Driving Factors and Moderating Effects Behind Citizen Engagement With Mobile Short-Form Videos

CEVIN ZHANG [1,2], HEMINGXI ZHENG [3], AND QING WANG [1]
[1] School of Media and Design, Beijing Technology and Business University, Beijing 102488, China
[2] Avdelningen för Hälsoinformatik och Logistik, Kungliga Tekniska Högskolan, Huddinge, 14156 Stockholm, Sweden
[3] School of Humanities and Social Sciences, City University of Macau, Macau, Macau

Corresponding author: Qing Wang (susana_wang@sina.com)

ABSTRACT Mobile short-form video entertainment enables mainstream public sites to expedite the dissemination of essential information, increase transparency, and maintain trust among decision-making bodies. In view of these benefits, it is necessary to understand the mechanism of citizen engagement with short-form videos using social media almetrics. The purpose of this study is to delineate the driving factors and moderating effects of large-scale interactive participation in TikTok's public accounts committed to sustainable poverty alleviation, a grand challenge that spreads quickly on the official agenda. Specifically, this study estimates negative binomial models based on the complete set of videos, released between 2018 August (the earliest publication date available) and September 2021, in poverty-striken provinces. The results show that appropriate combinations of common themes, music genres, and sentiment can strengthen the involvement and awareness of short-form video entertainment. It serves as convincing proof that 1) content related to human resource development and public policies stimulated the highest level of citizen engagement, and it exceeded all other categories by a large margin; 2) sentiment's moderating roles could be partially confirmed across the common themes and music genres; and 3) while being moderated, popular and epic music could either arise or weaken citizen engagement under the topical series, but the benefits of containing these genres were not limited to performance.

I. INTRODUCTION

The Internet of Things is rapidly changing the future of social media. Users are not only able to connect quickly and reliably to non-human objects and communities without borders, but also share thoughts in the public sphere. Specifically, mobile entertainment applications can enable high-level authentic and responsive engagement in the information era [1], [2]. From a practical standpoint, these digital services are available as best-in-tech solutions [3] and offer creative choices of interaction with promising [4], context-aware [5], and ever-present messages [6]. One of the opportunities brought is the increasing presence of content and material for the major area of concern, that is, climate change and poverty alleviation, as covering these subject matters over which society and

its members have responsibility can lead to social security, situational awareness, essential resource allocation, and community support. A shift in the primary source from simply digitalized texts to short-form video content is generally seen as one of the most important means of meeting this challenge.

However, a significant barrier to this goal is the underexplored communication mechanism of short-form video entertainment [7], a media format subject to all factors affecting the popularity of social media design that may result in a wider attention span. Some factors are unplanned and unexpected (e.g., latest news, practices, and accidents), while others are formal mechanisms (e.g., video caption, length, background music selection, and focused area) or known in advance (e.g., top trends in society or culture). Owing to the strong interplay between engagement and video design strategies, video characteristics are prone to social media reaching a large audience and enjoying sustained popularity.

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Communication plays an active role in citizen engagement and hinges on the most important distinguishing features, that is, the metrics of comments, likes, and shares on social media. When the share count increased, popularity often leveled up, and digital content became viral. As comments grew, videos could moderate the public sphere and produce more emotional experiences, which may affect feelings of adequacy, satisfaction, and correspondence. Thus, the acknowledgement received from a social media application might serve as a promising aspect for video content planning, design strategies, and the effectiveness of message delivery.

Until recently, relatively little research has been devoted to two-way communication with official channels rather than with fellow creators from any online community. Most existing studies have analyzed the variables of user engagement by investigating memes and trending videos in terms of discourse interest [8]. The impact of public accounts on health communication has been assessed through quantitative indicators of video format attributes and by analyzing the potential of emerging tools to educate community members [9]. Chen *et al.* considered citizen engagement with social media during the pandemic and found that public health departments should supply shorter videos with longer titles and content focused on the handling of health issues and providing stakeholder guidance [10]. Larbi *et al.* studied the most engaging features based on a thorough examination of posts over three years on the diabetes-related social media channels of the Norwegian Diabetes Association [11]. They concluded that social media users were the least engaged with post content, which could be a priori linked to greater empowerment.

