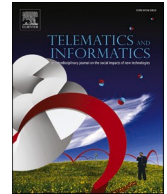




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Emotion regulation and cheap talk as signaling strategies: Evidence from crowdfunding for Ukraine

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ABSTRACT

Crowdfunding, as enabled by donors worldwide, has played a critical role in financially supporting military forces, NGOs, humanitarian groups, and civilians in the Ukraine-Russia Crisis. This global mobilization underscores the evolving dynamics in the modern geopolitical landscape, emphasizing the transformative power of online collective action in fundraising and organizing. This study draws on signaling theory to pinpoint success indicators in crowdfunding for Ukraine projects on GoFundMe. Recognized as an effective explanatory framework, signaling theory is used as it bridges fundraising tactics with donation behavior in crowdfunding contexts. Particularly, the research examines how emotions and semantics contributed to (or hindered) fundraising success through sentiment analysis, topic modeling, and paragraph vectors. Findings revealed that trust showcased in fundraisers' texts and videos amplified donations. Conversely, expressions of sadness deterred donations. Furthermore, the strategic deployment of an anti-Putin narrative notably enhanced fundraising results, but this strategy was way more likely to be deployed by fundraisers based in the United States. The distinct linguistic patterns of US campaigns were so pronounced that machine learning classifiers could predict the fundraiser's origin (US vs. non-US) with 82% accuracy based solely on language. Overall, the study sheds light on the importance of emotion regulation and "cheap talk" as functional signaling strategies that facilitate value alignment. It provides new theoretical insights and methodological feasibility of examining how strategic communication affects financial outcomes in crowdfunding.

1. Introduction

Since early 2022, one of the most influential world events has been the Russia-Ukraine War and its consequent humanitarian crises. As more than 7.9 million refugees are fleeing throughout Europe, both Ukrainian and global entities have been turning to crowdfunding as a major means of acquiring essential financial support (UNHCR, 2022). To date, although crowdfunding has already been leveraged to address worldwide concerns such as the COVID-19 pandemic (Igra et al., 2021) and climate change (Hörisch, 2019), the extent to which it is incorporated in human warfare as a primary fundraising strategy is groundbreaking. Therefore, analyzing the transnational crowdfunding initiatives for Ukraine can offer valuable insights into modern geopolitics, digital mobilization, and the impact of strategic communication on achieving financial goals through large-scale online collective endeavors.

Numerous theoretical frameworks have been utilized to investigate the factors determining the success or failure of crowdfunding

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campaigns (McKenny et al., 2017). Among them, signaling theory (Spence, 1973) lends itself to a particularly viable approach when high levels of uncertainty exist and might disrupt fundraising (Ahlers et al., 2015). The theory posits that the information asymmetry between fundraisers and donors may be effectively mitigated through the adequate supply of signals, which serve to reduce uncertainty in crowdfunding communication (Courtney et al., 2017). Based on the theory, high-quality information senders, whose fundraising causes are legitimate and justifiable, may benefit from sending project-relevant signals that are less costly to themselves than to their low-quality counterparts (Anglin et al., 2018). Those cost-effective signals may enable a heuristic on which donors depend to compensate for the lack of social cues in high-noise fundraising environments (Steigenberger and Wilhelm, 2018; Xu, 2018). This makes signaling theory particularly relevant for global crowdfunding efforts for Ukraine, given the fluidity of collective mobilization and the scarcity of objective information. In essence, this theory provides a useful framework to construe crowdfunding as a dynamic assessment of project quality, connecting communication strategies with tangible economic outcomes.

Despite its explanatory power in crowdfunding research, scholars have highlighted a salient discrepancy between signaling theory and mainstream management literature on the role of rhetoric. Specifically, mainstream views often position rhetoric (or more generally, language-based information) as not distinctly benefiting high-quality information senders in communication (Steigenberger and Wilhelm, 2018). Traditional signaling theory tends to sideline language and rhetoric, regarding them as “costless signals” (Anglin et al., 2018, p. 471) easily produced by both high- and low-quality information senders. Due to the minimal costs associated with sending the rhetorical signals, “talk” is considered “cheap”, and the efficacy of this “cheap talk” (see Crawford and Sobel, 1982; Farrell and Rabin, 1996) remains a point of contention among proponents of Spence-style signaling theory (Backus et al., 2019). At its core, applying a cheap talk model in crowdfunding research is concerned with the following question: how influential, if at all, can a fundraiser’s communication efforts be on prospective donors’ decision-making, given the low cost of such rhetoric?

A large body of recent research on language use in crowdfunding (e.g., Adamska-Mieruszevska et al., 2021; Anglin and Pidduck, 2022), however, has emerged to only make the theoretical discord more noteworthy, which encourages researchers to revisit the boundary conditions of language-based, costless signaling. Based on the literature, Anglin et al. (2018) describe three conditions under which less costly signals like language may be useful, including the dearth of objective information, the lack of behavioral norms, and the paucity of sophisticated audience. Hence, the fulfillment of all three conditions in crowdfunding for Ukraine provides an optimal and timely occasion to systematically examine the effects of linguistic characteristics in fundraising communication. This is largely because participants in numerous projects come from different parts of the world without a cohesive organizational structure and a shared understanding of the war. Due to the lack of verifiable information from official sources, potential donors have to sift through project descriptions and use signal portfolios consisting of both substantive (that are costly and are project-based) and rhetorical (that are less costly and are language-based) signals to offset information asymmetry and inform decision-making (Steigenberger and Wilhelm, 2018).

The potential for a closer examination of signal portfolios used in crowdfunding for Ukraine is augmented by recent advancements in natural language processing (NLP) that have enabled large-scale quantitative analysis of sentiment and semantics in crowdfunding communication. By harnessing newly developed NLP models and algorithms, scholars (e.g., Kaminski and Hopp, 2020; Wang et al., 2021) have developed promising analytical procedures to expand signaling theory and inform crowdfunding research. Inspired by this line of emerging scholarship, the current study uses three NLP techniques, including sentiment analysis, topic modeling, and paragraph vectors (an unsupervised neural network language model developed by Le and Mikolov, 2014). Collectively, these methods serve to enable a holistic assessment of signaling strategies, with a focus on how language-based information affects crowdfunding outcomes.

2. Substantive and rhetorical signals in crowdfunding

In social science, signaling theory was initially applied in labor economics to understand how job candidates use educational credentials as costly signals—signals that are too hard to fake and mimic by competition—to indicate quality (Spence, 1973). A critical assumption under this theoretical application is that hiring is an investment decision under uncertainty. In comparing hiring a person to purchasing a lottery ticket, Spence (1973) notes that the employer must learn to decipher “...a plethora of personal data in the form of observable characteristics and attributes of the individual, and it is these that must ultimately determine his assessment of the lottery he is buying” (p. 357). Largely, this process of reducing hiring uncertainty resembles that of information processing and decision-making in crowdfunding, where prospective donors must understand how to identify and decode observable signals sent by the fundraisers as quality indicators (Courtney et al., 2017).

It has been generally acknowledged that “not all signals are created equal” (see Rao et al., 2013), yet different taxonomies have been developed based on important signal attributes, such as the cost associated with transmitting a signal (Connelly et al., 2011). Scholars (e.g., Certo, 2003) have differentiated costless signals from costly signals, the former of which can be produced by both high-quality and low-quality information senders and could be thus deemed less credible. For example, third-party endorsements in crowdfunding are usually considered costly signals, because they are more difficult for low-quality fundraisers to obtain (Courtney et al., 2017). Alternatively, providing detailed project descriptions and using rhetoric in telling crowdfunding stories are typically considered costless, as both high- and low-quality information senders can typically afford to produce such signals (Di Pietro et al., 2020). However, as costless signals typically involve information known only to the sender but not the receiver, they tend to suffer from low verifiability (Farrell and Rabin, 1996).

In line with using signal cost as a standard for categorization, Steigenberger and Wilhelm (2018) adopt a similar rationale and distinguish rhetorical signals from substantive signals. The examples of substantive signals in crowdfunding include hiring renowned personnel and showcasing prototypes of new products, whereas publishing press releases is categorized as a rhetorical signal (Steigenberger and Wilhelm, 2018). Although the cost of signal is still an important criterion for this categorization, it is obvious that the

emphasis of the substantive/rhetorical dichotomy is placed on language, the importance of which is otherwise ignored in traditional, Spence-style signaling theory.

