

## Research article

# Signaling theory in charity-based crowdfunding: Investigating the effects of project creator characteristics and text linguistic style on fundraising performance

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## ABSTRACT

This research investigates the influence of project creator characteristics and text linguistic style on the effectiveness of fundraising campaigns within the realm of environmental crowdfunding. Drawing on a dataset encompassing 2641 campaigns conducted on the Tencent Gongyi platform spanning from April 2012 to December 2022, the study employs stratified regression analysis to discern the factors that contribute to variations in fundraising outcomes. In terms of hard information, the outcomes reveal that organization size, registration date, prior project initiation experience, and the organization's rating wield a noteworthy influence over the ultimate crowdfunding performance. Conversely, when considering soft information, the presence of negative emotional signals in crowdfunding texts was found to positively correlate with fundraising success. However, emotional intensity exhibited a negative impact on fundraising performance. These findings have substantial implications for practitioners engaged in environmental crowdfunding endeavors. When initiating a project, the creator should demonstrate his or her competence as much as possible to enhance credibility and in addition, should try to show negative signals in the text.

## 1. Introduction

With the development of internet technology, online crowdfunding has become an important philanthropic method and has attracted widespread attention. In recent years in China, the traditional public service fundraising approach, represented by the Chinese Red Cross, has led to a lack of universal participation due to time and space constraints and a crisis of trust among citizens due to the opaque flow of funds. This has resulted in a significant decline in the amount of donations received through the traditional offline public service participation model [1]. In contrast to traditional offline public welfare, online charity-based crowdfunding is dominated by the project creator and the donor, relying on online social media publicity and online financial platforms to raise funds, and thus, it does not have the same drawbacks. This enables a direct dialog between the project creator and the donor, and presents the advantages of low barriers to entry, diversity, convenience, openness, transparency, and high interactivity [2].

Online charity-based crowdfunding has become an increasingly popular current trend in philanthropy. For instance, the renowned crowdfunding platform GoFundMe raised over \$5 billion for more than two million individual projects between 2010 and 2017, with

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over 50 million donors participating. As of July 16, 2022, Tencent Gongyi, a Chinese philanthropy platform, had engaged approximately 600 million people and raised more than \$18.6 billion. Many sensational microcause projects have been launched on major charity platforms and have experienced rapid growth. For example, the "Free Lunch" project, which aims to provide free lunches to children in poor areas, has raised RMB 900 million from April 2011 to July 2022, reaching a total of 1591 schools, and benefiting more than 390,000 people. Online philanthropy is booming and has become a new way to promote the public good. Therefore, research into the behavior of online charity-based crowdfunding is important and necessary, and improving the effectiveness of public service crowdfunding in the context of Internet empowerment remains a critical concern for platforms and project creators.

In addition to the statistical information such as goal amount, donation amount and duration, charity-based crowdfunding websites also contains two sections: objective information related to material from the project creator and the project text, which has been subjectively edited by the creator. According to signaling theory, the project creator information is usually a physical signal presented directly on the crowdfunding platform, such as the size of the organization, eligibility for pretax deductions, and the rating of the organization. This information directly reflects the experience, expertise and qualifications of the project creator and the quality of the project, and can directly influence the credibility of the charity project and the trust of the audience. Therefore, according to signaling theory, we regard this information as hard information [3]. In contrast, text linguistic style is often a factor that indirectly influences fundraising outcomes; it is usually not presented directly on crowdfunding platforms, but is communicated indirectly through words and emotions. On crowdfunding platforms, project creators can use different text linguistic styles to mobilize philanthropy and promote users' donation behavior. For example, factors such as emotional intensity and emotion categories can influence users through verbal delivery without being presented directly. Therefore, we see these factors as soft messages in signaling theory [4].

Research on charity-based crowdfunding involves disciplines such as psychology, sociology, ethics, communication, computer science, and economics, and researchers are dedicated to exploring and parsing the influencing factors and persuasive mechanisms of the operational effectiveness of charity-based crowdfunding projects. In general, research on charity-based crowdfunding is in its infancy, and the issues behind it still need to be deepened and centralized as it moves from Web 2.0 to Web 3.0.

One of the major research gaps is that most of the studies on charity-based crowdfunding have been conducted in developed countries such as the United States and Canada [5–7]. In developing countries such as China, which have more pressing needs in areas involving common prosperity and environmental sustainability, relatively little research has been conducted on charitable giving. In particular, concerning environmental protection, the excessive industry associated with economic development in developing countries is often accompanied by the overutilization of resources and environmental damage. Philanthropy, especially in support of environmental protection projects, can help establish a more sustainable development framework and promote synergy between economic growth and ecological balance. Despite the commonality of human prosocial behaviors, it is undeniable that people from different cultures will have different perspectives when faced with the same problem, leading to different behaviors [8].

To address this gap, we aimed to investigate the determinants of success for charity-based crowdfunding on Chinese platforms, especially for environmental projects. For the data source, we chose Tencent Gongyi, one of the largest charity-based crowdfunding platforms in China. Specifically, we used big data mining methods and computerized linguistic sentiment analysis to obtain the required variables and then performed statistical regressions to examine their impact on the likelihood of success. This study explains the factors that contribute to the success of localized crowdfunding practices for charity-based crowdfunding in China.

