Frames and sentiments of the Twitter communication by German Chancellor Scholz during the Russian invasion of Ukraine

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Abstract: *In a complex information environment, Russia's invasion of Ukraine presents a major challenge to the communication of political leaders throughout the world. The objective of this article is to analyse the frames and sentiments used by German chancellor Olaf Scholz, employing a novel data set of his Twitter communication (N = 612) during the Russian invasion of Ukraine between 24 February 2022 and 24 February 2023. A combination of computational text analysis approaches with natural language processing (NLP) techniques was used, including the Valence Aware Dictionary and the sentiment Reasoner (VADER) model for sentiment analysis and Latent Dirichlet Allocation (LDA) for topic modelling. This research investigates the prevalent frames and emotions in the chancellor's communication, providing valuable insights into the German government's stance and strategic communication during this critical geopolitical event. The results of the study revealed that the chancellor used the frames 'effects of the Ukraine invasion', 'climate & environment', 'solidarity' and 'Russian aggression' and communicated with positive sentiments. By examining the chancellor's Twitter communication, this study contributes to the understanding of political communication in the digital era, particularly in the context of international crises, and offers implications for policymakers, scholars and the broader public.*

Keywords: ***Olaf Scholz, Russian invasion, sentiment analysis, social media***

I. Introduction

After the Soviet Union (USSR) had dissolved in 1991, Ukraine declared itself an independent country on 24 August 1991 (Bukkvoll 1997). Tensions between Ukraine and Russia have been on the rise for decades, but have substantially increased in the past few years, leading to the annexation of Crimea by Russia through non-military and military means in March 2014 (Biersack – O'Lear 2014; Marples 2022) and culminating in Russia's military invasion of Ukraine in February 2022, a disaster for the Ukrainian people and their nation, causing millions of people to flee their homes and villages, with many seeking refuge overseas. War is a disguised humanitarian crisis that disrupts communal harmony and fosters violence, terrorism, social inequality and exclusion (Jain et al. 2022).

International crisis management is of the highest significance for Western nations participating in transnational events and local and regional conflicts overseas in today's globalised world (McNair 2016; Schwarz – Seeger – Auer 2017). In response to recent disruptions in Europe caused by the euro, Ukraine and the migrant crises, the German government has abandoned its policy of moderation. The German government was placed in a leading role in international crisis management with its impact on the stabilisation of the currency of the European union (2010–2015), during peace negotiations in Ukraine (2013–2015) and by the temporary suspension of the Dublin agreement during the migration crisis (2015–2016) (Daehnhardt 2018; Wright 2018).

Every piece of verbal or non-verbal, direct or indirect information supplied by political leaders during an invasion or war is crucial. In these times of crisis, leadership is improved not only by taking appropriate actions but also by showing the appropriate attitude or emotion (Boin et al. 2017). The disputes extend beyond military warfare; the dramatic disparities in terminology used to describe war are indicative of efforts to manipulate public opinion, which has been an effective military technique throughout history. Accordingly, Russia and Ukraine manipulate information to pursue their objectives in this conflict, although to varying degrees (Roman et al. 2017).

The government's use of social media to communicate has risen considerably in recent years, making them a crucial battlefield (Criado et al. 2013). Social media platforms allow governments and politicians to choose their political agendas and communicate directly with their audiences (Yang et al. 2016). The essential concern regarding digital media and government communication is whether or not the government loses power as a consequence of using political communication. Some argue that institutional rules shared by governments and media organisations no longer control political communications, since social media are the medium of the people (Warnick – Heineman 2012). It should not be forgotten that the role of user-generated online media is a blessing and a curse at the same time: On the one hand, scientists argue that social media

serve as venues for the growth of participatory culture (Bertot et al. 2012) and as facilitator of the mobilisation of the public (Papacharissi 2016); on the other hand, others emphasise that social media simply strengthen pre-existing power structures in the media environment and in society (Fuchs 2013: 62) and serve as platforms for the expression of right-wing discourses (Ekman 2019) or result in the formation of echo chambers (Brundidge 2010; Flaxman et al. 2016).

The aim of this article is to provide a systematic overview and demonstrate the evolution and dynamics of the media discourse of the political leader of Germany. It investigates the framing of the Ukraine crisis by analysing Olaf Scholz' Twitter communication during the Russian invasion of Ukraine from 24 February 2022 until 24 February 2023 and addresses the absence of integrated assessments on strategic media frames (Borah 2011). This research focuses on social media due to their enormous interactive possibilities and wider reach than traditional media in crisis communication (Xu 2020). The goal of this analysis is to understand 'what' and 'how' the political leader communicated to society. By investigating the dynamics of emotional and content-related components of Olaf Scholz' communication, I aim to discover changes in his framing and the emotions used to communicate during the invasion by Russia. Hence, this study addresses the following research questions:

Q1: What are the common frames used by Chancellor Scholz on Twitter during the invasion of Ukraine?
Q2: How did the prevalent frames change during the invasion?
Q3: How did the sentiments use change during the invasion?

This study contributes to previous research by systematically analysing Twitter communication of the German chancellor during the Russian invasion of Ukraine. Consequently, the purpose of this article is to provide a more systematic and nuanced understanding of the crisis communication and to identify its key components. By analysing the social media content within a longer period, between 24 February 2022 and 24 February 2023, this research should also give insights into and understanding of discourse shifts. This is the first study so far analysing the social media communication of the German chancellor during the Russian invasion, applying computational text analysis tools to perform the analysis.

II. Literature review / Frames

Gamson and Modigliani (1987) defined frames as central organising story lines or ideas, which can influence individual opinion and understanding of an issue by highlighting specific characteristics or elements of a broader picture (Nelson et al. 1997), to promote a specific issue definition, causal interpretation,

moral evaluation or treatment recommendation (Entman 1993), integrating framing as a fundamental part of political communication (Chong – Druckman, 2007a). In addition, frames have the ability to give meaning to problems and propose how others should think and interpret them. (Nelson – Kinder 1996; Sniderman – Theriault 2004). Frames can be detected within the content of cognitive structures of journalists, news media, in the minds of individuals and strategic communications of political and organisational actors (Matthes 2011). Communicators with unequal resources, including activists, political elites, lobbyists and social movements build frames about an issue and attempt to establish them in news media and public discourse (Benford – Snow 2000; Hänggli 2012).