2.1. Substantive signals in crowdfunding

Substantive signals refer to quality indicators grounded in the material aspects of the information sender. As substantive signals are typically costly, they are more challenging for low-quality senders to emulate, as sending such signals often entails considerably more cost or effort than what can be afforded by senders who lack resources (Steigenberger and Wilhelm, 2018). Given this cost differential that is difficult to offset, substantive signals have been shown to enhance the perceived quality and trustworthiness of a crowdfunding project across different research scenarios. For example, in the context of equity-based crowdfunding, Ahlers et al. (2015) found substantive signals such as detailed budgets or established track records alleviate backers' apprehensions by providing concrete evidence of the feasibility of a crowdfunding project. Likewise, in reward-based crowdfunding Bi et al. (2017) noticed the same effect that crowdfunding campaigns with tangible rewards or prototypes are often perceived as higher quality, suggesting the project initiators are deeply invested in their endeavors. Building on this perspective, Ullah and Zhou (2020) found that projects spearheaded by teams tend to outperform those led by individuals, attributing this success to the greater resources and effort involved in mobilizing a collaborative group for fundraising. Overall, existing research suggests the tangible and verifiable nature of substantive signals serves as a beacon of trust and credibility, enhancing potential backers/donors' confidence and willingness to support a project.

While sending substantive signals has been proved to be an effective communication strategy, the strategy is not without drawbacks practically. For one thing, providing substantive signals often demands higher upfront costs from fundraisers, potentially limiting their utility for grassroots projects (Burtch, Ghose, and Wattal, 2013), such as donation-based projects. This echoes Xu (2018), who discovered that when compared to equity and reward-based crowdfunding, donation-based crowdfunding is characterized by more constrained resources available to fundraisers. Meanwhile, there is a risk that backers/donors might misinterpret substantive signals, potentially leading to misguided expectations (Kuppuswamy and Bayus, 2018). Steigenberger and Wilhelm (2018) further maintain that the focus on "isolated substantive signals" overshadows the potential impact of language, rhetoric, and emotions on decision-making, advocating for more research on the synergy between substantive and rhetorical signals in crowdfunding.

2.2. Emotions as rhetorical signals

A foundation for conceptualizing emotions as rhetorical signals can be traced back to Aristotle's "persuasion triad": ethos, pathos, and logos. Within signaling theory, ethos aims to enhance the credibility of the information sender, logos appeals to logical reasoning, while pathos is seen as a mechanism to evoke donors' emotions (Steigenberger and Wilhelm, 2018). There are two theoretical advantages to consider emotions rhetorical signals. The first advantage resides in leveraging the models of strategic information transmission (Crawford and Sobel, 1982), which support the potential effect of costless signals such as rhetorical signals—assuming interests of the information sender and receiver are perfectly (or even partially) aligned. As Crawford and Sobel (1982) point out, "... there may be a good case for presuming that direct communication is more likely to play an important role, the more closely related are agents' goals" (p. 1450). This perspective has paved the way for extensive research on how economic actors use language-centric signals (Backus et al., 2019). In addition to the potential for utilizing the incredibly rich literature on strategic information transmission, the second advantage lies in the possibility integrating signaling theory with the theories of emotion (e.g., Ekman and Davidson, 1994). While some researchers (e.g., Koch and Siering, 2019; Yu, Berg, and Zlatev, 2021) have begun this integration, a more cohesive framework is essential to bring together diverse theoretical viewpoints.

The role of emotions in crowdfunding and altruistic endeavors has garnered significant scholarly attention; however, previous work on this topic has produced informative yet mixed results. An influential theoretical framework in discerning these emotional effects is the concept of emotional valence, the degree to which an emotion elicits positive or negative sentiments (Ekman and Davidson, 1994). For example, a strand of studies (e.g., Cavanaugh et al. 2015; Koch and Siering, 2019) suggest that positive emotions expressed by fundraisers may improve crowdfunding outcomes. Other research (e.g., Baberini et al., 2015), however, seems to contradict this prediction, suggesting that negative emotions may be advantageous for fundraising campaigns under certain circumstances. Interestingly, Rhue and Robert (2018) found that crowdfunding campaigns descriptions that exhibited either positive or negative emotions were more successful than those that had less salient emotional delivery. In a similar vein, Liang et al. (2016) underscored that combining positive and negative emotions might be more effective than leaning solely on one emotional polarity. Furthermore, research (e.g., Bao and Huang, 2017; Kaartemo, 2017; Zheng et al., 2014) indicates that the context and cultural background of the target audience may also play a crucial role in how emotions are perceived and acted upon. Another enlightening perspective from Oo and Allison (2022) posits that the genuineness and authenticity of the expressed emotion can be a decisive factor in its impact. Overall, existing research seems to support the effectiveness of expressed emotions as rhetorical signals on fundraising outcomes, although the directions and contingencies of those effects are quite inconclusive.

Another theoretical basis for disentangling emotional effects is rooted in the theory of discrete emotions (see Izard, 1993), which posits that there are a set of primary emotional states distinct from one another, such as joy, sadness, fear, anger, disgust, and surprise. Likewise, this theoretical framework has produced quite inconsistent findings regarding the effects of different emotional states. For example, Ge et al. (2023) found that sadness exerted an inverted U-shaped effect on donations that either too much or too little sadness could be counterproductive; on the other hand, anxiety expressed by fundraisers tended to deter donations in medical crowdfunding campaigns. Delving further into the role of sadness, Small and Verrochi (2009) provided evidence that people were more likely to donate when they were exposed to sad expressions. Conversely, Zhao et al. (2022) demonstrated that when sadness was overtly

expressed in the campaign text, it was less conducive to crowdfunding success. In addition, while it is contested whether trust is an emotional state (Mohammad and Turney, 2013), research (e.g., Zhang et al., 2021) has generally supported that affect-based trust is crucial to charitable fundraising. The findings on the effects of discrete emotions, albeit insightful, are further complicated by other variables, such as modality through which emotions are expressed. For instance, it has been found that the effects of emotions only existed in verbal communication but not in visual communication (Zhao et al., 2022). Hence, based on existing research, it is likely that the effect of emotions, if any, is context-specific and highly depends on the nature of the fundraising cause in crowdfunding. This is consistent with other studies that have expanded on the contextual importance of emotions in charitable giving. For example, Harbaugh et al. (2007) maintained that charitable giving is determined not only by emotions per se but also by the broader social and cultural contexts. Additionally, Andreoni et al. (2017) emphasized the nuanced ways in which different emotional appeals might interact with the preferences of individual donors. In light of these findings, it is evident that the influence of emotions in crowdfunding is multifaceted. Its effectiveness seems to be contingent upon various factors, including the nature of the fundraising cause and the mode of emotional expression.

The nascent state of research on crowdfunding for Ukraine makes drawing definitive conclusions more challenging. Nonetheless, this challenge does not overshadow a compelling argument to be made regarding the potential influence of emotions on Ukraine crowdfunding outcomes, even if predicting the precise direction of this effect remains a theoretically intricate task. It is also worth noting that crowdfunding initiatives for Ukraine have broken conventional boundaries, moving beyond traditional donation-based campaigns like medical or civic crowdfunding. Notably, to date much of the financial support has come from Ukraine's political and military allies (Beauty, 2022). Apparently, this tendency introduces a new layer of complexity to understanding the role of emotions in crowdfunding for Ukraine. While altruism and empathy have traditionally been recognized as the dominant emotional drivers in donation-based crowdfunding campaigns (Liu et al., 2018; Rhue and Robert, 2018), the political and strategic undertones of Ukraine-focused crowdfunding might instigate different motivational currents. This possibility is showcased in Bekkers and Wiepking (2011), who argue that public benefit motivations, which encompass a broad range of motivations including altruism and reciprocity, can greatly influence donation behaviors. In the context of Ukraine, donations might not only be spurred by altruism but also by a sense of (inter)national solidarity, political alignment, or strategic interests. Moreover, Smith et al. (2013) point out that the nature of the cause, especially when intertwined with larger socio-political issues, can invoke specific emotions that either encourage or discourage monetary contributions. Thus, emotions tied to political affiliation, geopolitical strategy, or national pride could be equally influential as more traditional sentiments such as empathy, compassion, and altruism. As scholars continue to explore this evolving field, we are positioned to propose an initial set of hypotheses to shed light on these intricacies and guide future empirical investigations related to emotions as rhetorical signals in crowdfunding campaigns for Ukraine:

H1_a: Positive emotions, conveyed by fundraisers as rhetorical signals, will influence fundraising outcomes in crowdfunding for Ukraine.

H1_b: Negative emotions, conveyed by fundraisers as rhetorical signals, will influence fundraising outcomes in crowdfunding for Ukraine.