**Table 1**  
A review of factors that influence crowdfunding according to signaling theory.

Signal Type	Authors	Category	Data Source	Methodology	Variables
Hard Information	[16]	Reward-based	JD Crowdfunding	Online survey	Webpage visual design; Crowdfunding platform reputation; Product innovativeness; Product quality
	[17]	Charity-based	Tencent Gongyi	Natural language process	Project categories; Project creator categories
	[18]	Charity-based (medical)	Tencent Gongyi	Sequential qualitative-quantitative mixed-methods	Fundraiser's personal and family characteristics; fundraiser's health-related characteristics; Characteristics of the organization
Soft Information	[5]	Reward-based	Goteo	Manual content analysis	Project experience; Human capital
	[10]	Charity-based	A Korean platform	Deep learning	Text complex; Recipients' facial emotions
	[19]	Reward-based	Kickstarter	Deep learning	Facial emotional expressions
	[7]	Reward-based	Kickstarter	Natural language process	Subjectivity in text
	[20]	Charity-based	Kitabisa.com	Manual content analysis	Storytelling technique
	[21]	Reward-based (travel)	not stated	Online survey	Digital storytelling
	[6]	Reward-based	Kickstarter	Natural language process	Object information; Positive sentiment
	[22]	Reward-based	Kickstarter	Natural language process	Positive psychological capital in text
Hard & Soft Information	[23]	Reward-based	Kickstarter	Natural language process	Emotion arousal
	[4]	Reward-based	Dreamore	Natural language process	Creating experience; Failure history; Supporting experience; Topic; Positive sentiment; Negative sentiment
	[24]	Reward-based	Kickstarter	Manual content analysis	Social capital; Impression management

2. Literature review

2.1. Charity-based crowdfunding

Crowdfunding is a method of raising funds by collecting donations from a large group of people, including family, friends, strangers, and businesses. It has emerged from the concepts of microfinance and crowdsourcing, and its online model allows for greater reach through social media.

Crowdfunding projects can be classified into four categories: charity-based crowdfunding, debt-based crowdfunding, reward-based crowdfunding, and equity-based crowdfunding [9]. In debt-based crowdfunding projects, backers expect a certain rate of return on their capital investment [10]. Reward-based crowdfunding is the most common form of online crowdfunding, where investors do not receive a monetary return from the project but receive certain rewards, such as an acknowledgement in the credits of a film project, project-related memorabilia, or a meeting with the project's creators [11]. Equity-based crowdfunding projects are those in which individuals can invest directly in shares or bonds issued by the company, meaning that the project's backers are equivalent to investors who own a share of the project's future profits [9]. In charity-based crowdfunding, donors typically do not receive monetary or material rewards for their contributions. This form of crowdfunding is a type of spiritual consumption for donors, as it provides them with a sense of satisfaction from contributing to a good cause. It often focuses on issues such as health care, environmental protection, education, disaster relief, and poverty alleviation.

A number of studies have been conducted on charity-based crowdfunding to explore the factors influencing crowdfunding performance, as shown in Table 1. Most of these studies have focused on creator-related information and text-related information. Existing studies on project creator information have examined factors such as gender [12], experience [4], education level [5], and social status

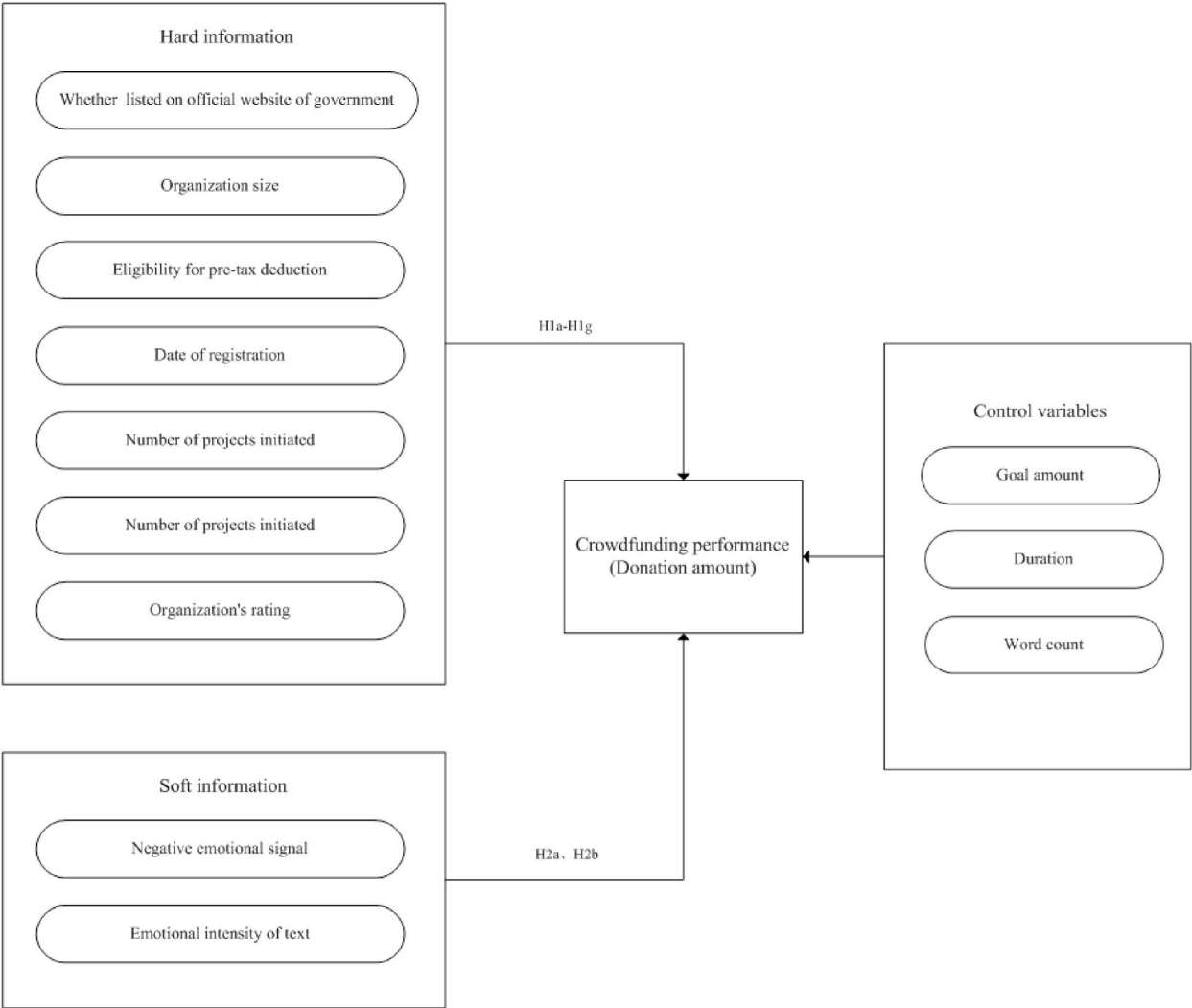


Fig. 1. The research framework.