Nevertheless, people do not blindly accept the framing of news media; on the contrary, many criteria determine whether people are affected by frames. For example, Matthes (2008) found that only a consistently scheduled frame has the probability of causing an effect (also known as frame repetition); and that if there is a competing frame, the frame effects are weaker (Chong – Druckman, 2007b). This phenomenon is relevant to all subject matters in modern democratic societies due to two primary factors: Firstly, there is a prevalent competition among political elites for the determination of frame definitions, and secondly, journalists are generally inclined towards conflicts, subsequently adhering to the journalistic norm of presenting diverse perspectives. Moreover, frames supported by feeble arguments yield diminished effects. Efficacious frames necessitate persuasive and compelling evidence, or the utilisation of emotions such as anger or fear (Chong – Druckman, 2007b). Ultimately, the impact of framing is significantly contingent upon the credibility of sources, individuals' prior opinions and citizens' interpersonal communication (Matthes 2008).

Framing has a crucial role when dealing with crises such as armed conflicts (Makhortykh – Sydorova, 2017), healthcare emergencies (Bolsen et al. 2020) or natural catastrophes (Houston et al. 2012). By emphasising specific interpretations of a crisis, frames possess the capacity to significantly influence its trajectory by dictating the reactions of pertinent stakeholders and shaping their anticipations of the crisis. Within the realm of armed conflicts, the consequences of framing can manifest in a multitude of ways, ranging from fostering reconciliation and attenuating hostilities to facilitating amicable resolutions (Bratic 2008), as well as exacerbating violence and hindering the adoption of de-escalatory measures (Hamelink 2008).

Nevertheless, besides emphasising the issue, media frames can also invoke and associate emotional connotations with the situation under consideration. A prior study demonstrated that positive emotions exhibit a contagious effect among followers (Kaur et al. 2021). Manuel Castells devoted his book, *Communication Power*, to the exploration of communication in the digital era,

scrutinising the manner in which individuals interpret information obtained from media sources and the influence of media on the 'framing of the public mind' (Castells 2013: 157). In particular, he concurs with Entman's assertion that emotionally charged frames exhibit a greater propensity to interact with pre-existing cognitive frames and elicit specific emotional reactions (Castells 2013: 157). Consequently, media frames capture the audience's attention when their understanding of a specific event aligns with the interpretation proffered by the frame. Castells employed the United States' war in Iraq as an illustration, during which 'patriotism' and 'war on terror' frames were employed, evoking fear of death as the principal emotional undertone (Castells 2013: 169). This is highly pertinent to the subject matter this research endeavours to analyse, as it also represents an emotionally charged topic. In this investigation, I aim to identify various emotions, such as joy, love, surprise, sadness, fear and anger, which are linked to or incited by different media frames and the issue of migration in general (refer to the Methods section).

2.1 Framing the Russian aggression against Ukraine

Since the inception of the hybrid conflict in 2014, the scholarly domain has exhibited substantial interest in the framing of Russia's aggression towards Ukraine. For instance, the research focus of Pasitselska (2017), Ojala et al. (2017) and Nygren et al. (2018) has predominantly centred on the media framing of the Ukrainian conflict. Ojala et al. (2017) conducted an analysis of the visual framing of the war within a sample of major Western European media, revealing a tendency to underscore the humanitarian aspects of the conflict as well as the involvement of Russian political leaders. Nygren et al. (2018) examined the framing of the conflict in Ukrainian, Russian, Polish and Swedish television programmes and publications, identifying considerable country-specific variations in the propensity to emphasise neutrality over partisanship concerning the war. The findings suggest the existence of significant disparities in framing. Pasitselska (2017) explains how two prominent Russian television channels crafted a persuasive message, fostering robust unity and garnering extensive support among the national audience.

Research has thoroughly investigated social media responses to the events surrounding the 2014 Russian annexation of the Crimean peninsula (Suslov 2014), including images (Pantti 2019), hashtags (Makhortykh – Lyebyedyev 2015) and memes (Wiggins 2016). However, the portrayal of the Ukrainian conflict on social media remains underexplored. Additionally, Makhortykh and Sydorova (2017) utilised a content analysis of the Russian social media platform 'Vkontakte' to assess how the conflict was interpreted and depicted online within pro-Russian and pro-Ukrainian communities. In another study conducted by Nikolayenko (2019), which analysed Twitter during the peace march on 21

September 2014 in Moscow, the frames consisted of peace activists, whereas opponents of the march held contrasting frames. Gaufman (2015) investigated textual and visual framing of the war in 'Vkontakte' communities and observed a tendency to draw upon references to previous armed conflicts (such as World War II) to augment the emotional impact of the frames, as well as the inclination to dehumanise Ukraine and the West as part of the framing process.

Besides the relatively limited number of studies examining the framing of Russian aggression against Ukraine on social media, further research gaps warrant attention. The first of these pertains to the absence of a systematic investigation of the framing of the invasion in the context of the subsequent stage of the war that commenced in February 2022. In the academic literature, the concentration has predominantly been on the communication strategies employed by the aggressor party. However, to date, merely a single study has undertaken an analysis of the communication approach adopted by the political leader, Volodymyr Zelenskyy, spanning the invasion period from February 2022 through February 2023 (Nisch 2023). Moreover, none of the prior studies have scrutinised the communication of political leaders which are indirectly involved and their social media communication utilising frames and emotions.