To this end, scholars have sought to contrast the frequent features of digital media across social networks to determine how modes of sociality differ across platforms [12]. Mobile short-form videos could thus be a novel format for public health services as they draw on imitation and replication. As an illustration, Du *et al.* found that the quality of TikTok's travel videos affects the inspiration for visiting global destinations [13], while extensive studies have discussed information searching only as an engagement behavior. Even though some participants did not show a preference, most were picky about where and with whom to share their personal trials. Vázquez-Herrero et al.'s conclusions point to an adaptation of the news media and programs to TikTok logic [14], especially aiming at new audiences, moving away from the traditional spaces of digital consumption patterns.

The prospective impact placed by user-created contents was emphasized with extant consideration paid to personal storytelling in previous studies. To sustain this progress, it is in the interest of understanding what types of influential factors and moderating effects on mobile short-form video entertainment can be investigated by what types of new models for citizen engagement. However, these key gaps have not been bridged in research carried out to date due to the following aspects 1) researches addressed the ways to engage audiences in an explicit manner by analyzing single aspect such digital

narratives, video format attributes or social media metrics; 2) modeling efforts on smartphone apps have become scarce in recent years; and 3) media studies on TikTok have been based on evaluating qualitative level of evidence. In order to address these limitations, a timely and targeted case in the present study is deemed to be required.

The aim of this study is to provide cutting-edge behavioral insights into citizen engagement with short-form videos, thereby contributing to the empirical literature on the role of next-generation social media in promoting interactive communication. Furthermore, many studies of short-form videos, such as content production and marketing, do not consider supporting a topical series such as poverty alleviation, but rather handling health crises, climate change, or social welfare. Meaningful engagement in poverty issues could be achieved through a mixed-message media diet that must include diversified stories and frames, as suggested by Cameron [15]. Therefore, the primary objective of this study was to examine how comments, likes, and shares vary with the attributes inside the platform to answer the following research question:

What are the cornerstone factors affecting citizen engagement in mobile short-form video entertainment?

The analysis consisted of estimating the impact of video length, title length, and content type on the attention surrounding the publications. In addition, categorical characterization of the interacting variables was conducted to determine sentiment's mediating role. This is because the combination of subject matter and emotional value in the online text might cause a redistribution of the number of comments, likes, and shares. Hence, this study is expected to respond to the hypothesis put forth in the research model.

II. RESEARCH MODEL

Based on the assumption that altimetry in mobile short-form video entertainment is affected by style, we suggest that the dimensions of citizen engagement also rely on the selected common theme topic and music genre, in addition to the lengths and replies of prior studies [10]. Fig. 1 illustrates our research model. To understand the communication mechanism, we assume that video characteristics play an important role in all the quantitative indicators received by each video. Furthermore, sentiment's moderating effect is investigated to explain the differences across category variables. A detailed reason for selecting these hypotheses under the research model is presented in the remainder of this section.

Literature has discovered that video length is one of the cardinal features with a significant impact on digital consumer engagement [16], defined as the attention span required for media entertainment [17]. Similarly, Jang *et al.* connected duration to narrative engagement [18], a discourse effort that becomes more important with excessive video length.

Provided that video length is an important aspect of design, the hypotheses to be examined are as follows:

Hypothesis 1 (H1): Video length negatively affects the three dimensions of citizen engagement with mobile
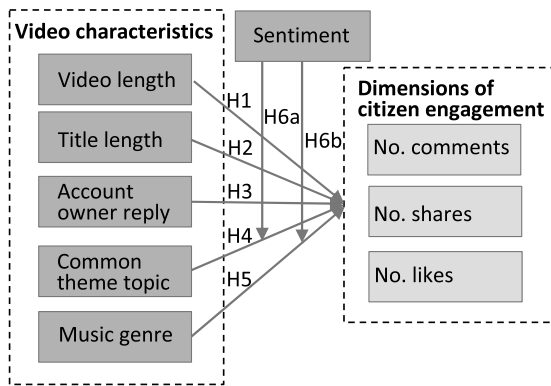
FIGURE 1. The research model of the relationship between video characteristics and dimensions of citizen engagement.

short-form video entertainment as measured by the number of likes, shares, and comments.