[13]. Many of these studies have shown that these factors significantly impact the effectiveness or success of the project. For instance, Borrero-Domínguez et al. [5] found that the gender, experience, and education level of the creator have a significant impact on crowdfunding effectiveness. García and Welter [14] also found that projects initiated by men are more likely to be successful than those initiated by women. Similarly, Vismara [15] found that although female and male creators had the same ability to attract support for their projects, female-initiated projects raised comparatively lower amounts of money. In the crowdfunding text, the project description, implementation plan, and call to action for potential funders are typically included. Project creators may also use project-related text and images on campaign pages to increase transparency or reduce information asymmetries. The impact of descriptive features, including linguistic style and emotional signals, on the outcome of project crowdfunding is currently being extensively researched by scholars due to the importance of crowdfunding text in attracting funding.

## 2.2. Signaling theory

Signaling theory was originally proposed by Spence [25] to explain how job seekers can reduce information asymmetry with potential employers. The theory suggests that the effectiveness of signals is influenced by two factors: signal cost and signal observability. In regard to cost, two types of information that employers use to evaluate job applicants are distinguished: soft information and hard information. Soft information refers to subjective or hard-to-measure characteristics of job applicants, such as their personality, motivation, work ethic, and communication skills. In contrast, hard information refers to objective and easily measurable characteristics of job applicants, such as their level of education, work experience, and exam results. This type of information is usually more readily available to employers and can be used to evaluate job applicants.

In crowdfunding campaigns, the signal cost reflects how to prevent competitors from faking or imitating similar signals. High-cost signals can create a distinction between high-quality and low-quality projects [26], known as "hard information". This "hard information" including project creator information, project types, and goal amounts, is a crucial quality signal about the project, and it is presented on the web based on facts that cannot be changed by the project creator or imitated by others, and is thus considered a high-cost signal. Low-cost signals are less valuable than high-cost signals because they are more easily imitated. The project text includes signals set by the project creator, which serve as "soft messages" reflecting the creator's attitude in promoting the project [4]. The project creator can send signals merely by clever design when launching the project, such as suggesting positive psychological capital in the text's language [22], inserting objectification cues in the abstract and award statement [16], evoking emotions in the reader through a change in the text's persona [20], or using the face of a grieving recipient as soft information to evoke empathy [10]. It is important to note that while low-cost signals may not provide as much valuable information as high-cost signals, they can still play an important role in attracting supporters to a crowdfunding project.

Signal observability helps differentiate the quality of projects and allows investors to accurately identify them. Wang et al. [7] conducted a study on signal observability and argued that the accurate observation of signals enables signal receivers to understand the content of the signal. For crowdfunding text, subjective descriptions lead to higher cognitive load, requiring greater effort from the receiver to understand the signal. The presentation of information that deviates from objectivity is a 'double-edged sword'; on the one hand, it reflects the creativity of the project, while on the other hand, fictionalized descriptions may reduce the observability of the signal. In a noisy environment with asymmetric information, both signals can be moderated [22]. Thus, both the linguistic style of the text (a low-cost signal) and sponsor characteristics (a high-cost signal) influence crowdfunding performance.

## 3. Research model and hypothesis development

The research framework is shown in Fig. 1.

### 3.1. Hard information: project creator

The project creator is typically a registered user who possesses the necessary credentials and qualifications to initiate a project on a crowdfunding platform and has already launched at least one project. A project creator can be a natural person, a legal entity, or an organization and is specific to the project they have initiated. For other projects, it is possible for the project creator to become a project donor or a supporter.

The project creator information contains a variety of details, including the date of registration, organization size, whether it is listed on the Ministry of Civil Affairs' official website, eligibility for pre-tax deduction, number of projects initiated, number of projects supported, and the organization's rating, all of which can provide a good indication of the project creator's ability [13]. Generally, project creators with more experience and higher ratings have a better reputation and are more likely to gain the trust of donors, which is a crucial factor influencing donation behavior. This information on creator characteristics can be interpreted as a composite rating of the organization's past actions and used to assess whether the project creator is trustworthy. Good creator characteristics can bring a number of competitive benefits to the creator, including higher online exposure and publicity based on their influence, as well as attracting better donors. Liu and Chen [27] demonstrated that creators with good word-of-mouth scores in terms of the number of followers and status are more likely to succeed with crowdfunding projects. Frydrych et al. [28] argue that organizations that show a good image by demonstrating legitimacy raise the perception of the organization's potential for success. These demonstrations of legitimacy are a sign of hard-earned achievement and credibility; they inform the public that a charity is under government oversight and convey information about organizational capacity and the reliability of a chartered crowdfunding project. Therefore, the hypotheses of this study are as follows.

- H1a.** The fundraising performance of projects initiated by organizations listed on the Ministry of Civil Affairs website is significantly higher than that of organizations not on the list
- H1b.** Fundraising by centrally affiliated organizations is significantly more effective than fundraising by locally-affiliated organizations
- H1c.** Eligibility for pre-tax deduction has a positive impact on crowdfunding performance.
- H1d.** Date of registration has a positive impact on crowdfunding performance.
- H1e.** Number of projects initiated by the organization has a positive impact on crowdfunding performance.
- H1f.** Number of projects supported by the organization has a positive impact on crowdfunding performance.
- H1g.** The organization's rating has a positive impact on crowdfunding performance.