2.2 Government social media communication

Communication of the government serves an educational purpose by informing citizens, and Gebauer (1998) defines it as public relations for policymakers to justify or explain their decisions. Therefore, the government, which is represented by elected officials, is expected to inform the public about its activities and political decisions to justify them to the public (Gebauer 1998). According to Hill (1993), government communication should inform and assist individuals in influencing and participating in government activities, decisions and proposals. Citizens should have access and the ability to approve or reject government choices, actions and ideas that have an impact on their daily lives. Governments legitimise their actions by informing their citizens. Previously, the governments largely addressed these issues through press releases and made them public in newspaper articles, radio interviews and television appearances. Due to the growth of social media lately, governments are broadening their choices to educate and engage with the public in order to meet their requirements and expectations (Borucki 2016). One major source of friction in the relationship between governments and citizens is a lack of trust, which can be improved primarily through transparency, engagement with stakeholders and effective action. Therefore, a government's use of social media must be viewed as a paradigm shift aimed at increasing citizen participation and empowerment through increased government accountability, transparency and open collaboration (Bonsón et al. 2014).

Despite these potential advantages, not all technological advances or adoptions are entirely useful. Farazmand (2012) defines technology as both a facilitator and a destroyer, a platform capable of facilitating and restraining emancipation and tyranny, development and deterioration, and democracy and despotism. Among these negative aspects are the exponential surge in fake news since the emergence of social media and the restriction of social media channels in some nations.

Twitter is widely utilised in the socio-political sphere as a tool for spreading information and ideas. The adoption of social media by political leaders to disseminate information has been widely increasing. One of the most popular users of Twitter was the former president Donald Trump (Ross – Rivers 2018). Furthermore, Bertot et al. (2012) found in their study that governments centred their activities on social media. The study found that the Obama administration's use of social media focused on contact with the public, the spread of information and the distribution of services (Bertot et al. 2012).

The literature also discusses the use of social media by opinion leaders to bypass conventional media; politicians, journalists, celebrities and others are enabled to use social media to maintain direct contact with their audiences. In the past, they relied on the mainstream media for coverage and visibility, while today, they utilise their social media accounts to communicate with their audiences directly without the participation of the traditional media (Lev-On 2018). Early studies on politicians' internet use centred on their worries and the potential harm that social media could do to their reputations. Politicians are exposed to public criticism in social media spaces, are forced to respond to uncomfortable enquiries and need time and resources to be appropriately managed (Stromer-Galley 2000). Digital platforms are transforming the landscape of political information, but they are not replacing journalism and conventional media, they coexist alongside them, each offering their own advantages (Casero-Ripollés 2018).

The architecture of each digital platform varies, resulting in distinct features unique to each platform (Bossetta 2018; Nahon 2016). These differences significantly impact the distribution of content across these platforms. For instance, prior research emphasises that Twitter focuses on disseminating news and current affairs, whereas Facebook focuses on fostering user communities and, consequently, facilitates mobilisation and organisation (Stier et al. 2018). Researchers all over Twitter's world use the database for their research because of its significance in the political discourse, since many politicians use it as an instrument for campaigns and elections or the society for movements and protests in political events (Jungherr 2016). The paradox lies in research focusing on Twitter despite Facebook's larger user base. This can be attributed to factors such as Twitter's data accessibility, its alignment with political discourse through news dissemination and its status as a hub for

political influence due to the presence of prominent political and journalism figures (Casero-Ripollés 2018).

There is a geographical bias in research on public leadership and crisis management, since the majority of studies analyse US-American situations, while there is little empirical research about other countries (Helms 2008). This research addresses this gap by analysing the tweets of Chancellor Olaf Scholz in Germany.

2.3 The setting Germany

Germany is a representative democracy. The country has a multiparty political system structure, its electoral system is based on the principle of proportional representation, and it has a consensus-based political culture. The German Federal Government (also called Federal Cabinet or in German Bundeskabinett or Bundesregierung) can be defined as the chief executive body of the Federal Republic of Germany. It consists of the federal chancellor and federal ministries. The current and 24th federal Government of Germany has been in office since 8 December 2021 and governs for four years. It consists of 16 ministries and the chancellor (Bundesregierung 2022).

The use and expanses were debated in Parliament in 2015. Therefore, the following information was disclosed. The German government uses social media offerings on Facebook, YouTube, Instagram and Twitter as a contemporary extension of its public relations work. In this way, it fulfils its constitutional mandate to inform citizens about its activities, plans and goals. These offerings are citizen centric and dialogue orientated. They provide a direct insight into government activities, and thus ensure greater transparency. The Press and Information Office of the Federal Government (BPA) operates social media accounts on behalf of the entire federal government, which are managed by a social media editorial team at the, BPA. Social media information does not replace traditional channels such as the www.bundesregierung.de website or print products. Numerous brochures, guidebooks and leaflets provide citizens with information on important government policy issues (Deutscher Bundestag 2015). To create an initial social media strategy, the amount of EUR 196,350 was invested, and each ministry has employees who work on the social media channels, which can range from 0.2–10 employees, depending on the workload (Deutscher Bundestag 2015).

Chancellor Olaf Scholz has two social media accounts: An Instagram account like his predecessor Angela Merkel's, and a newly created Twitter account, which has been in use since February 2022 to communicate with the public.

2.4 Emotions

During campaigns, the strategic use of emotions by political leaders for communication depends on how they want to be seen by the audience in order to evoke comparable sentiments from them. Emotions of political leaders may have a significant impact on their public (Paul – Sui, 2019). Leaders are evaluated based on how they respond to issues which they are faced (Bucy – Bradley 2004); consequently, even the briefest demonstration of emotion, lasting less than a second, may lead to intense reactions from followers (Stewart et al. 2009). Therefore, the importance of emotions in communication to influence supporters may grow. During a crisis, non-verbal expression of emotion may backfire, so it is crucial to be conscious of how one expresses oneself.

In general, individuals are more inclined to engage with entertaining and inspiring articles than those causing fear and anger (Borah 2016). Furthermore, when positive feelings are conveyed, a positive attitude may spread (Barsade 2020). Consequently, individuals who follow the leader on social media are more likely to echo their emotions. Lewis (2000) utilised filmed speeches to evaluate the emotions of leaders and how they influenced their followers. He found that neutral emotions are more effective than angry or sad ones. In addition, followers showed less enthusiasm for leaders who conveyed negative feelings. Consequently, it is essential to study the detection of emotions in leadership communication during crises.