2.3. Semantics as rhetorical signals

Commensurate with the research on emotional appeals as rhetorical signals, another emerging stream of research (e.g., Kaminski and Hopp, 2020; Xu, 2018; Yuan et al., 2016) has examined the role that semantics plays in crowdfunding communication. As semantics studies the logical aspects of meaning in human language, examining how it is encoded and decoded in crowdfunding communication provides important insight into how meaning is constructed, shared, and negotiated. Along this line, Tausczik and Pennebaker (2010) argue that linguistic cues derived from semantic analysis can provide useful insights into social and psychological dynamics. In the context of crowdfunding, such cues could reveal not just the intent of the fundraiser but also the underlying motivations and biases of potential donors. Because semantics is fundamentally concerned with meaning and logic, it focuses on the structured elements of communication rather than the emotional undertones. This distinction is aptly described in Steigenberger and Wilhelm (2018), where logos and ethos have been regarded as semantic and rhetorical signals with a clear goal of reducing information asymmetry between fundraisers and donors:

“Logos appeals are signals that convey information about a focal economic activity (e.g., characteristics, of a new product to be developed) used to reduce activity-related information asymmetry. Finally, ethos appeals are signals that convey information about the firm seeking resources (e.g., claims related to the capabilities of a firm), aiming to reduce firm-related information asymmetry” (pp. 531–532).

A critical challenge, however, lies in navigating various ways of conceptualizing and operationalizing semantics in crowdfunding research. While some research is grounded in clear theoretical definitions, others is loosely guided by theory at best. For instance, the use of framing theory (e.g., Entman, 1993) offers a concrete theoretical lens, a well-established framework that is helpful for explaining how fundraisers strategically craft message frames as semantic tools to influence donors' cognition, emotion, and decision-making (e.g., Defazio et al., 2021; Moradi and Dass, 2019). Through analyzing over 8000 Kickstarter projects, Defazio et al. (2021) found prosocial framing was associated with better fundraising outcomes. Nielsen and Binder (2021) further contend that “...framing campaign messages in a way that is salient and that resonates with the values of the audience” (p. 531) was especially important in crowdfunding. Nevertheless, in practice it may be difficult to provide less ambiguous conceptualizations and more functional operational definitions of “resonance” (or “value alignment”, as described in Nielsen and Binder, 2021). To this end, Snow et al. (1986) introduced four value/frame alignment processes, including frame bridging, amplification, extension, and transformation, all of which involve some kind of strategic and linguistic adjustment that aims to reduce cognitive and narrative discrepancies between the mobilizers and the mobilized

in collective action. Despite its importance and its potential for explaining fundraising success and failure, value alignment using semantics remains a relatively untrodden path in crowdfunding research (Nielsen and Binder, 2021).

Alongside theory-driven research, other scholars (e.g., Babayoff and Shehory, 2022; Yuan et al., 2016), however, have advocated for a data-driven approach by harnessing latest text mining techniques to map the semantic structures as predictors for crowdfunding outcomes. Like in other fields, the debate over the supremacy of theory-driven versus data-driven research remains vibrant, particularly given the interdisciplinary nature of crowdfunding studies (McKenny et al., 2017). Nevertheless, examining semantics as rhetorical signals offers a promising avenue in light of the rich linguistic cues ridded in crowdfunding narratives.

One of the limitations with this line of research is that linguistic context is often distorted, if not deprived, when semantic features are extracted from crowdfunding project descriptions (Kaminski and Hopp, 2020). Central to this challenge is the reliance on the “bag-of-words” models employed in many NLP techniques, which often overlook word sequence, grammar, and thereby, context. To overcome this limitation, advancements in the NLP domain have introduced more refined models over recent years. For instance, Le and Mikolov (2014) and Mikolov et al. (2013) have pioneered models that emphasize the retention of overarching semantics. Similarly, Pennington et al. (2014) introduced GloVe, an unsupervised learning algorithm for obtaining vector representations for words, allowing better semantic analysis by bridging the gap between count-based and predictive methods. Building upon these advancements, our second hypothesis is anchored in both theoretical underpinnings and cutting-edge methodologies for the semantic analysis of crowdfunding narratives. It specifically emphasizes the role of semantics in aligning the values of fundraisers with those of donors.

H2: As rhetorical signals, semantics that facilitate value alignment will influence fundraising outcomes in crowdfunding for Ukraine.

3. Method

3.1. Data retrieval

Data for the study were collected from project webpages on GoFundMe, a major donation-based crowdfunding platform based in the United States. We specifically targeted projects under “Donate to Ukraine Relief Efforts”, an ad hoc project category created by the platform in early 2022.¹ On June 9th, 2022, the authors extracted the publicly accessible data² using a web crawler using BeautifulSoup and Selenium libraries in Python.

The dataset is comprised of a total of 452 crowdfunding projects. Among them, 320 projects used English to communicate fundraising causes, whereas the rest used other languages including but not limited to Ukrainian, Russian, Portuguese, French, and Italian. While translating multiple languages is possible with advanced AI tools, the nuances of rhetorical signals, the primary focus of the current study, risk being misconstrued during translation. Hence, the study narrowed its analysis to campaigns with descriptions exclusively in English.

Drawing from prior studies (e.g., Kaminski and Hopp, 2020; Mollick, 2014; Xu, 2018), we compiled metadata for each project, including (1) project description; (2) project updates; (3) “words of support” (WOS), as expressed by donors; (4) project goal, converted to US dollars; (5) number of donors; (6) funds raised, transformed into US dollars; (7) organizer name(s); (8) organizer location; (9) video count; and (10) picture count. Subsequently, video transcripts sourced from YouTube and were included in the dataset as part of corpus.

To depict the geographical spread of the projects, we organized the campaigns by fundraisers’ locations and created the map shown in Fig. 1. To provide a clear representation of the engagement of different countries, we visualized the median number of donations, instead of the average, to counter the effect of outliers. It can be seen from the map that the most involved countries were those geographically proximate to the epicenter of the war, with only a few exceptions (e.g., United States, Canada, Australia).

3.2. Measures

3.2.1. Number of donations (DV)

The number of donations that each project garnered was used as the dependent variable (DV). In our sample, projects had an average of 787.71 donations ($SD = 5227.36$), with a median of 65. The measure had a rather wide range, with a minimum of 0 and a maximum of 75,800.

3.2.2. Substantive signals (IV)

Two independent variables (IV) were treated as substantive signals given the cost differential induced between high-quality and low-quality information senders (Steigenberger and Wilhelm, 2018). The first substantive signal was whether the campaign was launched by an individual fundraiser or a team of fundraisers, as being a team project may enhance the legitimacy of fundraising (Frydrych et al., 2014). In the sample, the majority of the projects were organized by individual fundraisers ($n = 253$), with the rest being team projects ($n = 67$). The second substantive signal was the number of “words of support” (WOS), as third-party endorsement is usually considered costly for low-quality fundraisers to obtain (Courtney et al., 2017). The projects received an average of 36.77 (SD

¹ The category of “How to Help: Donate to Ukraine Relief Efforts” can be accessed <https://www.gofundme.com/c/act/donate-to-ukraine-relief>.

² Although it has been contested whether researchers should be allowed to scrape publicly available webpages, the U.S. Supreme Court has recently reaffirmed that this act is legal. See also: <https://techcrunch.com/2022/04/18/web-scraping-legal-court/>.

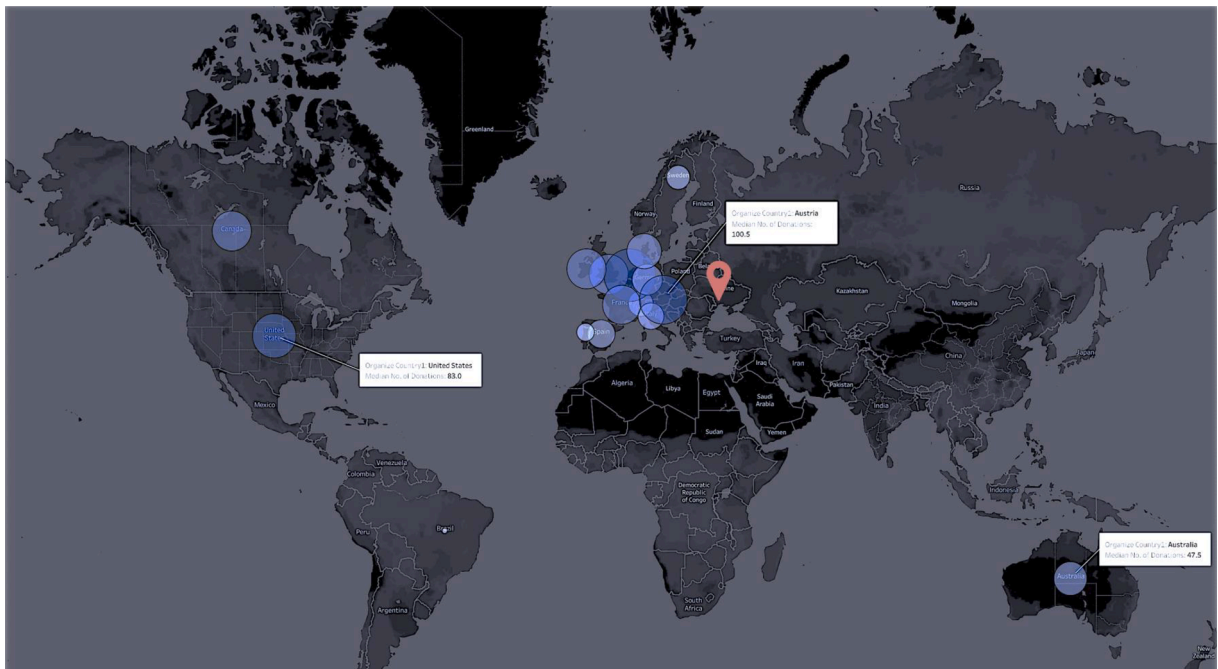


Fig. 1. Median numbers of donations by fundraiser's country.