### 3.2. Soft information: text linguistic style

The use of emotional language in project text can serve as a persuasive strategy for project creators. Research has shown that using positive emotions such as hope, optimism, resilience, and confidence in reward-based crowdfunding can reflect the creator's belief in the project's success and can motivate and convince potential donors of the project's value [22]. Similarly, a study by Chen et al. [29] found that positive affective tendencies in reward-based crowdfunding project texts were the most influential factor in crowdfunding outcomes, while negative affective tendencies inhibited funding behavior. However, charity-based crowdfunding may differ from reward-based crowdfunding in terms of emotional signals, as the donors do not receive any material rewards. Negative emotional signals in text may be more effective in charity-based crowdfunding as they can stimulate empathy and lead to greater engagement from donors. Therefore, this study suggests that the positive effect of positive emotions in reward-based crowdfunding may not apply to charity-based crowdfunding, and negative emotional signals may be more effective in promoting donor engagement and increasing crowdfunding performance.

A body of research has investigated the impact of the emotional intensity of the text on donation behavior. Generally, texts with a high frequency of subjective adjectives and adverbs, such as "We are delighted to welcome such a great occasion," are considered to be emotionally intense and contain subjective descriptions [7]. Emotional descriptions tend to reflect people's judgments about things, and involve more emotion, perception, experience, evaluation, and understanding, and are often more creative [30]. Subjective descriptions can serve as a signal of observability and assist potential supporters in gaining insight into and differentiating project quality [7]. While some scholars argue that subjective descriptions tend to increase cognitive load, resulting in more effort needed from message receivers to comprehend the message [7,31], research has also shown that emotionally rich textual expressions can stimulate funders' willingness to invest or increase capital due to the emotional distance between the crowdfunding investor and the initiator [29]. Thus, the hypothesis of this study is as follows.

- H2a.** Negative emotional signals in the text have a positive impact on crowdfunding performance.
- H2b.** Emotional intensity of the text has a positive impact on crowdfunding performance.

## 4. Methodology

### 4.1. Data collection

This article utilized the open-source web crawler software "Octopus Collector V8.5.8" to collect data from the project pages of Tencent Gongyi, the largest charity-based crowdfunding platform in China. The data of 2923 closed crowdfunding projects from the Environmental Protection category, covering the period from April 2012 to December 2022, were crawled by setting the crawler rules through the graphical interface. The crawler collected the project title, goal amount, donation amount, start date, end date, project creator, and project text. However, due to space limitations on the project page, information about the characteristics of the project creators (organizations) was not visible. To obtain more detailed information about these organizations, relevant data from the statistical database were gathered and matched it with attributes such as registration date, organization size, listing on the Ministry of Civil Affairs website, eligibility for pre-tax deduction, number of projects initiated and supported, and the organization's rating. After removing duplicates and projects with missing goal amounts, the final dataset comprised 2641 crowdfunding projects initiated by 129 charity organizations.

### 4.2. Variables

#### 4.2.1. Dependent variable

In this paper, the donation amount raised at the end of each project is chosen as the dependent variable to represent crowdfunding performance. Previous research in crowdfunding often utilizes big data analysis methodologies to select the dependent variable, typically involving the total fundraising amount collected by a project or a binary classification of "success" or "failure" based on whether the fundraising meets the target goal by the end of the campaign period. The data for this study are sourced from Tencent Gongyi, which differs from certain reward-based crowdfunding platforms that employ an "all-or-nothing" model, in which projects that

fail to reach their funding goal return all contributions to backers [32]. Irrespective of the amount raised, funds are either transferred by the initiating charity organization to recipients or the project is executed according to a pre-established plan. Therefore, utilizing the binary variables of “success” and “failure”: to gauge crowdfunding performance may not be suitable. Instead, representing the donation amount as a continuous variable appears more effective in capturing a project’s appeal to funders and their willingness to contribute [19,22]. Given that the donation amount does not exhibit a normal distribution, this paper employs a logarithmic transformation on this factor.

4.2.2. Independent variables

To gauge the type and intensity of emotions in crowdfunding project texts, a deep learning approach was employed for text processing. Tafesse [6] utilized the natural language processing library Textblob to quantify textual emotions in a study on messaging strategies for crowdfunding campaigns. This was accomplished by identifying adjectives and adverbs within the text and subsequently calculating their scores, with positive emotions assigned a value of 1 and negative emotions assigned a value of −1. For this paper, a scoring methodology akin to Tafesse’s work is adopted and a similar text processing tool, the word segmentation software Jieba, is employed. Jieba facilitates the segmentation of Chinese text through various methods, including simple, parallel, and command-line splitting. Additionally, it supports functions such as keyword extraction, lexical labeling, and word position query.

The initial step involves cleaning the text extracted from 2923 crowdfunding messages obtained by the crawler. This process entails removing irrelevant characters such as punctuation marks, emoticons, English content. Furthermore, common phrases found in project texts, such as “project introduction,” “latest progress,” “who is he,” “details,” and similar elements are excluded, as per Wang et al. [16]. In the subsequent phase, the Chinese word segmentation model provided by Jieba is employed to segment the text and annotate the lexical attributes of each segment within every sample. The third phase utilizes a deactivation lexicon to eliminate superfluous words, including inflectional terms, following the segmentation process. Next, texts containing noun classes are extracted, and almost every sample comprises nouns. Following these steps, the results are saved as “word.csv.” Next, the fourth step is based on the CNKI Sentiment Dictionary, where positive sentiment words are attributed a weight of 1 and negatively weighted words were assigned a value of −1. However, the presence of double negatives in sentences could lead to misconceptions. To address this, the Negation Correction Dictionary is employed to rectify such sentiment tendencies. In the final stage, the emotional intensity of each text is computed, which involves calculating the absolute value of the emotion word weights. Following this, we categorize the emotion types: “pos” for those exceeding 0 in emotional value, “neg” for those less than 0, and “med” for those equal to 0.

The project creator’s name can be directly obtained from the information gathered by the crawler. However, the project creator’s information column on Tencent Gongyi is restricted in space and does not display other pertinent detailed attributes. As a result, a manual search for information associated with the 129 charity organizations is performed within the exported dataset. The primary approach involves querying the website of Charity China, which serves as an integrated government service platform for civil affairs. Subsequently, Baidu Encyclopaedia and information provided by each public welfare organization’s official website are used as secondary sources of reference. Through these means, details such as date of registration, organization size, listing on the official website of the Ministry of Civil Affairs, eligibility for pre-tax deduction, the number of projects initiated, the number of projects supported, and organization rating are identified and documented for each organization.