Numerous researchers are engaged in emotion detection utilising text, picture, audio and video, among other media (Shrivastava et al. 2019). Nevertheless, this research is focused on the text analysis of tweets using a machine learning technique that classifies the text into emotions, such as 'anger', 'anticipation', 'disgust', 'fear', 'joy', 'sadness', 'surprise', 'trust', 'negative' and 'positive'. The extraction and analysis of leaders' Twitter posts may reveal their emotional states.

III. Methodology

3.1 The Data

This study uses tweets posted from the official Twitter account from the chancellor of Germany Olaf Scholz (@Bundeskanzler) from 24 February 2022 until 24 February 2023 to examine his communication towards the population. Raw data was collected on March 2023 using the rtweet package R package rtweet (Kearney et al. 2023) and the official API, and a total of 612 tweets were collected. The data collection included the written text content as well as the creation data and the user's Twitter screen name. The following procedures were used to process and analyse the Twitter dataset using R and Python:

1. Raw data extraction: After gathering the data in R the data is exported as an Excel sheet.
2. Text Pre-processing: The extracted tweets were preprocessed using regular expressions and Natural Language Processing (NLP) methods to clean up the content, eliminate irrelevant data and make them processable.
3. Sentiment analysis: VADER (Valence Aware Dictionary and sentiment Reasoner) (Hutto – Gilbert 2014) was utilised to conduct sentiment analysis on the collected tweets with the goal of identifying and extracting attitudes, emotions, evaluations and opinions.
4. Topic Extraction: Latent Dirichlet Allocation (LDA) was used after proper preprocessing to identify the primary subjects in the collection of tweets and their changes over time.

3.2 Data Pre-Processing

A tweet is a microblog message posted on the Twitter platform. The textual content of a tweet is limited to 280 characters; the inclusion of a hyperlink reduces this limit to 257 characters. Raw tweets contain redundant information and are very unstructured. The R, Python and NLP approaches were utilised to do the following pre-processing stages with the goal of transforming raw data into a format that can be simply read and used for sentiment and topic analyses:

1. Pre-processing in R: Subsequent to the acquisition of data, regular expression was employed to eliminate mentions, URLs, hashtags, HTML characters (replacing '&amp' with 'and' or tags (such as , <p>, etc.). Additionally, unnecessary line breaks, special characters and punctuations (except exclamation points since VADER uses them for sentiment analysis), were removed as well as numbers and dates.
2. Twitter posts of the chancellor of Germany are sometimes written in different languages; therefore, the text was converted into English using the 'googletrans' tool (Google LLC 2023).
3. As in the second part, a higher quality dataset is needed for the LDA. The vocabulary was pruned by removing stop words, and terms unrelated to the topic (such as 'as', 'from', 'would', etc.), and a bigram model was created. Further, lemmatisation and tokenisation could improve the model to achieve better results (Ghosh – Gunning, 2019). The text was then tokenised using the Gensim library (Rehurek – Sojka) to ensure that every word appears in a consistent format. Finally, the spaCy library of NLTK (Bird et al. 2009) was utilised to achieve lemmatisation.

3.3 Sentiment Analysis

Humans associate phrases, sentences and words with emotions. Sentiment analysis utilises computational techniques to extract and analyse the emotions portrayed in a document. In the current study, the Valence Aware Dictionary and sentiment Reasoner (VADER) model was used to interpret and evaluate sentiments, opinions and emotions from the collected tweets of the German chancellor.

Vader is a pre-trained sentiment lexicon and rule-based sentiment analysis tool that was first introduced in 2014 by Hutto and Gilbert (2014) specifically tailored for social media text analysis. It works exceedingly well in microblogging contexts where the short-text data are a complex mix of a variety of features and a sentence may contain multiple sentiments at once. Freely accessible as a 'vaderSentiment' module included within the Python NLTK library, VADER Sentiment Analysis can be used to analyse unlabelled text. Notable advantages of VADER over conventional sentiment analysis approaches include:

- Training data are not needed. It is built using a crowd-validated, standard sentiment lexicon (accompanied by corresponding sentiment intensity measures) that is specialised in analysing the sentiment of social media platforms such as Twitter.
- Evidence of outperforming individual human raters and exhibiting equal or superior performance compared to other highly-regarded sentiment analysis tools in determining tweet sentiment (Hutto – Gilbert 2014).
- It performs computationally quickly and does not significantly suffer from a speed-performance trade-off.
- Vader was already used in several similar studies before (Stracqualursi – Agati 2022; Rustam et al. 2021; Moussa et al. 2020; Monselise et al. 2021).

VADER can perform sentiment analysis based on its rules, employing an array of lexical features such as capitalisation, punctuation, degree modifiers, the contrastive conjunction "but" and the negation-flipping trigram.

The sentiment score (*Ss*) of a phrase is determined by summing the lexical rates of each word that is included in the VADER dictionary. Following appropriate normalisation, VADER generates a 'compound' *Ss* that ranges from 1 to –1, from most positive to most negative. Threshold values can be applied to classify tweets as negative, neutral or positive once the *Ss* is known.

In this study, the VADER model yields a sentiment score, which is used to apply the following thresholds in order to classify each tweet with its polarity: positive, neutral or negative (see Table 1).