= 257.98). The median was merely 2, suggesting the paucity of WOS as a resource in general.

3.2.3. Non-hypothesized rhetorical signals (IV)

Four costless signals, on which the study does not focus but are known to affect crowdfunding outcomes according to existing research (e.g., Kaminski and Hopp, 2020; Mollick, 2014; Xu, 2018), were included as non-hypothesized rhetorical signals. To clarify, these variables were not hypothesized variables but were controlled for, including the numbers of updates, videos, pictures, and project goal, all of which share the commonality of not creating the cost differential between high- and low-quality fundraisers. In other words, both high- and low-quality fundraisers can relatively effortlessly manipulate the numbers in crowdfunding communication.³ Descriptives of the variables are shown in Table 1.

3.2.4. Hypothesized rhetorical signals (IV)

Our two hypotheses primarily centered on two rhetorical signals, emotions and semantics, which served as the main independent variables. As the two variables were not readily available in the metadata, specific analytical procedures were required to extract these linguistic features from the corpus. Semantic analysis using the NRC Emotion Lexicon (Mohammad and Turney, 2013) was used to quantify emotions. Topic modeling implemented through latent Dirichlet allocation (Blei et al., 2003) and paragraph vectors implemented through Doc2Vec (Le and Mikolov, 2014) were used to establish associations between semantics and fundraising outcomes. The subsequent section provides a comprehensive breakdown of these methods.

3.3. Analytical procedures

3.3.1. Sentiment analysis

Sentiment analysis aims to categorize natural language expressions into specific sentiment states, such as emotions or moods (Prabowo and Thelwall, 2009). Among different implementation techniques, the NRC Emotion Lexicon allows for categorizing English words into ten groups, including two overarching sentiment states (positive, negative) and eight discrete emotional states (anger, anticipation, disgust, fear, joy, sadness, surprise, and trust). Recent studies in crowdfunding have used the NRC Lexicon to explore how emotional delivery affects crowdfunding success. For example, Rhue and Robert (2018) used the method to gauge the emotional tone of campaign descriptions. Gao et al. (2021) adopted the approach and used the NRC Lexicon to examine the relationship between emotions and crowdfunding success using data collected from Kickstarter. The same type of analysis was also seen in Qi et al. (2020), in which the authors extracted emotions from crowdfunding project comments as performance indicators.

³ Although videos are usually treated as costless signals, Xu (2018) maintains that video production may be an exceedingly challenging task in donation-based crowdfunding, as people in need might not have the expertise, time, and energy to shoot, edit, and upload videos.

Table 1
Correlation matrix of key variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Updates	-																
2 WOS	0.12*	-															
3 Goal	0.05	0.82***	-														
4 Donors	0.10	0.97***	0.88***	-													
5 Funding	0.05	0.81***	0.99**	0.87***	-												
6 Videos	0.33***	0.23***	0.33***	0.25***	0.32***	-											
7 Pictures	0.70***	0.11	0.00	0.07	0.00	0.17**	-										
8 Positive	0.64***	0.26***	0.21***	0.24***	0.19***	0.45***	0.43***	-									
9 Negative	0.48***	0.15**	0.10	0.14*	0.09	0.40***	0.32***	0.91***	-								
10 Anger	0.41***	0.18***	0.12*	0.17**	0.11	0.43***	0.24***	0.84***	0.94***	-							
11 Anticipation	0.65***	0.20***	0.14*	0.18**	0.13*	0.43***	0.41***	0.98***	0.92***	0.84***	-						
12 Disgust	0.42***	0.11	0.06	0.10	0.05	0.35***	0.24***	0.78***	0.88***	0.86***	0.76***	-					
13 Fear	0.52***	0.19***	0.10	0.17**	0.08	0.40***	0.38***	0.93***	0.98***	0.91***	0.94***	0.84***	-				
14 Joy	0.69***	0.19***	0.14*	0.18**	0.13*	0.43***	0.46***	0.98***	0.89***	0.82***	0.98***	0.74***	0.91***	-			
15 Sadness	0.55***	0.14*	0.08	0.12*	0.07	0.42***	0.38***	0.93***	0.97***	0.91***	0.93***	0.86***	0.96***	0.91**	-		
16 Surprise	0.63***	0.18**	0.13*	0.16**	0.12*	0.44***	0.42***	0.96***	0.92***	0.87***	0.97***	0.78***	0.92***	0.96***	0.94***	-	
17 Trust	0.60***	0.24***	0.18***	0.23***	0.17**	0.45***	0.41***	0.99***	0.93***	0.88***	0.97***	0.78***	0.94***	0.97***	0.94***	0.96***	-
M	2.99	36.77	166 k	787.71	168 k	0.36	3.13	40.26	15.53	6.50	19.39	2.54	11.80	16.83	7.80	8.44	25.02
SD	5.80	257.98	1.7 m	5227.36	2.1 m	1.14	7.88	71.04	29.83	12.03	33.91	5.98	21.78	27.93	14.84	13.38	44.19

Note: * = $p < .05$, ** = $p < .01$, *** = $p < .001$. All "00"s are values less than 0.0001.

We used an enhanced version of the NRC lexicon, NRClex 4.0,⁴ which further includes the NLTK library's WordNet synonym sets and enables the coverage of more than 27,000 unique English words. To retain the subtleties of the language, we refrained from data preprocessing methods that simplify inflectional variations, like stemming (see Lovins, 1968) and lemmatization (see Liu et al., 2012). Consequently, words of the same stem (e.g., improve, improved, improvement) were analyzed as separate words. We implemented the NRClex4.0 to count word occurrences in the ten groups. Descriptives of the ten emotional categories, including their means and standard deviations can also be found in Table 1.

3.3.2. Topic modeling

Topic modeling is an NLP technique that identifies latent semantic structures in the corpus (Vayansky and Kumar, 2020). This technique includes a family of machine learning algorithms that detect abstract "topics" based on how words co-occur with each other across different documents. Intuitively, words that have higher loadings on the same "topic" would have higher probabilities of appearing together across different documents. Numerous studies across various disciplines have harnessed topic modeling to probe textual datasets, aiming to uncover and interpret the inherent linguistic structures (Hu et al., 2014; Vayansky and Kumar, 2020). Specifically in crowdfunding research, examples include Xu (2018) that used topic modeling to examine language use patterns enhancing or undermining crowdfunding performance. Likewise, Yuan et al. (2016) used the same method to understand how topical features affect entrepreneurial crowdfunding projects. Overall, ample evidence has shown that topic modeling lends itself to a promising NLP technique that connects crowdfunding semantics with fundraising performance.

To implement topic models, we used latent Dirichlet allocation (LDA), a generative model in which each topic is "...modeled as an infinite mixture over an underlying set of topic probabilities" (Blei et al., 2003, p. 993). To initialize LDA, the first step is to determine k , the number of topics to retrieve from the corpus. Subsequently, each word in each document is randomly assigned to a random topic, after which a certain number of iterations are performed to loop the data through the model and enhance the accuracy of the algorithm. The output of LDA includes a topic per document model and a words per topic model, represented by their respective probabilities (please see Blei et al., 2003 for equations used).

Initial data cleaning and preprocessing were applied, including text tokenization and the application of bigram and trigram models using the genism library (Rehurek and Sojka, 2010). Words were lowercased. Stop words were removed using an English stop-word list within the Natural Language Toolkit (nltk). Additionally, data were lemmatized to only include nouns, adjectives, verbs, and adverbs. Further, words that appeared in more than 99% of the corpus, or in less than 2 documents were excluded. This study reports results from LDA with k (number of topics) = 15. The number was chosen, because it maximized the semantic coherence score (0.47, see Mimno et al., 2011) and the number of sensible topics. Topics were visualized in Fig. 5 using the pyLDAvis interface, a port to Python of the LDAvis R package (Sievert and Shirley, 2014).