4.2.3. Control variables

This study incorporates three control variables into the model: goal amount [10], project duration [19], and the number of words in the project text [18]. These variables have been highlighted as exerting a significant influence on crowdfunding outcomes in numerous studies.

4.3. Descriptive statistical analysis

Descriptive statistics for the variables in the sample data are displayed in Table 2.

**Table 2**  
Descriptive statistical analysis of each variable.

Variable	Description	Mean	Median	Std	Min	Max
Goal	Amount of money set as a goal	355,896.916	121133.5	1,203,478.076	2	30000000
Duration	Duration of the project	152.063	92	208.681	0	1910
Count	Word count of project text	2201.717	2168.5	790.291	23	6272
List	Whether listed on the Ministry of Civil Affairs’ official website	0.981	1	0.136	0	1
Size	Whether the organization centrally or locally affiliated	0.742	1	0.437	0	1
Tax	Eligibility for pre-tax deduction	0.982	1	0.132	0	1
Registration	Length of registration of organization	19.478	14	9.549	3	40
Initiate	Number of projects that project creator initiated	270.217	167	313.048	0	992
Support	Number of projects that project creator supported	287.937	110	428.413	0	1448
Rating	Organization rating	1.861	0	2.150	0	5
Neg_SIG	Negative emotional signal in project text	0.992	0	1.000	0	2
Emo_INT	Emotional intensity in project text	6.944	5	7.414	3	88



4.4. Correlation analysis

After conducting descriptive statistical analysis, the correlations between variables were calculated to mitigate the risk of strong correlations leading to multicollinearity issues. Given that the variables selected for the study encompass both rank and continuous variables, conducting a single correlation test was not feasible. As a result, separate correlation tests were performed. Spearman’s rank correlation method was utilized for rank variables, while Pearson’s product-moment correlation method was applied to continuous variables. The outcomes of these tests are displayed in [Tables 3 and 4](#).

5. Results

This paper employs stratified regression for analysis, as depicted in [Table 5](#). Model 1 constitutes a regression model assessing the influence of control variables such as goal amount, duration, and word count on the dependent variable, namely the donation amount. Model 2 extends from Model 1 by incorporating variables associated with the project creator’s characteristics to investigate their impact on the raised amount. Subsequently, Model 3 builds upon Model 2 by integrating variables linked to the emotional content of the text.

The findings reveal that in Model 1, the target amount exhibits a statistically significant positive predictive effect on the outcome ( $\beta = 0.137, p < 0.01$ ); likewise, the project duration holds a statistically significant positive predictive influence on the outcome ( $\beta = 0.054, p < 0.01$ ); and the word count of the text also demonstrates a statistically significant positive predictive impact on the outcome ( $\beta = 0.167, p < 0.01$ ). Model 1’s  $R^2$  value is 0.234, underscoring that the control variables aptly account for the model’s outcomes.

In Model 2, the organization’s size demonstrates a significant and positive predictive effect on the outcomes ( $\beta = 0.225, p < 0.01$ ); the duration of the institution’s registration significantly and positively predicts the outcomes ( $\beta = 0.05, p < 0.05$ ); the number of projects initiated by the organization significantly and positively predicts the outcomes ( $\beta = 0.149, p < 0.01$ ); and the assessment rating of the institution significantly and positively predicts the outcomes ( $\beta = 0.175, p < 0.05$ ). Model 2’s  $R^2$  value is 0.318, indicating that the control variables and independent variables related to the project creator’s information effectively account for the outcomes and surpass the  $R^2$  of Model 1. This suggests that Model 2 better aligns with the study’s objectives than Model 1.

In Model 3, the inclusion of an organization on the Ministry of Civil Affairs website’s list does not exhibit a significant predictive effect on the outcomes ( $\beta = -0.036, p > 0.05$ ), thus failing to support [H1a](#). Conversely, the organization’s size significantly and positively predicts the outcomes ( $\beta = 0.233, p < 0.01$ ), thereby supporting [H1b](#). This implies that fundraising by centrally-affiliated organizations is notably more effective compared to locally-affiliated organizations. The eligibility for pre-tax deductions fails to significantly predict the outcomes ( $\beta = -0.02, p > 0.05$ ), thus not supporting [H1c](#). On the other hand, the duration of the institution’s registration demonstrates a significant and positive influence on the outcomes ( $\beta = 0.048, p < 0.05$ ), thereby supporting [H1d](#)—indicating that the date of registration positively affects crowdfunding performance. Moreover, the number of projects initiated by the organization significantly and positively predicts the outcomes ( $\beta = 0.156, p < 0.01$ ), substantiating [H1e](#)—highlighting that the number of projects initiated by the organization has a positive impact on crowdfunding performance. Conversely, the number of projects supported by the organization does not significantly predict the outcomes ( $\beta = -0.069, p > 0.05$ ), hence failing to support [H1f](#). The assessment rating of the organization significantly and positively predicts the outcomes ( $\beta = 0.182, p < 0.01$ ), supporting [H1g](#)—indicating that the organization’s rating has a positive impact on crowdfunding performance. In contrast, the type of emotional signals present in the project text significantly and negatively predicts the results ( $\beta = -0.047, p < 0.01$ ), thus supporting [H2a](#)—suggesting that negative emotional signals in the text have a positive impact on crowdfunding performance. Additionally, the intensity of emotional signals in the text significantly and negatively predicts the outcomes ( $\beta = -0.045, p < 0.05$ ), rejecting hypothesis [H2b](#). This implies that the emotional intensity of the text has a negative impact on crowdfunding performance. Model 3 exhibited an  $R^2$  value of 0.323, signifying that the combination of control variables, project creator-related variables, and text linguistic style variables effectively accounted for the outcomes and surpassed the  $R^2$  value of Model 2, thus indicating a more favorable alignment with the study’s objectives.