Table 1: Threshold of sentiment score and polarity

Ss	Polarity classification
Ss > +0.05	Positive
Ss <-0.05	Negative
+0.05 ≥ ***Ss*** ≤ -0.05	Neutral

3.4 Topic modelling

The objective of the unsupervised machine learning approach known as 'Topic Modelling' is to find the topics that most accurately represent the content of a collection of documents. It is a text mining technique that identifies the topics of texts from a large corpus of documents that have been gathered (Blei et al. 2003). One of the most commonly used topic modelling techniques is the Latent Dirichlet Allocation (LDA) model. This three-level hierarchical Bayesian probability model serves to represent a corpus effectively. The concept of LDA is that each document contributes to a topic and the topic is characterised as a word distribution (Lee et al. 2018). The procedure for creating documents inside a corpus, especially in LDA models, is as follows:

1. θ is sampled from a Dirichlet prior mixture of t topics, which is parameterised by α.
2. Following that, a topic t_n is then sampled from a multinomial distribution, $p(\theta \mid \alpha)$ which is the document topic distribution and models $p(t_n = i \mid \theta)$.
3. The number of topics was set to $t = 1\ldots, T$, and the distribution of words with t topics is described by ϕ, which is also a multinomial distribution whose hyper-parameter β follows the Dirichlet distribution.
4. Through the topic t_n, a word w_n, is then sampled via the multinomial distribution $p(w \mid z_n; \beta)$.

A document or, in our specific case, tweet $'k'$ containing words is described as:

$$p(k) = \int_{\theta} p(\theta \mid \alpha) \left(\prod_{n=1}^{N} \sum_{t_n=1}^{t} p(k_n \mid t_n; \beta) p(t_n \mid \theta) \right) d\theta$$

Furthermore, with LDA it is possible to observe how the various topics of texts evolve over time. The collected data set corpus used for this research (from February 2022 until February 2023) contains twelve months and is then calculated by the model provided by gensim (Rehurek – Sojka).

Finding the right number of topics is a crucial challenge in LDA. Coherence scores were suggested by Roder et al. (2015) to rate the effectiveness of each topic model. The measurement used to evaluate the coherence between topics inferred by a model is specifically topic coherence. For the coherence measure, *Cv* was used, which is a measure based on a sliding window that employs cosine similarity and normalised point-wise mutual information (NPMI). These values represent how much a topic's words 'make sense' and are meant to mimic the relative score that a human would probably give it.

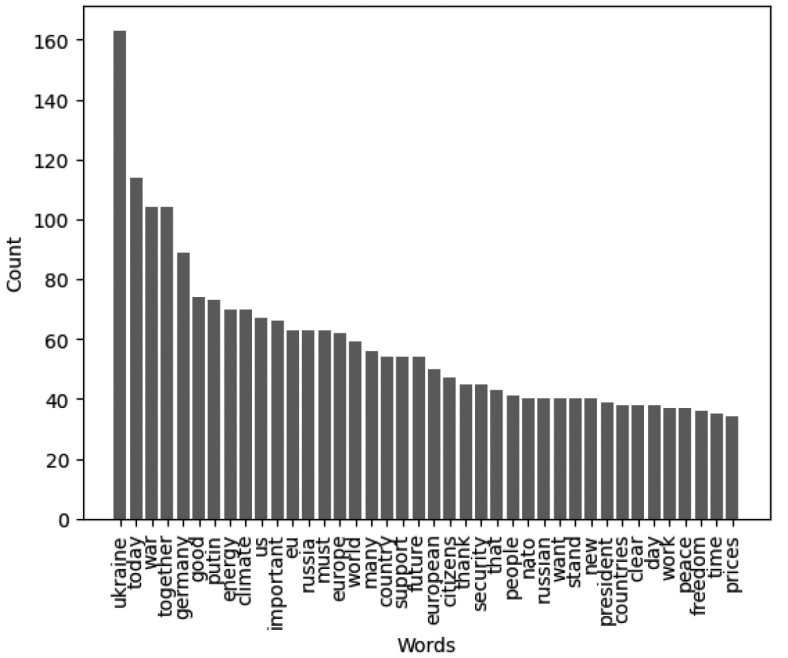
These ratings suggest the degree of coherence among the 'top' words within a particular topic. Additionally, the distribution of the principal component analysis (PCA), which can display the topic models in a spatial framework with two dimensions, is taken into account. It is preferable to have a uniform distribution, which is perceived as having a high degree of independence for each topic. Higher coherence and an average distribution in the primer analysis displayed by the pyLDAvis are the criteria for a good model (Sievert – Shirley 2014).

IV. Results

4.1 Exploring the Twitter content

The word frequency of the 40 most used words is shown in Figure 1, offering valuable insights into the themes and foci of the communication. The most used words are related to the Ukraine invasion like 'Ukraine', 'war', 'Putin' and 'Russia'. These keywords indicate that the political dialogue is primarily centred around the conflict and the key players involved. Only words like 'peace' and 'freedom' are towards the lower end of the frequency spectrum, suggesting that these concepts, while still present, are less frequently emphasised in his tweets. This could imply that the overall communication is more focussed on the unfolding situation and the challenges it presents. Further words which could be related to the invasion are found 'together', 'support', 'Nato' and 'security'. These words imply a focus on international cooperation, alliance-building and the broader implications of the conflict on global security. It is worth noting that the analysis also reveals the presence of words unrelated to the invasion, such as 'climate.' This observation suggests that the political communication encompasses broader issues and concerns beyond the immediate crisis, highlighting the multifaceted nature of his tweets.

Figure 1: Total text frequencies



4.2 Sentiment analysis

The output of the VADER model reveals that the German communication by the chancellor of Germany was mainly positive on Twitter (see Table 2). In addition, three examples with different polarities and their respective sentiment scores are shown in Table 3.

