.24	Rule	0.23	Council				
0.29	Storage	0.31	Proof	0.32	Weather	0.22	Achieve	0.28	Capabil- ity	0.23	Ground						
0.29	School	0.31	Collec- tive	0.32	Private	0.22	Topic	0.27	Resil- ience	0.22	Agreement						
0.28	Tempo- rary	0.29	Opportu- nity	0.32	Imple- menta- tion	0.22	Deliver	0.22	Update								
0.28	Kiev	0.29	Cross	0.32	Effective	0.22	Fund	0.22	Advance								
0.28	Measure	0.29	Mask	0.32	House	0.22	Pan- demic	0.22	Coopera- tion								
0.27	Diversify	0.29	Agency	0.31	Commis- sion	0.22	Capacity	0.22	Principle								
0.27	Reliable	0.29	Destroy	0.30	Afford- able	0.21	Western										
0.27	Fossil	0.29	Decent	0.30	Enor- mous	0.21	Poland										
		0.28	Assess- ment	0.29	Invest- ment												

mediatized leadership (Mazzoleni & Schulz 1999), where leaders modulate style and content depending on the communication context without compromising thematic consistency. Recurrent topics—such as the Green Deal, digital innovation, or geopolitical crises—are present across all three corpora, yet articulated differently to fit the communicative logic of each platform. This confirms a context-sensitive structure of communication (RQ1), aligned with platform-specific functions: emotional engagement on Instagram, agenda-setting on X, and strategic justification in speeches (Tufekci 2013; Enli 2017; Van Aelst et al. 2017). Notably, longitudinal variations in the lexical framing of the same topic (e.g., Ukraine) show an evolution from symbolic statements (“We stand with Ukraine”) toward implementation-focused language (“We have approved the 12th sanctions package”), reflecting policy cycle stages—agenda-setting, mobilization, delivery. This semantic shift, combined with low lexical overlap (Jaccard index < 0.11), further supports the idea of communication as a dynamic, adaptive process rather than a static message distribution strategy. Our analysis indicates that von der Leyen’s leadership communication blends multiple leadership styles, strategically shifting between them depending on topic, platform, and institutional role. These shifts are evidenced in the thematic clusters and in specific lexical features (see Sect. 5.2), such as the use of personal vs. procedural language, emotional vs. institutional tone, and directive vs. collaborative frames.

- Transformational leadership emerges prominently in speeches addressing long-term goals like the European Green Deal or digital sovereignty. These communications foreground strategic vision, normative values, and collective identity (“NextGenerationEU is not just a plan—it is our opportunity to shape the future”), echoing Müller (2020).
- Transactional leadership is visible in X posts and speeches centered on negotiation and implementation (e.g., vaccine delivery, sanctions packages), where policy execution and measurable outcomes are emphasized (Bass 1990).
- Positional leadership is most evident in institutional stances, particularly in speeches related to EU authority and rule of law (“We will never allow judicial independence to be compromised”), where authority is derived from office (Calise 2005).
- Ideational leadership is reflected in cross-platform appeals to shared European values, especially in areas such as democracy, solidarity, and equality. These statements aim to legitimize policies by aligning them with ethical narratives (Baracani 2023).

This strategic alternation among leadership styles reflects a contingent and adaptive model (Dowding 2013), rather than a fixed communicative identity. The topic modeling results provide empirical support for these interpretations by identifying platform-specific clusters aligned with these leadership categories. The data also reveal how von der Leyen performs gendered leadership across platforms, selectively mobilizing femininity and authority depending on the communicative context. On Instagram, gender-related posts are frequent and emotionally expressive. For instance, messages posted on International Women’s Day or during symbolic events employ affective and inclusive language (“Let’s break the glass ceiling—together”) and emphasize community and empathy—traits associated with relational or feminine leadership (Jamieson 1995; Campus 2013). On X, gender topics are less frequent and more formulaic, often confined to hashtags (#IWD2023) or brief statements. Speeches, in contrast, institutionalize gender issues within a policy framework, emphasizing legal instruments and systemic reforms (“We have proposed a directive to combat violence against women”), which denotes a shift from emotional resonance to structural commitment. This multimodal gender performance reflects von der Leyen’s strategic navigation of the “double bind”—the expectation to be both authoritative and caring,