In previous studies of YouTube videos' temporal format, title length was considered useful for estimating social media popularity [19], acknowledging that further research should consider a much wider variety of design factors. Correspondingly, Moro *et al.* trained neural networks to model the title length of hospitality reviews. Thus, the authors determined the impact of gamification features [20]. Abu Daabes *et al.* analyzed, among other things, video title, URL, length and tags of 150 YouTube cancer treatment videos to explore how linguistic messages facilitated effective communication [21]. Evidence of this relationship was worthwhile to explore the relationship between title length and online behavior. Considering these attempts, the hypotheses to be examined are as follows:

Hypothesis 2 (H2): Title length positively affects the three dimensions of citizen engagement with mobile short-form video entertainment, as measured by the number of likes, shares, and comments.

Replies from the account owner play a role in citizen engagement with social media but receive less attention than deserved. In one of the few studies, Qu conducted a quantitative content analysis to study dialogic communication between charitable foundations and WeChat public sites [22]. This empirical study identified communication strategies by virtue of the successful delivery of multimedia content. Furthermore, Gálvez-Rodríguez explored dialogic strategies in social media activities to bolster citizens' interactions with local governments [23]. The results showed that over half the pages encouraged feedback from citizens, underlining the account holder's view of the overall expectation of participation. Thereafter, more evidence was supplied: Men *et al.* expanded the conceptual framework of dialogic communication on social media [24]. The creation of dialogic loops has been identified as a critical endeavor for leadership in public relations. Considering these attempts, the hypotheses to be examined are as follows:

Hypothesis 3 (H3): Replies from the account owner affect the three dimensions of citizen engagement with mobile

short-form video entertainment, as measured by the number of likes, shares, and comments.

The literature reports a broad spectrum of video content of any kind in general, and topic selection guidelines in particular. As a synthesis, Campbell and Rudan reviewed articles and documents addressing engagement with health themes [25]. They emphasized more research on messages to raise awareness of behavioral changes. On the webpage side, by analyzing 50 posts from each of the 75 local communities, Bonson *et al.* studied the e-participation of various media and content types [26]. It was clear that posts had to be focused on topics related to local citizens' interests. More importantly, heterogeneity was observed among the most popular, commented, and viral topics. Liao *et al.* developed a topic model to level up Facebook engagement [27]. A photo post-recommendation system can arise from modelling to give rise to an increased engagement rate. Provided that short-form video entertainment currently embodies topical features, the following hypothesis was examined:

Hypothesis 4 (H4): Common themes exert significant differential effects on the three dimensions of citizen engagement with mobile short-form video entertainment, as measured by the number of likes, shares, and comments.

Recently, research on the cognitive and psychological impact of music genres has been heading towards mixed reception from users on social media. For example, Fraser *et al.* investigated audience engagement with YouTube music broadcasts from a performance aspect [28]. Collaboration with genres led to emotional support and even potential wellbeing outcomes. More specifically, Ruth tested participants' appraisal of music and their behavioral intentions [29]. The experimental results indicated media coverage as the forthcoming contrast to running the channels. Overall, the literature considered that the music format would be the key source of engagement [30], in which there is a need to present and launch new music genres. Therefore, the following hypothesis was examined:

Hypothesis 5 (H5): Music genres exert significant differential effects on the three dimensions of citizen engagement with mobile short-form video entertainment, as measured by the number of likes, shares, and comments.

Finally, a sentiment is supposed to result in ramifications, if used appropriately. This was evident in Xu's article - the study elicited original tweets posted by emergency-related Twitter accounts for a text-mining analysis [31], demonstrating the possibility of identifying the most influential channels by considering the sadness of words. Viswanathan *et al.* elucidated the dynamics between media engagement, viewing patterns, and firm-generated content [32]. Again, negative emotional values serve as strong predictors of digital consumption patterns. At the platform level, Seifert and Kwon examined how the sentiment of a social networking site affects consumers' engagement with the brand and purchase intention [33]. Again, sentiment was found to be a significant motivational factor in the value co-creation process. Recently, the interaction of variables inside and outside social

media has emerged as a frequently addressed issue [34]. Based on these achievements, the following hypotheses were examined:

Hypothesis 6a (H6a): Sentiment moderates the effects of common themes on the three dimensions of citizen engagement with mobile short-form video entertainment, as measured by the number of likes, shares, and comments.