To summarize, the study findings provide support for [H1b](#), [H1d](#), [H1e](#), [H1g](#), and [H2a](#). This implies that fundraising by centrally-affiliated organizations is significantly more effective than by locally-affiliated organizations. Furthermore, date of registration positively influences project outcomes, an increased number of projects initiated by these organizations has a positive impact, higher assessment ratings of these organizations lead to enhanced project performance, and the presence of negative emotional signals in the project text contributes positively to fundraising outcomes. On the other hand, [H1a](#), [H1c](#), and [H1f](#) are not supported. Additionally, the study results contradict [H2b](#), revealing that the intensity of emotions in charity-based crowdfunding text has a negative impact on

**Table 3**  
Variable correlations (rank variables).

	List	Size	Tax	Rating	Neg_SIG
List	1				
Size	−0.69**	1			
Tax	0.738*	−0.66**	1		
Rating	0.119*	−0.445**	0.115**	1	
Neg_SIG	0.038	0.038	0.025	0.102**	1

\*\* $p < 0.01$ , \* $p < 0.05$ .

**Table 4**  
Variable correlations (continuous variables).

	Donation	Goal	Duration	Count	Registration	Initiate	Support	Emo_INT
Donation	1							
Goal	0.444**	1						
Duration	0.090**	0.127**	1					
Count	0.046*	0.028	0.084**	1				
Registration	0.026	0.030	0.062**	−0.035	1			
Initiate	0.038*	−0.005	−0.114**	−0.031	0.407**	1		
Support	0.056**	−0.005	−0.103**	−0.034	0.334**	0.842**	1	
Emo_INT	0.004	0.012	−0.037	0.145**	0.032	0.051**	0.026	1

\*\*p < 0.01, \*p < 0.05.

**Table 5**  
Regression models.

Variable	Model 1			Model 2			Model 3		
	Coefficients	t	SE	Coefficients	t	SE	Coefficients	t	SE
Goal	0.137**	6.643	0.000	0.139**	6.870	0.000	0.137**	6.787	0.000
Duration	0.054**	2.630	0.000	0.108**	5.149	0.000	0.106**	5.048	0.000
Count	0.167**	8.143	0.000	0.130**	6.361	0.000	0.14**	6.763	0.000
List				−0.037	−1.229	0.193	−0.036	−1.223	0.193
Size				0.225**	8.047	0.059	0.233**	8.303	0.059
Tax				−0.021	−7.13	0.200	−0.02	−0.67	0.2
Registration				0.05*	2.132	0.002	0.048*	2.049	0.002
Initiate				0.149**	3.736	0.000	0.156**	3.897	0
Support				−0.064	−1.517	0.000	−0.069	−1.617	0
Rating				0.175**	6.841	0.011	0.182**	7.062	0.011
Neg_SIG							−0.047*	−2.278	0.02
Emo_INT							−0.045*	−2.193	0.003
F	43.822			25.484			22.023		
Adjusted R <sup>2</sup>	0.234			0.318			0.323		

\*\*p < 0.05, \*p < 0.01.

fundraising outcomes.

**6. Discussion**

Big data mining is employed for this paper to investigate potential factors influencing the fundraising outcomes of charity-based crowdfunding projects. Drawing from prior research findings, we selected three control variables—namely, goal amount, project duration, and word count in the project text—as well as independent variables related to project creator information and text linguistic style. The project creator information-related independent variables encompass whether the organization is listed on the Ministry of Civil Affairs’ official website, organization size, eligibility for pre-tax deduction, the date of registration, number of projects initiated, number of projects supported, and organization’s rating [13]. Meanwhile, the text linguistic style-related independent variables include the type of emotional signals and the emotional intensity in project text. After gathering crowdfunding data from Tencent Gongyi, the largest charity-based crowdfunding platform in China, and conducting empirical analysis on 2641 concluded projects in the environmental protection category, three main conclusions are drawn in this study.

First, it has been confirmed that the goal amount, project duration, and word count in the project text indeed have a significant positive impact on crowdfunding performance. When individuals browse a charity-based crowdfunding project on a webpage, the specified fundraising goal holds considerable importance as a reference point for determining their contribution. Notably, as the set goal amount increases, it appears that people ascribe greater significance to the project, resulting in higher final fundraising sums. This observation aligns with the findings of Yang et al. [33], who similarly conducted research on the Tencent Gongyi platform, indicating that projects with higher target amounts are more likely to yield positive outcomes compared to those with targets set at lower to medium levels. Additionally, projects with longer durations also enjoy increased exposure on the web, heightening the likelihood of being clicked on and followed by webpage viewers. Consequently, these projects tend to yield enhanced fundraising outcomes [11]. Furthermore, the word count of the project text can serve as an indicator of the project creator’s disposition toward the initiative. When the description is comprehensive, it leads observers to believe that the project creator has carried out meticulous preparations and possesses a profound understanding of the project’s nuances. This perception may foster anticipation for the project’s successful execution, thereby further stimulating donation behavior [19].