3.3.3. Paragraph vectors

Like many other NLP models, LDA may be limited by the "bag-of-words" method it operates on, because such models typically ignore the influence of word order and context. To address this issue and provides more context-specific information about semantics in crowdfunding communication, we further integrated word and paragraph vectors (Le and Mikolov, 2014) to better interpret results obtained from LDA. Word and paragraph vectors are engineered to transcend the "bag-of-words" model's limitations by generating vector representations for more extended text passages. Word vectors (often known as Word2Vec) represent words as multidimensional vectors based on their contextual usage. Put alternatively, words that often appear in similar contexts will have vectors that are close in the vector space as a way to encode semantic relationships. Building upon Word2Vec, paragraph vectors (Doc2Vec) elevate the process. Instead of representing just a word as a vector, Doc2Vec represents an entire document as a single vector in an N -dimensional space, thereby encapsulating more contextual information (Kaminski and Hopp, 2020). In our study, by combining the high-level topics from LDA with the context-rich vectors from Doc2Vec, we aimed to develop a more holistic and nuanced understanding of crowdfunding communication strategies. This hybrid approach ensures that we leverage the strengths of both models: the thematic structures from LDA and the intricate contextual semantics from Doc2Vec, thus offering a comprehensive view of the textual data we have.

Although paragraph vectors have been used extensively in NLP, its adoption in crowdfunding research remains limited. Examples include Kaminski and Hopp (2020), who used the method to extract textual features as an important predictor of crowdfunding campaign success. In this research, we followed the same approach and implemented the Distributed Memory model of paragraph vectors (PV-DM). This model predicts the forthcoming word within a context either by averaging or amalgamating the paragraph and word vectors (Le and Mikolov, 2014). We tailored this model to operate in a 30-dimensional space.

After we obtained the paragraph vectors, these vectors served as inputs for a few classification algorithms that helped us predict whether an attribute in our data was present (1) or absent (0). These classifiers included Logistic Regression, Kernel Support Vector Machine (Kernel SVM), Linear Support Vector Machine (Linear SVM), and the Extreme Gradient Boosting (XGBoost). We used 80% of campaigns ($n = 256$) to construct the training set and 20% ($n = 64$) as the test set. All work was implemented using scikit-learn (Pedregosa et al., 2011) and genism (Rehurek and Sojka, 2010) libraries in Python. Fig. 2 illustrates the workflow pertaining to paragraph vectors. In addition, Fig. 3 provides a flow chart that illustrates the analytical procedures.

To ensure optimal performance and fine-tune the hyperparameters, we leveraged the Bayesian Optimization technique in scikit-

⁴ The NRClex 4.0 library is maintained by Dr. Mark Bailey. The documentation is available: <https://pypi.org/project/NRClex/>.

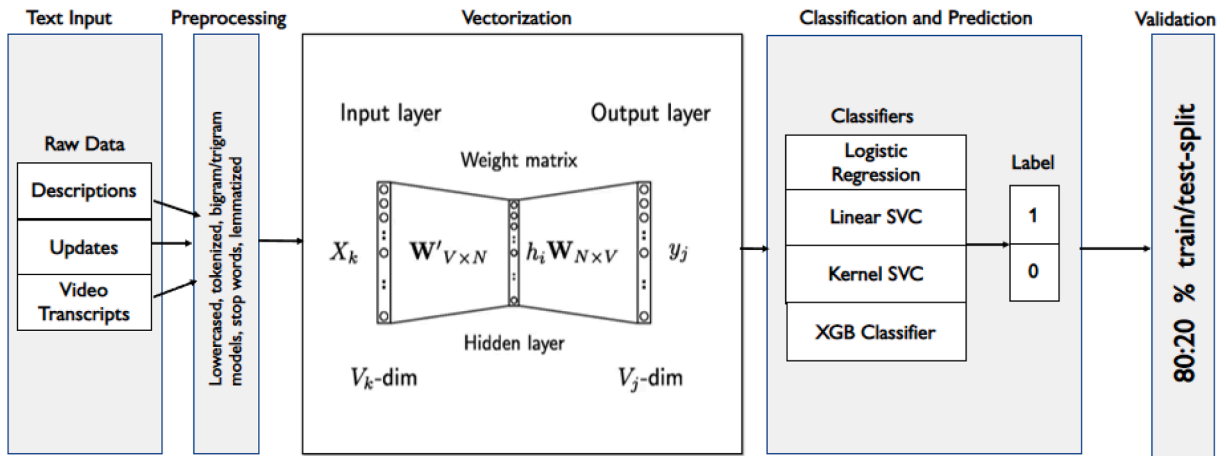


Fig. 2. Predicting fundraisers' locations (US vs non-US) using language through paragraph vectors (). adapted from Kaminski and Hopp, 2020

learn (BayesSearchCV). Essentially, BayesSearchCV offers a more efficient and targeted search than the traditional grid or random search methods by leveraging prior evaluations and focusing the search on hyperparameters that are most likely to improve the model's performance.

4. Results

Before examining if there were any hypothesized effects, we first established the baseline models to evaluate how the non-hypothesized signals functioned in crowdfunding communication. In the study, we used negative binomial regression to test the effects given that our dependent variable (number of donations) was count data and was over-dispersed (i.e., the variance exceeding its mean). This choice stems from the inherent limitations of Poisson regression, which assumes equal mean and variance in the dependent variable. Conversely, the negative binomial distribution incorporates an added parameter, permitting a variance distinct from its mean (Gardner et al., 1995).

Specifically, we fit three negative binomial regression models with a log link function. In assessing the effects of substantive signals, Model 1 found that being a team project ($B = 0.74$, $SE = 0.14$, Wald $\chi^2 = 27.17$, $p < .001$) and receiving more words of support from GofundMe users ($B = 0.009$, $SE = 0.46$, Wald $\chi^2 = 87.15$, $p < .001$) both positively predicted the number of donations. Similarly, Model 2 revealed that two rhetorical signals, including the number of updates ($B = 0.06$, $SE = 0.02$, Wald $\chi^2 = 9.38$, $p = .002$) and fundraising goal ($B = 2.109e-6$, $SE = 1.5066e-7$, Wald $\chi^2 = 195.93$, $p < .001$), positively predicted the number of donations. Interestingly, while video did not exert any statistically significant effect, the number of pictures produced a negative effect on the number of donations received ($B = -0.25$, $SE = 0.01$, Wald $\chi^2 = 4.27$, $p = .04$). All effects held in the full model (Model 3), in which all predictors from Model 1 and Model 2 were included. Table 2 provides all statistics for the three models.

$H1_a$ and $H1_b$ were proposed to evaluate the effects of emotions as rhetorical signals in crowdfunding campaigns for Ukraine. We tested both hypotheses by fitting three negative binomial regression models (Model 4, 5, and 6), with addressing potential multicollinearity issues in mind. As different emotional states are inherently highly correlated as exhibited in Table 1, we first constructed a model (Model 4) in which only positive and negative affective states were entered as predictors of the number of donors. Interestingly, while positive emotions increased the number of donations ($B = 0.02$, $SE = 0.002$, Wald $\chi^2 = 110.90$, $p < .001$), negative emotions created an adverse effect on donations received ($B = -80.03$, $SE = 0.005$, Wald $\chi^2 = 33.92$, $p < .001$). In Model 5, we tentatively included eight discrete emotions as predictors, but the model produced pronounced multicollinearity. A trimmed model (Model 6), with a collinearity tolerance value of 0.12 and variation inflation factor (VIF) of 8.44 for both predictors, was fit to only include sadness and trust. It can be seen in Table 3 that sadness negatively predicted fundraising success ($B = -0.14$, $SE = 0.009$, Wald $\chi^2 = 211.41$, $p < .002$); however, the effect of trust went the other direction ($B = 0.06$, $SE = 0.004$, Wald $\chi^2 = 276.92$, $p < .001$). Overall, our findings highlight the favorable influence of positive emotions, particularly trust, on fundraising outcomes. On the contrary, negative emotions, especially sadness, appeared to hinder fundraising efforts. Both $H1_a$ and $H1_b$ were thus supported, although the directions of the effects were opposite.

We further expanded our analysis to consider emotions conveyed in the words of support (WOS), aiming to understand the sentiments from the perspective of donors. To our surprise, both positive ($B = 0.008$, $SE = 0.004$, Wald $\chi^2 = 4.67$, $p = .03$) and negative sentiment ($B = 0.03$, $SE = 0.007$, Wald $\chi^2 = 17.00$, $p < .001$) positively predicted the number of donors. Furthermore, donors' expressed sadness in WOS was no longer an inhibitor but became a catalyst for fundraising success ($B = 0.05$, $SE = 0.01$, Wald $\chi^2 = 12.75$, $p < .001$).