Hypothesis 6b (H6b): Sentiment moderates the effects of music genres on the three dimensions of citizen engagement with mobile short-form video entertainment, as measured by the number of likes, shares, and comments.

III. METHODOLOGY

Sentiment analysis, provided correctly organizing textual data, is the ideal approach to obtain the overview of the wider public opinion behind the sustainable poverty alleviation topic. This evaluates emotive words separated from single words or unigrams to identify distinct human emotion types. More specifically, it involves processing of tokens to locate carries of a positive or negative connotation. A sentiment examination driven by emotional linguistic performance would detect and recognize types of feelings towards a new digital product or service.

The complete set of videos between 2018 August (the earliest publication date available) and September 2021 should be sufficient to address supposed research questions thanks to the data availability and the following research design 1) all visual and audio contents as well as the numbers of comments, shares and likes are displayed in TikTok; 2) the purpose of the regression model in this study is rather identifying statistically significant relationships; and 3) previous studies citing a thorough and complete sample of digital content publications estimated negative binomial regression models to analyze over dispersed count data in social media.

A. SENTIMENT MEASUREMENT

We measured the sentiment of each item's title on SnowNLP, a class library written in Python that supports the natural language processing task. For sentiment analysis, the Python library involved well-trained semantic dictionaries to estimate the overall tendency of a paragraph based on the positive and negative nature of emotive words. The value was calculated by aggregating the sentiment of words, degree adverbs, and negations.

In particular, the sentiment was approximated by the logical structure of the emotive word, which was subdivided into four scenarios 1) containing only the emotive word; 2) containing negations without degree adverbs; 3) containing degree verbs; and 4) containing degree adverbs and negations. For each of these cases, the following methods were applied:

1) CONTAINING ONLY THE EMOTIVE WORD

The corresponding value was obtained directly if an emotive word was present in the lexicon. Thereafter, the overall sentiment for the item's title in the behavioral model is calculated as shown in (1).

$$\emptyset = \sum_{k}^{n} f(x_k) \tag{1}$$

$$U = \emptyset \times \emptyset(\text{SnowNLP}) \tag{2}$$

where $\emptyset$ is the sum of the sentiment based on the logical structure of the emotive words; n is the number of emotive words; $f(x_k)$ is the polarity value of emotive word x_k; $\emptyset(\text{SnowNLP})$ is the sentiment of the sentence according to the SnowNLP. Throughout the calculated cases, U is the sentiment of the emotive words in the behavioral model.

2) CONTAINING DEGREE ADVERBS

It is clear that the degree adverb enhances or wears off the sentiment of an emotive word. Equation (3) presents the calculation rule for the sentiment of a text containing an adverb.

$$\emptyset = \sum_{k}^{n} \left(f(x_k) \prod_{l=1}^{m} a_{kl} \right) \tag{3}$$

where m is the number of degree verbs, n is the number of emotive words, a_{kl} is the weight of the l-th adverb before emotive word x_k.

3) CONTAINING NEGATIONS WITHOUT DEGREE ADVERBS

The calculation only considers negations in close proximity to emotive words. In the case of an even number of negations, they are ignored. Otherwise, it takes the opposite polarity value of the emotive word.

4) CONTAINING DEGREE VERBS AND NEGATIONS

This study calculated the combinational weight of degree adverbs and negations in two cases, as illustrated in (4).

$$w(s_{kl}) = \begin{cases} -a_{kl}, & \text{adverb precedes a negation} \\ \dfrac{1}{a_{kl}}, & \text{negation precedes the adverb} \end{cases} \tag{4}$$

$$\emptyset = \sum_{k}^{n} \left(f(x_k) \prod_{l}^{m} w(s_{kl}) \right) \tag{5}$$

B. VARIABLE SELECTION AND OPERATIONALIZATION

This section presents a methodology for measuring the impact factors of citizen engagement with short-form video entertainment. The most common approach with popular social media is based on negative binomial regression [35], which quantifies the extent of heterogeneity represented by dispersal data once performance metrics are available. This technique could be complemented by the interaction of variables that give rise to simultaneous changes [36] so that the dependency of one variable on the value of another could be interpreted.