assertive and likable. By adapting tone and framing to the platform while maintaining message coherence, she exemplifies a hybrid model of strategic feminine leadership (Verge & Pastor 2018; Krook & O'Brien 2012). Importantly, her consistent advocacy for women's rights and equality, combined with the use of emotionally charged language in selected contexts, represents both adaptation and resistance to gendered expectations in leadership (RQ2).

The multifaceted leadership has solidified her role as a future-oriented and decisive figure in EU politics. On July 18, 2024, Ursula von der Leyen was re-elected President of the European Commission with 401 votes, well above the required 360. The absence of alternative candidates further highlighted the growing politicization and personalization of EU institutions (Von der Burchard et al. 2020). Despite shifts in the European Parliament following the June 2024 elections—where Eurosceptic parties gained ground in countries like Germany, France, and Italy—the coalition of EPP, Socialists, and Liberals remained the only viable majority, ensuring the continuity of von der Leyen's leadership. This context has reinforced the presidentialization of EU governance, evolving into a consensual parliamentary system in which coalition-building and compromise remain essential (Kassim 2022).

7 Conclusions and future developments

This study offers new empirical and methodological insights into Ursula von der Leyen's multi-platform communication strategy during her first term as President of the European Commission. By applying Symmetric Non-Negative Matrix Factorization (SNMF) to a large corpus of texts drawn from institutional speeches, Instagram posts, and content from X, we uncovered key differences in thematic emphasis and discursive style across platforms. Two main findings emerge: first, von der Leyen strategically adapts her communication to each platform—employing formal, policy-focused discourse in speeches, actionable and declarative language on X, and emotional, personalized storytelling on Instagram. Second, her leadership style blends transformational traits (visionary appeals, unity framing) with transactional elements (policy delivery, legislative focus), in a context-sensitive manner. Critically, the analysis reveals that von der Leyen "speaks as a woman" not through overt identity claims, but through strategic gendered communication. Across platforms, she consistently employs inclusive language (e.g., high usage of "we," "our"), affective appeals, and emphasis on values such as equality, empathy, and solidarity. While avoiding explicit references to gender roles or maternal identity, she cultivates a leadership style that balances authority and relationality—thereby navigating the double bind that female leaders often face. This hybrid and adaptive style allows her to assert institutional credibility while humanizing her leadership persona, especially in digital spaces where emotional connection and authenticity are key.

However, several limitations should be acknowledged. First, social media platforms are governed by algorithms that influence content visibility, potentially distorting audience reception and engagement. Second, the decision to include only English-language posts and speeches, while aimed at ensuring comparability, may exclude culturally embedded nuances present in other linguistic contexts. Third, while SNMF effectively identifies salient terms and themes, it may underrepresent rhetorical subtleties, stylistic variation, or implicit meanings that require qualitative or discourse-level analysis. Despite these constraints, the study provides relevant theoretical insights. It contributes to the literature on

presidentialization in EU governance by showing how the Commission President leverages differentiated communication channels to assert visibility, build political capital, and construct coherent public narratives. It also advances gendered leadership theory, illustrating how a female leader like Ursula von der Leyen blends normative and performative dimensions across platforms—combining emotional resonance with institutional authority in a strategic and adaptive manner. Future research could build on this framework by conducting longitudinal comparisons with the communication strategies of other European Commission Presidents—such as José Manuel Barroso or Jean-Claude Juncker—to investigate how institutional leadership styles evolve over time and in response to shifting political and media landscapes.

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Declarations

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