We developed H2 to investigate the influence of semantics on fundraising results. The hypothesis was particularly proposed to focus on semantics that facilitate value alignment between fundraisers and donors. To test the hypothesis, we first used LDA to generate 15

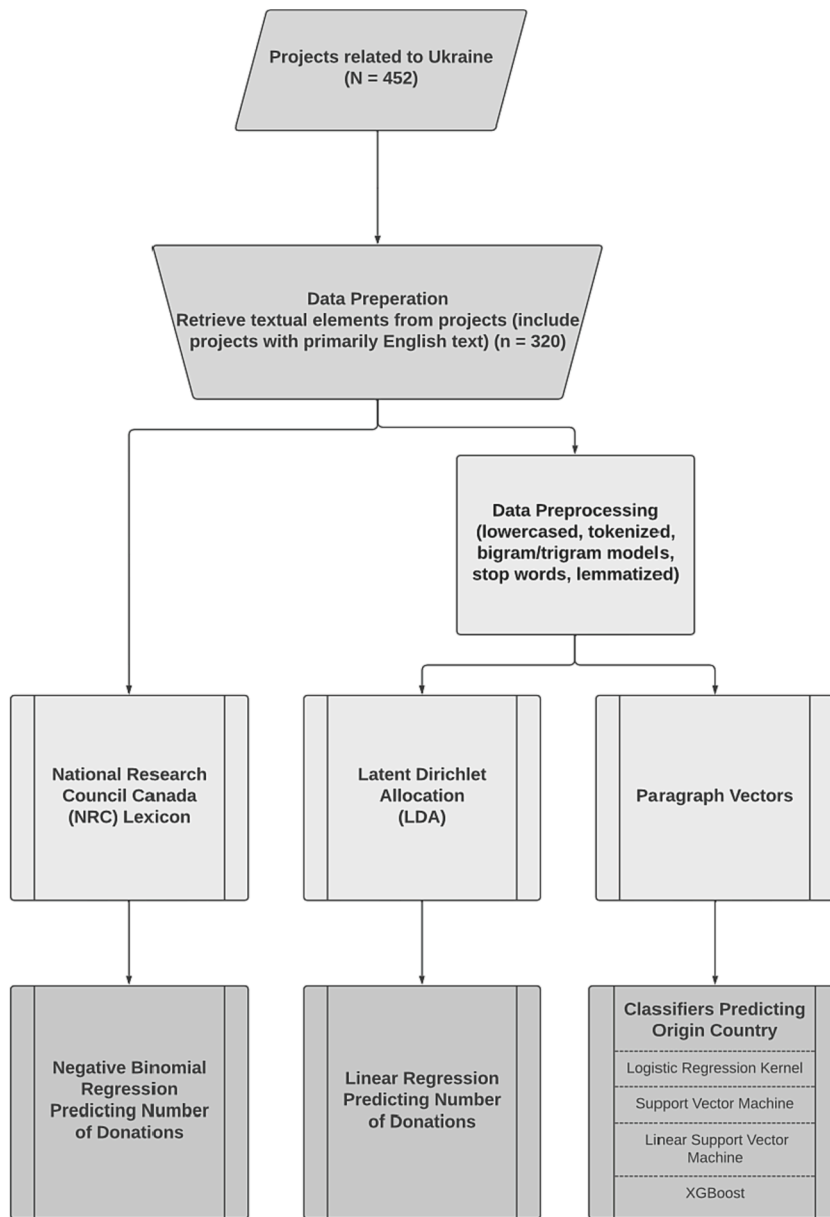


Fig. 3. Flow chart of analytical procedures.

topics as described in the Method section. Fig. 4 shows the top loaded topic words generated for each of the 15 topics, which reflects different themes and semantic structures that LDA helped uncover in the corpus. For example, Topic 7 seems to gravitate toward the Russian politics, with “Putin”, “democracy”, “cruel” identified among the top topic words. Instead, Topic 5, which includes “relief”, “organization”, “nonprofit”, and “UNICEF”, seems to be centered on organization-initiated efforts for Ukraine crisis relief. As a glimpse of the topics may only offer some initial insight but does not allow for statistical inference, we followed the approach described by Xu (2018) and used each document’s loadings on different topics as predictors of the number of donors in regression models. As these loadings are essentially probabilities of how a topic is likely to be detected in each document, they are a useful basis to connect semantics with fundraising outcomes. Out of the 15 topics, only Topic 7, the “Anti-Putin Topic”, positively predicted the number of donations (Standardized $\beta = 0.22$, $p < .001$). The other topics did not produce any statistically significant effects. We further used the topic loadings to predict whether the campaign was US-based using logistic regression. It turned out that the “Anti-Putin Topic” was way more likely to appear in campaigns initiated by fundraisers based in the US (OR = $3.97e+7$, 95% CI [90.002, $1.75e+13$], $p = .008$).

The finding that an anti-Putin narrative was much more salient in US-based projects motivated us to further examine the relationship between semantics and project locations. To achieve this goal, we followed the approach provided by Kaminski and Hopp (2020) and trained our classifiers (i.e., Logistic Regression, Kernel SVM, Linear SVM, XGBoost) with text vectorization from PV-DM as

Table 2
Negative binomial regression for substantive and non-hypothesized rhetorical signals.

	Model 1			Model 2			Model 3		
	DV = Donations			DV = Donations			DV = Donations		
	B	SE	Wald χ^2	B	SE	Wald χ^2	B	SE	Wald χ^2
Constant	4.71	0.07	4653.80***	4.96	0.07	4673.51***	4.60	0.08	3516.92***
Substantive signals									
Team (dummy-coded)	0.74	0.14	27.17***				0.84	0.15	32.48***
WOS	0.009	0.46	87.15***				0.009	0.001	49.65***
Non-hypothesized rhetorical signals									
Goal				0.00	0.00	195.93***	-0.00	0.00	0.79
Updates				0.06	0.02	9.38**	0.05	0.02	7.39**
Videos				-0.03	0.05	0.42	0.05	0.02	0.64
Pictures				-0.03	0.01	4.27*	-0.03	0.01	4.87*
Likelihood ratio χ^2 (omnibus test)	943.13***			811.45***			957.00***		
Df	2			4			6		
N	320			320			320		

Note: * = $p < .05$, ** = $p < .01$, *** = $p < .001$. All "00"s are values less than 0.001.

Table 3
Negative binomial regression for emotions as rhetorical signals.

	Model 4			Model 5			Model 6		
	DV = Donations			DV = Donations			DV = Donations		
	B	SE	Wald χ^2	B	SE	Wald χ^2	B	SE	Wald χ^2
Constant	5.63	0.07	6868.84***	5.22	0.08	4596.01***	5.47	0.07	6502.51***
Positive	0.02	0.002	110.90***						
Negative	-0.03	0.005	33.92***						
Anger				0.02	0.02	1.49			
Anticipation				-0.005	0.01	0.19			
Disgust				-0.04	0.03	2.39			
Fear				0.08	0.01	35.66***			
Joy				-0.08	0.01	58.15***			
Sadness				-0.17	0.02	85.87***	-0.14	0.009	211.41***
Surprise				0.009	0.02	0.17			
Trust				0.09	0.008	118.13***	0.06	0.004	276.92***
Likelihood Ratio χ^2 (omnibus test)	406.46***			690.83***			511.53***		
Df	2			8			2		
N	320			320			320		

Note: * = $p < .05$, ** = $p < .01$, *** = $p < .001$. All "00"s are values less than 0.001. All emotion variables were from sentiment analysis of fundraiser-generated content, including project descriptions, project updates, and video transcripts (if any).

input, as shown in Fig. 2, to predict whether the project was based in the US (1) or not (0). In the process of optimizing all classifiers using BayesSearchCV, we also compared the following commonly used classification metrics, including accuracy (i.e., the proportion of all predictions that were correct), recall (i.e., the proportion of actual positives that were correctly predicted), precision (i.e., the proportion of predicted positives that were correctly identified), and F1 score (i.e., the harmonic mean of precision and recall, providing a balance between them). Table 4 presents the complete metrics from the classifiers.

Notably, among the classifiers Logistic Regression was the optimal model (accuracy = 0.815, recall = 0.730, precision = 0.792, F1 score = 0.760). That said, our approach was able to use fundraisers' language alone (project descriptions, updates, video transcripts) to predict whether a fundraiser was based in the US, with 82% accuracy (validation score = 0.98, test score = 0.82).