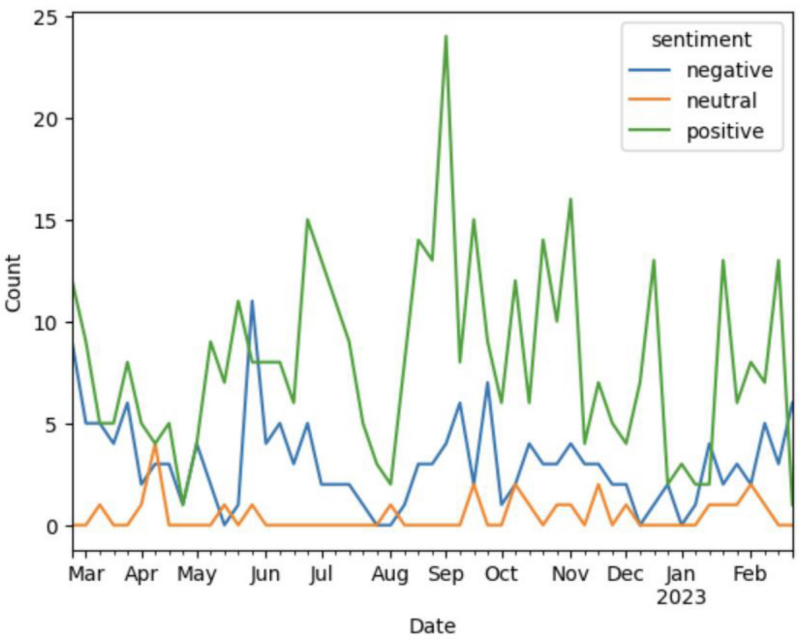
Table 2: Number of tweets with their polarity

Polarity	Absolute values	Percentages
Positive	425	69,4%
Negative	162	26,5%
Neutral	25	4,1%

Table 3: Example tweets with polarity and the sentiment score

Polarity	*Ss*	Tweet
Positive	0.9691	Ukraine will survive Freedom and security will triumph, just as freedom and security triumphed over bondage violence and dictatorship years ago Contributing to this as best we can today means never again! Therein lies the legacy of May
Neutral	0	The Russian president miscalculated both in regard to the resistance of Ukrainians and the unity of the European Union
Negative	-0.9847	It is a cruel war and the killing of civilians is a war crime Responsibility for these crimes lies with Russian President Putin We call on Russia to keep their guns silent The war must stop, and stop it now!

Figure 2: Timeline showing the sentiment of tweets



The detailed overview of the sentiment distribution of Olaf Scholz' Twitter communication can be found in Figure 2. Most of the months throughout the examined time period show a higher percentage of positive tweets than negative and neutral ones. This indicates that the chancellor's communication predominantly conveys an optimistic and encouraging sentiment. May, June, August, September and October 2022 in particular show a relatively high number of positive tweets, indicating that the political debate during

these times centred on promoting achievements, positive developments and constructive initiatives.

Negative sentiment appears to be consistently present in the chancellor's tweets but at a lower frequency compared to positive sentiment. The months with the highest number of negative tweets are March and June 2022, as well as February 2023. This implies that particular occurrences or problems during these months might have necessitated the chancellor addressing challenges or expressing concerns in his communication.

Neutral sentiment, on the other hand, is relatively infrequent across the analysed months, with the highest occurrences in April and October 2022, as well as January 2023. This indicates that the chancellor's communication infrequently adopts a neutral or impartial tone when discussing different topics.

4.3 Topic Modelling

To find out about what topics the chancellor writes about on Twitter, the LDA model was applied to the cleaned corpus, using only the following tagger components: nouns, adjectives, verbs and adverbs.

As described previously, to determine the appropriate number of topics, *Cv* was used as a measure of topic coherence, which expresses the coherence between topics inferred by the model (Röder et al. 2015). Additionally, the distribution of the primer component analysis (PCA) is taken into account, which displays the topic models in a spatial framework with two dimensions. It is preferable to have a uniform distribution, which is considered to have a high degree of independence for each topic. A high degree of coherence and an average distribution in the primer analysis shown by the pyLDAvis are the criteria for a successful model (Sievert – Shirley 2014).

We initialised the LDA models with topic numbers *k* ranging from 2 to 24 and determined the coherence of the model. The coherence score reached its maximum for 4, 9, 11 and 15 topic numbers, as shown in Figure 3. By selecting 9, 11 or 15 topics, this would lead to a non-uniform distribution on the primer component analysis (PCA), which would result in a low degree of independence for each topic (see the results of the LDAvis interactive map in Figure 4). By choosing the four topics, the model intersects with no other topics, the whole word space is well summarised, and the topics are independent (Syed – Spruit 2017).

The LDA analysis result with its words is shown in Table 4. They are listed in order of their frequency. The first topic represents 28% of the total tokens and includes words such as 'energy', 'price', 'gas' and 'cooperation'. On the basis of this, the deduction was made that the communication addressed the effects of the invasion resulting domestic measurements and finding new cooperations and solutions to reduce the dependence from Russia. The second topic had 27%

Figure 3: Coherence value

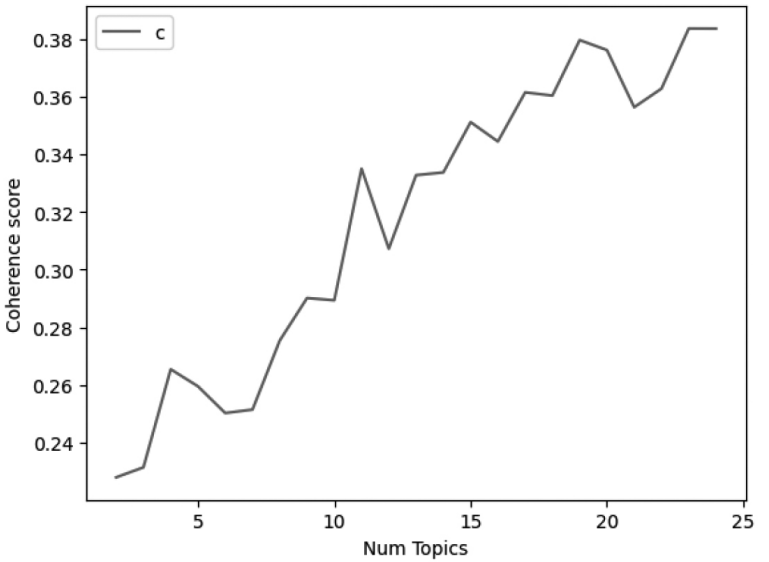
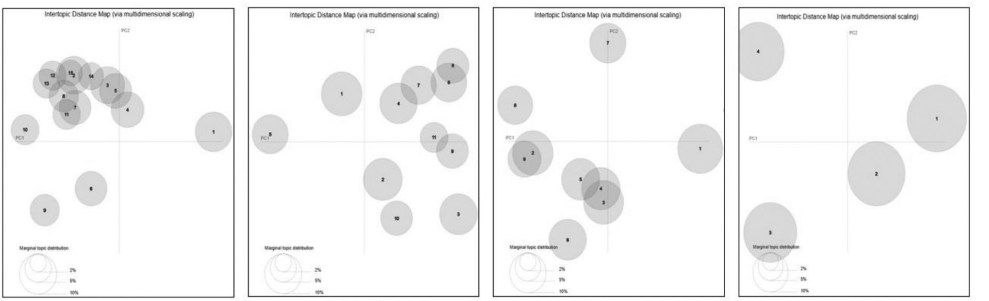