Second, viewed through the hard information perspective, several characteristics of the project creator’s profile have emerged as influential factors in shaping crowdfunding outcomes. Notably, the size of the organization, the date of registration, the number of previously initiated projects, and the organization’s rating have all demonstrated their capacity to wield a significant impact on the



ultimate crowdfunding performance. Specifically, this study finds a noteworthy contrast in the donation amounts garnered by projects initiated by centralized organizations versus those initiated by local organizations. This finding can be attributed to a twofold rationale. On the one hand, the heightened authority and credibility of centrally-affiliated organizations likely contribute to their more successful fundraising outcomes. On the other hand, it is conceivable that projects initiated by local organizations tend to possess a more localized and geographically concentrated scope [17], thereby appealing predominantly to donors within their immediate vicinity. As a result, these projects may inadvertently miss out on the opportunity to attract potential donors from other regions who are eager to support projects outside their hometowns. Furthermore, the possession of pre-tax deduction qualifications by a social organization has significant implications for the fundraising performance of its initiated projects. Notably, projects initiated by charity organizations with pre-tax deduction qualifications exhibit markedly superior fundraising performance compared to those launched by organizations lacking such qualifications. This disparity can be attributed to the fact that the pre-tax deduction qualification primarily benefits the donors themselves. Organizations equipped with this qualification are able to issue relevant receipts, enabling donors to avail themselves of tax benefits. Consequently, the allure of potential tax incentives serves as a strong motivating factor for donors, thereby contributing to the heightened fundraising success of projects initiated by organizations with pre-tax deduction qualifications. The duration of an organization's registration and the number of projects it has initiated serve as indicators of the organization's experience in the realm of philanthropy. Typically, a greater level of experience exhibited by a crowdfunding project creator is associated with heightened resilience against various risks, thereby contributing to an increased likelihood of project success. This notion stems from the belief that accumulated experience equips project creators with a deeper understanding of the intricacies involved in crowdfunding projects, enabling them to navigate challenges more adeptly and bolstering the overall success rate of their initiatives. Notably, project experience plays a pivotal role in gauging a project creator's competence in executing projects, thereby serving as a strategic signal to mitigate information asymmetry [3,4]. Clearly, experienced project creators who have previously initiated one or more projects possess a distinct advantage rooted in their ability to glean insights from both successful and unsuccessful endeavors. This iterative process of learning enables them to enhance their personal entrepreneurial skills, cultivate a profound understanding of investor preferences, and mitigate information asymmetry or "knowledge gaps" that often accompany project execution. Drawing from empirical wisdom, these creators can refine their approach and present project details with greater finesse at the outset of a new endeavor. In essence, their familiarity with the nuances of successful fundraising and reward fulfillment sets them apart from novices [22]. As a result, they are equipped to devise meticulously crafted action plans or strategies well in advance, affording them the flexibility to optimize or adapt their tactics during the nascent stages of a project [4]. This foresight and adaptability ultimately contribute to a smoother project implementation process, rendering their initiatives more poised for success. Previous research has confirmed that perceived others' abilities play a vital role in trust [34]. An ability is a group of skills, competencies, and characteristics that enable the trustee to exert influence in a specific domain. Many scholars consider ability to be an essential element of trust [35–37]. The characteristics of a project creator to some extent reflect their abilities, manifested particularly in the interpersonal intelligence needed to navigate relationships with both the platform and beneficiaries, the strategic planning skills essential for facilitating project implementation, and the reflective intelligence to learn from past failures. People are more inclined to trust creators who demonstrate strong capabilities, aligning their interests with those individuals. This trust stems from the creator's adept interpersonal skills, the ability to coordinate and plan effectively, and the capacity for self-reflection, drawing lessons from experiences of setbacks. Furthermore, the assessment rating of the organization serves as a significant gauge of whether a project merits an investor's trust. Crowdfunding behavior is inherently rooted in an individual's resonance with the project creator. When viewed through the lens of Tajfel's [38] framework on social identity, the identity established by donors within crowdfunding projects assumes a distinct emotional and value-based significance. The depth of this social identity influences the project creator's access to resources and motivation to navigate the execution process, playing an increasingly pivotal role in the realm of crowdfunding.

Third, when analyzed through the lens of signaling theory's soft information perspective, it becomes evident that negative emotional signals within charity-based crowdfunding text exert a positive influence on fundraising performance, a finding congruent with the conclusions drawn by Raab et al. [19]. Research in the fields of psychology and sociology is dedicated to exploring the underlying mechanisms of framing efficacy. Framing efficacy refers to whether donation appeals emphasize the potential benefits of donating (positive framing) or the negative consequences of not donating (negative framing) [39]. Positive framing highlights the positive impacts of making a donation, making it more favorable for individuals to decide to contribute [40]. However, under the condition where the decision to donate has already been made, negative framing can lead to an increase in the donation amount [39]. The presence of negative emotional frames in the text underscores the challenges confronting the project and the grave ramifications should the project's importance be underestimated. This narrative approach is more likely to evoke empathy and foster a sense of urgency among potential donors, kindling the notion of "ameliorating the current situation and averting dire consequences." This, in turn, facilitates their inclination toward donation behavior by enhancing their emotional connection to the cause. In the realm of charity work in China, there exists a classification based on propaganda strategies known as "sad charity" and "happy charity," as outlined by Han [41]. Illustratively, "Project Hope" stands as a quintessential example of sad charity, leveraging the poignant imagery of young girls in impoverished mountainous regions, evoking a sense of helplessness and yearning to elicit empathy. On the other hand, happy charity revolves around a blend of self-interest and altruism, as exemplified by initiatives such as the "Carry One More Kilogram" project. It is pertinent to highlight that negative emotions often function as cautionary cues for crowdfunding projects that prioritize impact over rewards [42]. Negative project texts often encompass references to the prevailing environmental condition, the costs associated with environmental degradation, and the repercussions of human actions on the environment. These references underscore the urgency of environmental preservation, suggesting that failure to contribute to the project could yield adverse outcomes. Such texts tend to be attention-grabbing and elicit a heightened sense of immediacy among potential donors, consequently bolstering their inclination to contribute. However, when making a choice between positive and negative framing, motivational factors also need to be

taken into consideration. According to regulatory focus theory [43], individuals with an elevated promotion focus tend to concentrate more on ideals and aspirations when pursuing goals, prioritize potential gains, and prefer measures that can improve outcomes. On the other hand, individuals with a prevention focus tend to focus more on responsibilities and obligations when pursuing goals, prioritize avoiding potential losses, and prefer measures that prevent outcomes from worsening. Negative text more often reflects coping with external threats in the environment, avoiding the deterioration of the beneficiary's living circumstances, and embodies the defensive focus behavior of donors when engaging in crowdfunding [44]. Meanwhile, it is noteworthy that this study has revealed a counter-intuitive finding: emotional intensity in charity-based crowdfunding texts has a negative impact on fundraising performance. This phenomenon may stem from the fact that while appropriate emotional signals can foster a stronger emotional connection with donors, an excessive emphasis on negative emotions can compromise the objectivity of the text, making it appear insincere and influencing potential donors' rational judgment. Moreover, an excessively high emotional intensity could impose a greater cognitive load on potential donors, potentially leading to fatigue and reduced engagement.