5. Discussion

United 24, a donation-based crowdfunding project launched by Volodymyr Zelenskyy, the President of Ukraine, has collected more than 498 million US dollars from over 110 countries as of December 2023.⁵ This aspirational initiative is coupled with thousands of other Ukraine-related crowdfunding campaigns that have financially assisted millions of beneficiaries on military defense, medical aid, and crisis relief. These global crowdfunding projects manifest the shifting powers in contemporary geopolitical landscape, providing important implications for large-scale organizing, fundraising management, and Internet-based collective mobilization. Through analyzing crowdfunding campaigns for Ukraine on GoFundMe, one of the largest donation-based crowdfunding platforms worldwide,

⁵ United 24 can be accessed at <https://u24.gov.ua/>.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13
Topic 1	help	need	people	refugee	donation	support	ukrainian	thank	fund	donate	child	ukraine	aid	food
Topic 2	family	get	friend	help	week	war	day	time	leave	safe	able	stay	many	live
Topic 3	know	people	think	s	go	say	bread	soup	m	anna	lot	tell	bake	see
Topic 4	appeal	medium	dialysis	achieve	alternative	organizerhello	donor	patient	lyrna	gift	coat	scooter	colleague	performance
Topic 5	relief	organization	student	impact	emergency	nonprofit	org	provide	ground	grant	alcin	crisis	unicef	humanitarian_aid
Topic 6	appreciated	british	lorry	hrs	canadian	writer	temperature	meaning	armed_force	glass	cad	fuck	leg	tin
Topic 7	palace	putin	romania	policy	irish_re	democracy	red_cross	scout	cruel	branch	principle	relation	prosperity	alliance
Topic 8	defender	accessible	croissant	plant	disabilite	health	euro	reaction	simultaneously	participation	sustainable	lgbtq	slide	electric
Topic 9	bike	divide	ten	cycle	extraction	youtube_com	apple	intensive	pete	consultant	variety	careful	pouch	stupid
Topic 10	generate	golf	arise	preparedness	vancouver	gps	resiliency	humane	rotate	recovery	yard	mini	phase	vacate
Topic 11	cereal	maternal	metro	inventory	wholesale	heritage	hilfe	cousin	jar	pole	reside	approx	stocking	rail
Topic 12	insulin	faint	diabetic	plague	poem	engagement	bean	teammate	complain	dig	chap	dependent	bluff	surely
Topic 13	induce	inadequate	dependent	lev	buying	chapter	christopher	darkest	vitality	marine	commence	accordingly	toothbrush	earth
Topic 14	gdansk	teammate	halt	impression	frustrate	flip	packed	dual	virtual	broke	surely	chap	dependent	blind
Topic 15	gdansk	teammate	halt	impression	frustrate	flip	packed	dual	virtual	broke	surely	chap	dependent	blind

Note: Despite the overlapping high-loaded words in Topics 14 and 15, the two topics are not identical. This is because LDA operates under the assumption that each topic has a unique word distribution, with each document representing a blend of these distinct topics (Blei, Ng, & Jordan, 2003). Given a wider table, which might go beyond the capacity of a publishable page, the “divergence point” between Topics 14 and 15 would become evident, illustrating their distinct thematic focuses unrevealed by the initial, shared vocabulary. This highlights LDA’s nuanced approach in distinguishing topics within a corpus, even when surface similarities are present.

Fig. 4. Highest loaded topic words from LDA. Note: Despite the overlapping high-loaded words in Topics 14 and 15, the two topics are not identical. This is because LDA operates under the assumption that each topic has a unique word distribution, with each document representing a blend of these distinct topics (Blei et al., 2003). Given a wider table, which might go beyond the capacity of a publishable page, the “divergence point” between Topics 14 and 15 would become evident, illustrating their distinct thematic focuses unrevealed by the initial, shared vocabulary. This highlights LDA’s nuanced approach in distinguishing topics within a corpus, even when surface similarities are present.

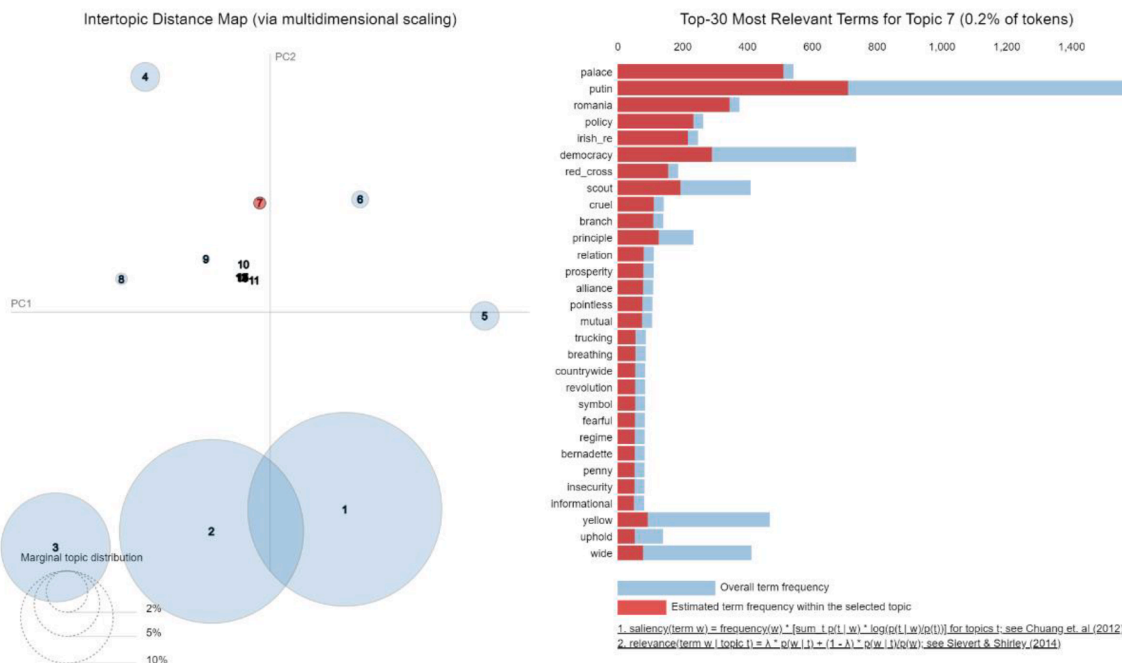


Fig. 5. Intertopic distance map and the top relevant words in the “Putin” topic.

the current study sheds light on new theoretical and methodological possibilities to examining how rhetorical signals affect collective outcomes in crowdfunding. In addition to providing confirmatory evidence that both substantive and rhetorical signals are vital components in crowdfunding communication, findings from the current study also point to new directions of future research: (1) effective signaling does not only take place through the expression of emotions but also through the control of emotions; and (2) “cheap talk” may facilitate resonance building and enable the use of rhetorical signals as a functional architecture to align values and interests between fundraisers and donors.

Table 4
Performance metrics of classifiers predicting fundraisers' locations (US = 1, other = 0).

	Accuracy	Recall	Precision	F1
Linear SVM	0.769	0.615	0.762	0.680
Kernel SVM	0.723	0.461	0.750	0.571
Logistic Regression	0.815	0.730	0.792	0.760
XGBoost	0.738	0.538	0.736	0.622

5.1. Signaling through emotion regulation

Although recent research (e.g., [Zhao et al., 2022](#)) has provided empirical evidence that helps clarify how emotions expressed by fundraisers may exert conditional effects in crowdfunding, our current study adds to existing literature by bringing forward an alternative yet noteworthy perspective on the functionality of emotions. Specifically, our research indicates that the success of a crowdfunding campaign is not solely determined by the unleashing of emotions but also hinges on the adept management of these emotions. This finding well aligns with existing research on the appropriateness of emotional displays (e.g., [Cheshin et al., 2018](#); [Raab et al., 2020](#)), which highlights the need for emotional delivery to be balanced and contextually suitable. Consequently, over-expressing, under-expressing, or conveying misplaced emotions that are less context-aware can all undermine the campaign's objectives. Corroborating this, our findings revealed that despite the inherently distressing nature of events like the Ukraine crisis, negative emotions, especially sadness, may deter potential donors.

At first glance, the finding that expressing sadness deterred donors may seem counter intuitive. However, when viewed through the lens of emotion regulation theory, the finding may begin to explain itself. According to [Gross \(2015\)](#), emotion regulation can be conceptualized as a dynamic process in which the activation of a goal alters the emotional trajectory. Mayer et al. (1997) also postulated that regulating emotions is a key facet of communication success. The ability to regulate one's emotion displays can be particularly important in contexts like crowdfunding, where aligning emotions with contextual demands can significantly alter donor perceptions and actions. Therefore, the capacity to delay or modify spontaneous reactions as needed may be an important cognitive basis to produce desirable, goal-oriented outcomes in crowdfunding. This suggests that while negative emotions like sadness is naturally rooted in distressing situations, positive emotions may potentially foster broader thinking and, consequently, facilitate donations (see [Fredrickson, 2001](#)). Therefore, from a managerial perspective, fundraisers might benefit from balancing spontaneous emotional expressions with regulatory strategies that better resonate with potential donors.

Another angle to examine why sadness backfired on fundraisers may be through the valence-arousal model of affect, a theory that categorizes affective and emotional states based on their intensity (arousal) and direction (valence) (e.g., [Russell, 1980](#)). According to this theory, sadness is characterized by its negative valence and low arousal. While the negative valence of sadness is logically consistent with tragic Ukraine crowdfunding stories and may engender a sense of empathy in the audience, its low arousal might be a double-edged sword. As pointed out by scholars ([Barrett and Russell, 1999](#)), emotional states with low arousal (like sadness) might not incite strong enough motivation to spur into action. In the case of sadness, processing crowdfunding information might become more introspective and passive rather than active and reactive, potentially explaining the hesitancy in donor behavior. Hence, while sadness conveyed in crowdfunding stories could transfer to the audience through emotional contagion, prospective donors may still withdraw from donating because the energy they could draw from sadness is rather low.