As negative binomial regression is an extension of the Poisson regression, behavioral modeling starts with the derivation of the Poisson formula. Equation (6) represents the function of the Poisson distribution.

$$P(s_k) = \frac{\lambda_k^{s_k} exp(-\lambda_k)}{s_k!} \tag{6}$$

where $P(s_k)$ is the probability of receiving s entries by the k-th video; λ_k is the expected number of entries on the k-th video.

Equation (7) presents λ_k as a function of impact factor on the dimensions of citizen engagement in the following form:

$$ln\lambda_k = ln\, M_k + N_k \beta_k \tag{7}$$

where M_k, N_k are the factors affecting the occurrence of commenting, liking, or sharing; β_k is the coefficient to be estimated.

Because the Poisson distribution requires equal means and variances, a prerequisite that is not easily fulfilled by the data, the error term ε_k is added. Equation (8) presents the functional relationship between the expected number of entries.

$$ln\, \lambda_k = ln\, M_k + \beta_k N_k + \varepsilon_k \tag{8}$$

Thereafter, the distribution function with the error term ε_i is:

$$P(s_k \mid \varepsilon_k) = \frac{[\lambda_k exp\,(\varepsilon_k)]^{s_k} \, exp\,[-\lambda_k exp\,(\varepsilon_k)]}{s_k!} \tag{9}$$

Equations (10) and (11) present the relationship after eliminating ε_k. and as a function of the distribution's expectation and variance, respectively.

$$P(s_k) = \frac{\Gamma\left(s_k + \vartheta^{-1}\right)}{s_k!\Gamma\left(\vartheta^{-1}\right)} \left(\frac{\vartheta^{-1}}{\vartheta^{-1} + \lambda_k}\right)^{\vartheta^{-1}} \left(\frac{\lambda_k}{\vartheta^{-1} + \lambda_k}\right)^{s_k} \tag{10}$$

$$V_k = \lambda_k + \vartheta_k \lambda_k^2 \tag{11}$$

In this study, the impact factors (i.e., the initial independent variables of the behavioral model) were analyzed using a negative binomial regression technique.

$$\lambda = exp\left(\sum_{k=1}^{\infty} \mu_k i_k + \mu_0\right) \tag{12}$$

where λ is the theoretical value of the number of entries with a negative binomial distribution; i_k is the impact factor of the initial k-th entry, μ_k is the coefficient of the impact factor of the initial k-th entry; μ_0 is the constant to be determined.

C. DATA RETRIEVAL AND COLLECTION

The TikTok search engine and its relational database systems were used to identify the video publications. The following data were collected: view date, account name, user name, location if provided, number of comments, number of likes, number of shares, text included alongside the hashtags, brief summary of the video plot, and the sound used.

Replies from the account owner were measured using two indicators: posing and answering the questions. These were manually calculated using video-by-video examinations. If a question or answer appeared in the text, it was marked as 1; otherwise, it was marked as 0. The number of replies was the sum of the scores for the two indicators.

We reviewed the format, content, image, and text to decide whether to accept or reject each video. To comprehensively examine the hypotheses, all videos were assessed without missing important contributions. We allowed a certain degree of snowballing for the TikTok videos that were searchable by the engine. This helped refine the video characteristics and construct the behavioral models.

D. SYSTEMATIC CONTENT ANALYSIS

To answer the research question, the authors adopted a purposeful hybrid approach to content analysis to align with the goal of hypothesis testing [37] together with an exploration of the relationship between visual content and knowledge [38]. The body of literature is limited to content analysis of short-form videos to topical series, with descriptive analyses being more common than the systematic approaches necessary for data-driven modelling of engagement behaviors.