Currently, online charity-based crowdfunding has emerged as a new channel for fundraising by businesses and individuals globally. Its advantages, such as low barriers to entry and diversity, have gradually replaced traditional methods of raising charitable funds, making it a widely adopted form of public welfare. The emergence and growth of online crowdfunding platforms will have profound effects on both domestic and international charitable endeavors and other fundraising activities. These developments have also made it feasible for individuals to engage in philanthropic activities. Therefore, the value of this article lies in its practical significance for practitioners in the field of environmental crowdfunding. The identification of key hard information signals, such as organization size and registration date, offers actionable insights for crowdfunding creators. Understanding the impact of these characteristics enables organizations to strategically position themselves for improved fundraising outcomes. Meanwhile, the unexpected positive correlation between the presence of negative emotional signals and fundraising success challenges conventional wisdom. This discovery prompts a reevaluation of the role of authenticity and vulnerability in campaign messaging, offering a fresh perspective for practitioners seeking to connect with donors on a deeper level. The research also sheds light on the delicate balance required in soft information signaling. While negative emotional signals prove beneficial, an excessively intense emotional appeal is counterproductive. This insight guides practitioners in crafting campaigns that evoke empathy without overwhelming potential donors.

In conclusion, this research addresses a significant gap in the literature by providing a comprehensive examination of the combined effects of project creator characteristics and linguistic style on fundraising outcomes in environmental crowdfunding. The nuanced insights generated have practical implications for practitioners and contribute to the theoretical foundation of signaling theory in the context of charity-based crowdfunding, making a valuable and unique contribution to the field.

## 7. Limitations

Despite our extensive efforts in conducting this research, limitations still exist. First, the research sample is relatively narrow, with only 2641 campaigns studied in the period from April 2012 to December 2022. This small size could affect the external validity of the findings. Second, the data utilized in this study originate exclusively from Tencent Gongyi. While Tencent Gongyi holds prominence as a renowned charity crowdfunding platform in China, it is important to recognize the existence of other comparable platforms, such as Weibo Micro Gongyi. Consequently, the findings drawn from this research possess certain limitations. To enhance and validate the model of influencing factors, future investigations should encompass a broader range of crowdfunding data sources. This approach would contribute to a more comprehensive understanding of the factors at play. Third, data obtained through real-world sampling may be influenced by numerous unquantifiable additional variables, such as the exposure rate of webpage links, celebrity endorsements, the category of environmental public welfare, and the creative level of the copywriting. These factors introduce interference that compromises the rigor of the final statistical results, undermining the conceptual validity. Moreover, the limitations of big data analysis are also evident in its inability to quantify demographic information and other characteristics of individual donors.

## 8. Future research

This paper delves into the influence of project creator characteristics and text linguistic style on project performance within the realm of environmental charity-based crowdfunding, employing signaling theory as its framework and leveraging data from Tencent Gongyi. There are also many related studies that could be conducted in the future.

First, project images are also a pivotal factor influencing donors' perceptions and attitudes toward the project. Research has highlighted the distinction between mental representations of verbal and nonverbal information, categorizing them as two distinct systems. The verbal system undertakes the processing of verbal information and abstract concepts, while the representational system manages the handling of perceptual information and concrete elements. It is crucial to note that these systems operate independently of one another [45]. Indeed, the project text and images used in crowdfunding campaigns are distinct semiotic systems that trigger varying recognition processing when donors engage with web pages. However, investigations that combine both project text and images and examine their collective impact on fundraising decisions and the mechanisms underlying their interaction remain scarce. Existing studies indicate that a strong alignment between images and text can enhance cognitive and emotional processing, thereby bolstering consumer preference and intent to make a purchase [46]. Moreover, research highlights that the correlation between graphics and text holds particular significance for cognitive processing among individuals who exhibit a field-dependent cognitive style [47]. In light of this, there is a need for future research to more deeply examine the implications of integrating visuals within crowdfunding messages and the potential outcomes it could yield. Such an exploration would offer valuable insights into the interplay between textual and visual elements and how they collectively shape donors' decision-making processes.

Second, to substantiate the results of regression analysis and further explore the causal relationships between creator characteristics, linguistic style, and crowdfunding performance, future research could employ rigorously controlled laboratory studies. Although laboratory experiments may introduce the Hawthorne effect, resulting in potential biases in the outcomes, they offer the advantage of strict control over irrelevant variables. Additionally, such experiments can delve into the psychological factors of donors, including motivations, personal needs, and moral identification. Regarding the positive impact of sad emotions, prior laboratory empirical studies have yielded similar results, indicating in experiments that individuals are more willing to donate more money to beneficiaries displaying sad facial expressions [48]. Researchers have also manipulated the relationship types between donors and recipients, validating the roles of donors' moral identification levels and altruistic motives in donation intentions [49].

Third, when donors decide to contribute to a charitable project, they may implicitly weigh multiple criteria in making their choices. To further explore donor decision-making behavior, multicriteria decision-making (MCDM) methodologies can be employed to assess the priority ranking of crowdfunding projects by investors. Numerous studies have demonstrated the undeniable value of the fuzzy multicriteria decision model (FMCDM) in practical applications [50–52].

## Ethical statement

The study was approved by the Ethics Committee of Science and Psychology Department of Hohai University (2024-2-0001).

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## Data availability statement

Data will be made available on request.

## CRedit authorship contribution statement

**Yimeng Zhai:** Writing – review & editing, Writing – original draft, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Wangbing Shen:** Supervision, Formal analysis, Conceptualization.

## 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.

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