Figure 4: LDAvis interactive map of the topic model distribution



of the total tokens, including the words 'climate', 'future', 'neutral' and 'energy', which led to the conclusion that the chancellor addressed the current challenges and his goal of achieving climate neutrality and protecting the environment. The third topic with 23% of the tokens included words like 'family', 'support', 'peace' and 'freedom', which can be inferred to of the expression of solidarity towards the Ukrainian population and the wish for peace. The last topic with 22% of the tokens included words like 'Russian', 'aggression', 'attack' and 'crime' which shows that the attacks were condemned in the communication of the Chancellor.

Table 4: LDA results: Topic size and with the 15 most used words

Number	Topic 1 (28%)	Topic 2 (27%)	Topic 3 (23%)	Topic 4 (22%)
1	energy	climate	today	war
2	price	good	country	russian
3	today	country	important	aggression
4	gas	future	war	country
5	time	world	family	good
6	citizen	energy	summit	people
7	future	neutral	decision	world
8	supply	protection	support	new
9	cooperation	important	peace	right
10	close	democracy	good	terrible
11	friend	security	year	peace
12	good	today	freedom	attack
13	high	commitment	right	crime
14	company	strong	accession	ukraine
15	world	crisis	partner	support

The Latent Dirichlet Allocation (LDA) model produced four key topics that persisted throughout time:

- Topic 1. Effects of the Ukraine invasion: consequences of the invasion and new cooperations
- Topic 2. Climate & Environment, such as sustainability, and focus on using renewable energy
- Topic 3. Solidarity: wishes for freedom and peace and addressing the victims of the invasion
- Topic 4. Russian aggression: addressing Putin's rough approach towards Ukraine

Figure 5 shows the dynamic changes in the occurrences of each topic between February 2022 and February 2023 to identify a discourse shift. The prevalence of the identified frames varied over time, reflecting the evolving priorities and concerns of the chancellor's Twitter communication. The Russian aggression frame was the most prevalent throughout the first three months, showing greater attention to the developing situation in Ukraine. This frame then frequently

reappeared in response to particular incidents and developments involving the aggression towards Ukraine.

Between June and October, the Climate frame emerged as the second most frequently employed topic, emphasising climate change and environmental sustainability. This focus can be attributed to Germany's dependence on Russian fossil energy and the requirement to move towards more sustainable energy sources.

From July to October, the Effects frame dominated, as concerns over the approaching winter and potential peak on energy prices grew among the population. This frame emphasises the consequences of Germany's prior reliance on Russian gas and oil and the need for alternative strategies to deal with these dependencies.

The Solidarity frame, although less prevalent compared to the other frames, experienced notable peaks in March, June and October. This variation suggests that it was primarily driven by specific events or developments during the analysed period.

Figure 5: LDA topic timeline

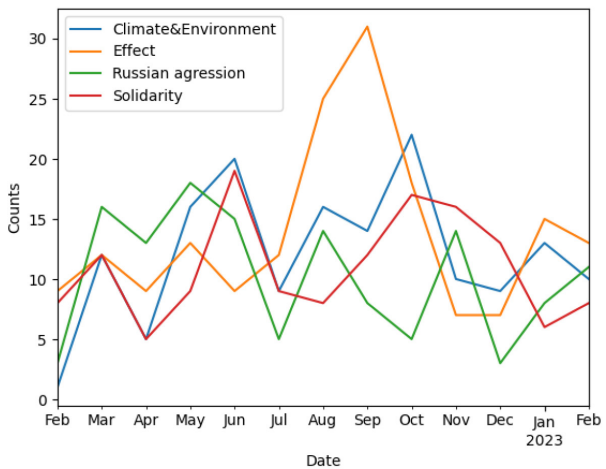
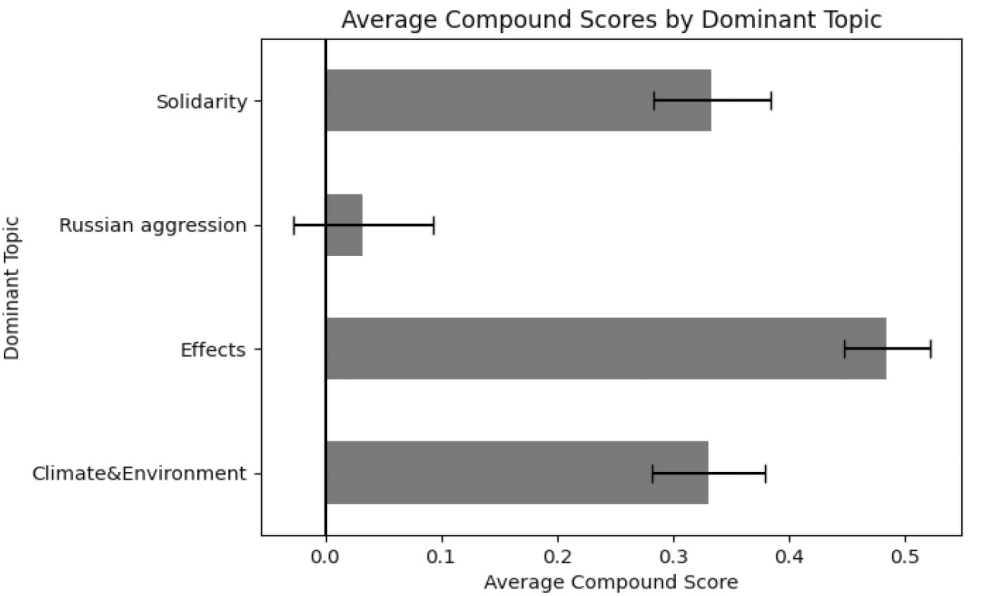