The authors jointly conducted the evaluation procedure. The criterion for video inclusion was that the addressed topic strived to communicate information on poverty alleviation progress from any of the economic, environmental, or social sustainability aspects. As the focus was on the impact of successful poverty alleviation in less-developed communities, videos on failed attempts and cases opposing sustainability were not included. Furthermore, because the focus was on evaluating citizen engagement in accordance with video analytics, still images and materials created on individual sites were not included. In addition to these general requirements, criteria for relevance were also implemented.

(1) Economic growth. The material offers evidence of an increase in the quantity and quality of services and goods to raise fair income distributions.
(2) Social progress. The material reflects the improved capacity of the community to meet the rudimentary needs of its members.
(3) Environmental protection. The material reported correct steps for protecting land, air quality, water sanitation, etc. to preserve the health of humans, plants, and livestock.

IV. RESULTS

Mobile short-form videos were retrieved for the study at the provincial, municipal, and county administrative levels. As presented in Fig. 2, between August 2018 and September 2021, all 982 TikTok videos on poverty alleviation were sourced through a keyword search in poverty-stricken provinces. Following the retrieval of videos, duplicates, missing information, and videos with disabled comments were excluded, resulting in 647 clips as the sample of the study. The number for the past year remained high, confirming our supposition that there was much knowledge gained from recent publications.

A. CLASSIFICATIONS OUTCOMES

The videos included statements about efforts to alleviate poverty. In light of this, the categories of issues addressed were agricultural advancement, transport infrastructure, human resource development, and public policies.
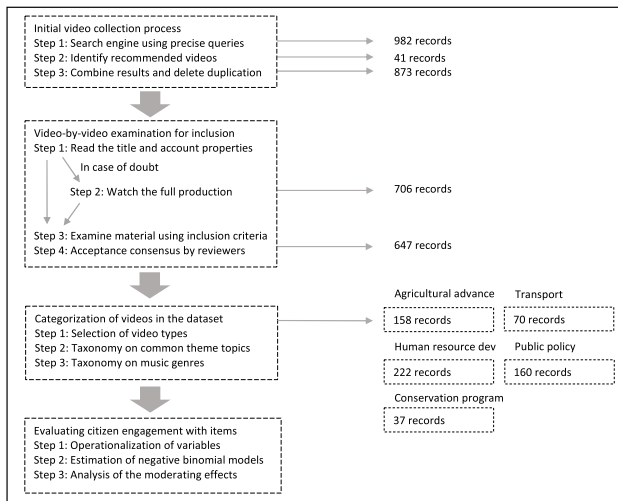
FIGURE 2. Flow diagram of the systematic content analysis procedure: records and reasons.
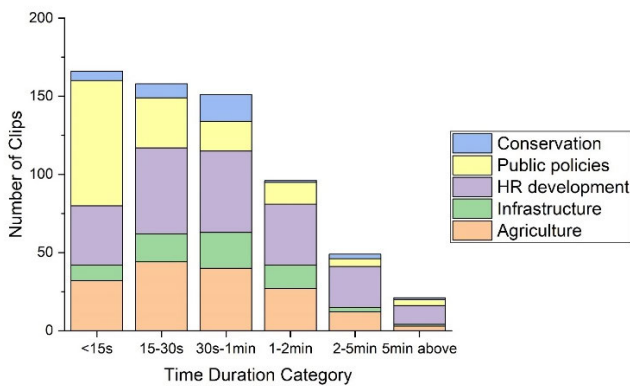

FIGURE 3. Time duration category of the mobile short-form videos.

FIGURE 4. Title length category of the mobile short-form videos.
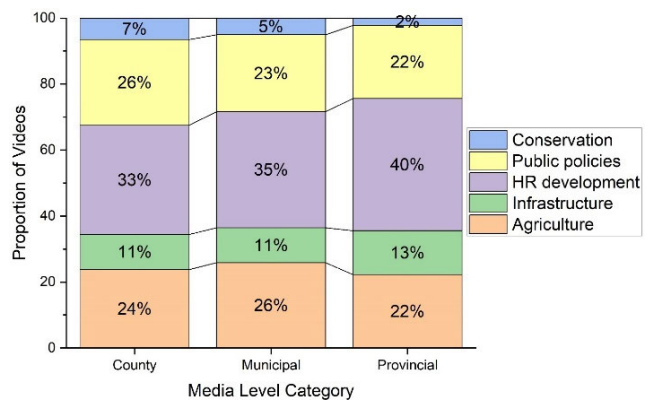
FIGURE 5. Media level category of the mobile short-form videos in the Yunnan and Guizhou provinces.