The effect of emotional regulation on fundraising effectiveness presents a useful lens through which traditional signaling theory can be further understood. In crowdfunding, signals are vital cues that potential donors rely on to gauge the legitimacy, urgency, and worthiness of a campaign. Our study showcases how strategic emotional regulation can function as an instrumental signaling strategy, which provides a novel perspective to the broader body of work on signaling in crowdfunding. This strategy somehow aligns with a recent study by [Ge et al. \(2023\)](#) that shows the use of sadness-related words more than five times in medical crowdfunding campaigns can be counterproductive. Although it is difficult to optimize emotional appeals through simply quantifying word occurrences, a curated configuration of emotional appeals may be an effective quality signal that current literature has yet to examine. In fact, this finding is consistent with traditional signaling theory that emphasizes the observability of quality signals. In our study, the excessive exhibition of negative emotions, though contextually relevant, may have hampered the observability of other signals, thus reducing the amount of effective quality signals as a whole. As potential donors only have limited time and cognitive bandwidth to process a crowdfunding message, it may be imperative to craft a holistic signal portfolio, where each signal, whether it be factual or emotional, costly or costless, complements rather than competes with one another ([Steigenberger and Wilhelm, 2018](#)).

As another important contribution, the study also sheds light on an interesting phenomenon of emotional displacement, observed between fundraisers and donors. Specifically, for fundraisers the exhibition of negative emotions was punished, whereas for donors such expression was linked with better fundraising outcomes. The somewhat paradoxical finding may suggest that emotional regulation on the fundraiser side may result in emotional catharsis on the donor side. Presumably, this emotional displacement is still fundamentally concerned with handling information asymmetry in high-noise environments like crowdfunding. As [Xu \(2018\)](#) points out, donors are constantly looking for factual details to justify their donating behavior. Hence, for many donors, bridging this informational gap becomes their primary objective, which lays the groundwork for the subsequent emotional response. For this reason, it may be unfair to state that the donors would not be affected by emotional appeals that seek to evoke empathy; instead, a more reasonable interpretation might be that donors cautiously guard against premature emotional engagement until they find credible evidence to justify their actions.

5.2. Cheap talk and aligned interests

As previously stated, the cheap talk models of signaling are an alternative approach to traditional costly signaling theory, putting strategic information transmission at the forefront of a refined signaling theory. As Crawford and Sobel (1982) note, "...perfect communication is not to be expected in general unless agents' interests completely coincide" (p. 1450). Although perfectly aligned interests may seem rare, finding points of convergence where interests of fundraisers and donors could at least partially align is critical to ensure that direct and costless communication can produce some utility. This is not an effortless task in donation-based crowdfunding, where money is transferred from donors to fundraisers without necessarily engendering a new value addition. Essentially, this zero-sum transaction activity does not favor donors in a pure economic sense, given that they do not receive returns on their contributions.

The present study unveils that a Putin-focused narrative was employed as a possible rhetorical device of value alignment, and the strategic use of Putin in crafting crowdfunding appeals significantly contributed to fundraising outcomes. Intriguingly, this trend was predominantly observed in campaigns originating from the United States. The distinct linguistic patterns in US-based initiatives were so pronounced that our machine learning classifiers could predict the fundraiser's location with 82% accuracy solely based on language. These projects likely took advantage of nationalist ideals stemming from the long-standing ideological clash between the US and Russia. In a study examining US media outlets and their presentation of Russia conducted by Tsygankov (2016), it is found that Putin acts as a universal representation of Russian politics. His name operates as a synecdoche for all of Russia's political system, contributing to a lack of nuance in American perspectives of Russia. Further, American media may have contributed to a less sophisticated understanding of the United States as a representation of freedom and Russia as an abusive autocracy (Chernobrov and Briant, 2022). Fundraisers that exhibit the qualities of this nationalist discourse solely via mentioning Putin are perhaps able to attract donors who subscribe to these political ideologies. Essentially, while a donor's financial contribution might seem like a monetary loss, the psychological reward might be the perceived alignment with a larger, shared objective. Put alternatively, if a donor's primary goal is defeating Putin, even if the fundraiser may seek to stop the war as their immediate objective, employing Putin as a symbol could facilitate value alignment. The study contributes to existing literature of signaling by highlighting that this alignment, when achieved, can notably amplify fundraising outcomes. Hence, the utilization of "cheap talk", such as the anti-Putin narrative emerging from our analysis, highlights that non-costly, strategic communication can be equally effective, if not more so, in certain contexts like transnational crowdfunding for the Ukraine crisis.

5.3. Limitations and future work

The current research has a few limitations. The first limitation has to do with the way data were collected. Our research used cross-sectional data obtained from GoFundMe at a single time point, which may be useful for detecting correlations but can also create difficulties in determining causality. Hence, future research may benefit from tracking fundraising progress using longitudinal crowdfunding datasets. It would also be desirable for platforms and academic researchers to develop research programs that allow for more accessible data. The second limitation is associated with the used analytical procedures. Particularly, the NRC Emotion Lexicon categorizes each word using a static standard without really taking into account any contextual effect. With new advances in affective computing (e.g., see Richardson, 2020), more sophisticated algorithms have been developed to capture the trajectory of emotional delivery, which future research can also employ. Additionally, experimental research can be conducted to collect self-reported emotion data from fundraisers and donors to validate the findings from the research. The third limitation, as we are aware of, is that the current research only analyzed campaigns written in English. Future research can tackle this limitation by analyzing multilingual campaign descriptions.

6. Theoretical contributions and practical implications

By empirically investigating relief campaigns for the Ukraine crisis on Gofundme, the current study offers important theoretical contributions and practical implications to inform existing literature on signaling in crowdfunding. From a theoretical perspective, the findings shed light on the interplay between emotion regulation and cheap talk, two signaling strategies that have yet to receive adequate attention. By focusing on how emotional expression and its regulation affect donor behavior, the study expands and enriches existing literature on using emotions as functional rhetorical signals. Additionally, our research also reveals the symbiotic relationship between strategic narrative curation and value alignment, as well as their combined effect on crowdfunding success, through highlighting the impact of specific emotional and semantic cues in crowdfunding campaigns. The theoretical framework we propose may be especially useful for researchers to examine crowdfunding campaigns in similar contexts, such as crowdfunding for regional wars that are taking place recently.

Practically, the above theoretical insights also point to feasible strategies for crowdfunding endeavors. One most obvious implication is that the study illustrates the critical importance of narrative crafting in mobilizing financial support, especially in geopolitically significant contexts. This implication is further manifested through demonstrating the power of strategic emotional engagement: both positive and negative emotions, when appropriately harnessed, can significantly influence fundraising outcomes. As discussed in Section 5, the use of an anti-Putin narrative in US-based campaigns exemplifies the importance of aligning fundraiser narratives with donor sentiments and geopolitical perspectives. To this end, this study provides a valuable guide for crowdfunding practitioners in optimizing their fundraising strategies, stressing on the need for balancing emotional expression with strategic communication to resonate effectively with prospective donors. The distinct linguistic patterns of US-based campaigns also offer a

useful template for customizing campaign narratives to specific donor groups, thus highlighting the importance of cultural and political contextualization in fundraising messages.

Overall, this research not only contributes significantly to the growing literature on signaling and crowdfunding, but it also serves as a practical handbook for practitioners who aim to enhance their crowdfunding efforts in complex and controversial socio-political environments. The findings thus offer both academic and real-world implications in the evolving landscape of digital fundraising.

7. Conclusion

Although both substantive and rhetorical signals play important roles in crowdfunding campaigns for the Ukraine crisis, rhetorical signals are worth more theoretical elucidation and empirical investigation to mitigate the gap between signaling theory and management research. The current study investigates strategic information transmission in crowdfunding for Ukraine and identifies a few important costless rhetorical signals that affect fundraising outcomes. The study has two major contributions. First, findings pinpoint emotional regulation as a novel signaling strategy, as fundraisers' expressed trust increased donations, whereas sadness, surprisingly, produced an adverse effect. Second, cheap talk signaling played an important role in crowdfunding for Ukraine. The value alignment created by an anti-Putin narrative sheds light on a nuanced understanding of global geopolitics and offers crucial pointers for effective fundraising management. From a theoretical perspective, this study broadens the horizons of signaling theory by positing that crowdfunding success is greatly influenced by strategic emotional calibration. Practically, the research underscores the immense value of semantic frameworks that cultivate a congruence of values and aspirations between fundraisers and donors. Such alignment, which existing research has yet to adequately explore, is a crucial ingredient for orchestrating a successful crowdfunding campaign.

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CRedit authorship contribution statement

Alexandra Fischmann: Data curation, Formal analysis, Methodology, Software, Visualization. **Larry Zhiming Xu:** Ideation, Data Analysis, Manuscript Writing and Preparation.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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