Figure 6 can help to investigate the frames and their average compound scores further. This data analysis provides valuable insights into the emotional nuances of Chancellor Scholz' communication on Twitter, enhancing our understanding of the sentiment conveyed within the identified frames. The Effects frame exhibits the highest average compound score of 0.48, suggesting that the sentiment in tweets containing this theme is predominantly positive. This may indicate that the chancellor's communication aimed to emphasise the beneficial outcomes or positive implications of various policies, events or decisions within this frame.

The Climate frame has an average compound score of 0.33, also revealing mainly a positive sentiment in tweets related to environmental issues and sustainability. This indicates that the communication regarding climate change mitigation and sustainable development was generally optimistic or constructive in nature.

The Solidarity frame demonstrates an average compound score of 0.33, reflecting a positive sentiment as well. This suggests that the chancellor's focus on fostering unity, collaboration and support among various stakeholders was conveyed in an encouraging and affirmative manner.

Figure 6: Average sentiment score for each topic



V. Discussion

According to Entman (1993), framing involves choosing and emphasising elements of information to create a specific reality. The initial stated research questions can be answered by the following findings.

- Q1: In the context of the Twitter communication by the German chancellor during the invasion of Ukraine, our analysis identified four key frames – 'Effects of the Ukraine invasion', 'Climate & Environment', 'Solidarity' and 'Russian aggression'.

This finding is consistent with the research on framing in political communication, where key issues and themes are often structured around specific frames (de Vreese 2005).

- Q2: The initial focus on Russian aggression reflects the immediate attention on the conflict, while the subsequent emphasis on the frames 'Climate & Environment' and 'Effects' shows how communication has been adjusted to address broader concerns, such as energy security and the consequences of the invasion.

The dynamic nature of the prevalent frames throughout the invasion is consistent with the literature, emphasising that framing is not static and can change in response to external events and political developments (Scheufele 2000). The frequent occurrence highlights the role of specific events or developments in influencing political discourse (Gamson – Modigliani 1989).

The sentiments conveyed in the chancellor's Twitter communication provide insight into the emotional undertones of his messaging.

- Q3: The findings indicate that the sentiments of the tweets were primarily positive. Negative sentiments appear to be consistently present in the chancellor's tweets but at a lower frequency compared to positive sentiment and neutral sentiments were relatively infrequent.

This aligns with the literature on political communication, which often employs optimistic language to foster public support and project an image of competence (Graber – Dunaway 2017). The positive sentiment connected with the 'Climate & Environment' and 'Effects' frames suggests a focus on promoting achievements, positive developments and constructive initiatives. For example, with the tweet from 17 December 2022 from Olaf Scholz (2022b):

> *As of today, our energy supply is a bit safer and more independent. The first LNG terminal in #Wilhelmshaven has opened – built in record time and also ready for the future with hydrogen. Three more will follow soon. We know how to set off and speed!*

The 'Solidarity' frame's positive sentiment underscores the aim to convey collaboration, unity and support in an affirmative manner. For example, on 18 March 2022 Olaf Scholz (2022a) published the following message on Twitter:

> *I would like to express my sincere thanks to the many volunteers who helped me. Your overwhelming solidarity, your tireless efforts make it possible for us to help the people fleeing the terrible war in Ukraine.*

The interplay between framing and sentiment in the chancellor's Twitter communication during the invasion of Ukraine demonstrates how language is strategically used to shape public perceptions and opinions (Entman 2004). By focussing on key frames and using predominantly positive sentiment, the chancellor sought to manage the narrative around the invasion and address the concerns of various stakeholders.

These findings will assist future leaders to communicate more effectively to gain the public's support amid crises. Taking emotions into account, the outcomes will assist leaders in their social media communication. To provide accurate information to the public, communication strategies must be properly prepared, with an emphasis on word selection. A compelling message that evokes emotion may connect the public and leaders in order to communicate effectively during a crisis such as the invasion of Ukraine, when a mistake might foster distrust and increase the threat.

This study has several limitations. First, this research focused only on the Twitter communication of the German chancellor. However, users may be spread over many social media platforms. Nevertheless, the techniques used in our study may be applied to a variety of social networking sites.

It is important to note that according to the most current data on social media use, 83% of Twitter users globally were under the age of 50 (STATISTA 2021). This suggests that research using Twitter often has a bias toward underestimating the views of people over 50 years of age.

For sentiment analysis, the VADER model was used with a lexical approach. This implies that it employs vocabulary or words that have been given fixed positive or negative ratings. The ratings are based on a pre-trained model that human reviewers have designated as such. As a result, this strategy also has certain drawbacks:

- Grammar and spelling errors might lead the analyst to miss significant terms.
- Sarcasm and irony might lead to misinterpretation.
- There may be difficulties interpreting discriminating jargon, nomenclature, memes or turns of phrase.
- Pictures or videos were not analysed.

The main drawback of topic analysis when using unsupervised learning methods like LDA is that there is some subjectivity in determining the topic formed (Kwok et al. 2021).

In summary, this study contributes to the understanding of political communication on social media during major geopolitical events, such as the Russian invasion of Ukraine. The results highlight the evolving priorities, sentiments and concerns that shape the discourse and offer valuable insights into the multifaceted nature of political communication. The findings of this study have

implications for both political communication theory and practice, offering a comprehensive understanding of the key topics and concerns driving political discourse during such important global events.

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