As we can see from the bar chart in Fig. 3, publications decreased over the time duration. More specifically, at first at 15 seconds the number of clips stood at 166. Then, the number gradually declined over the next two categories, centered at approximately 150 at 30 seconds-1 minutes. After that, the number dropped rapidly for three categories, bottoming out at 21 at 5 minutes and above. The interval between below 15 seconds and 30 seconds-1 minutes experienced a slight growth in the number of videos reporting agricultural advancement, with the number peaking at 40. The number for conservation leveled up at 17. From this point onwards, it plunged to a few at 1 minute to 5 minutes. This made videos for human resource development a sharp increase of proportion for the total number clips, with 26 at 2-5 minutes. After that, the number rose again, reaching the high point of 12 amongst the themes at 5 minutes and above.

We can see from Fig. 4 that at 20-30 words, 30-40 words, and 40-50 words, more videos were produced by public accounts than the other options. Specifically, the number reached 198 at 30-40 words while was followed by the next categories with 170 and 130 videos, respectively.
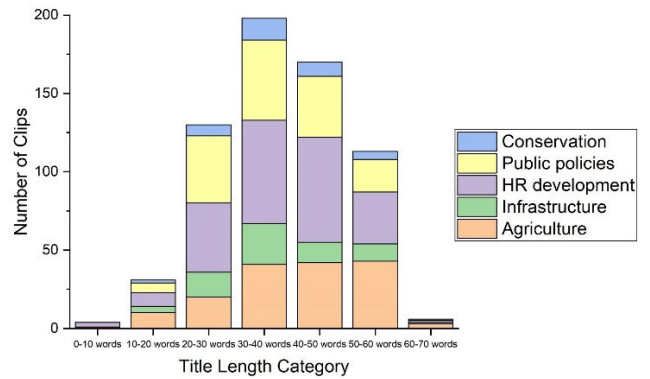
At 50-60 words, the number stood at 113, while all the remaining categories only had 31 videos or below. The category of 0-10 words contained 4 videos whereas 60-70 words contained 6. According to the bar chart, the trends show a fluctuating tendency. For agricultural advancement, the number steadily increased over the majority of title length categories.

The percentage chart in Fig. 5 clearly shows that human resource development accounted for the greatest proportion of videos at the county (Anlong, Binchuan, Dafang, Daguan, Danzhai, Dushan, Fugong), municipal (Kunming, Guiyang, Baoshan, Bijie, Lijiang, Lishui, Liupanshui), and provincial levels (33%, 35%, and 40%, respectively) in Yunnan and Guizhou. As for the other topics, the percentage of videos on public policies was 26% at the county level; this figure fell to 22% at the provincial level. In contrast, the percentage of videos on transport and infrastructure showed an upward trend over the media level. Conservation constituted only 2% of the entire sample at the provincial level; however, at the county level, this figure accounted for 7%.

A total of 60.0%, 1.9%, and 37.2% of the videos were identified as reflecting social progress, environmental protection, and economic growth in sustainable poverty alleviation. Threads posted on county-level media sites contained

the highest percentage of information about social progress (n=232, 63.4%). Of the 45 TikTok videos published by provincial accounts, 48.9% (n=22) reported economic development. As an illustration, a handful of videos elaborated on employment opportunities, while others emphasized retailing efforts around agricultural products and commercial sales to raise income levels. Videos on social progress and economic growth have focused on individual narratives, such as stories, specific issues with relocation, revitalization, and farmers. The topic shifted towards poverty alleviation itself, probably owing to the geographical barriers in developing regions.

B. NEGATIVE BINOMIAL MODEL ESTIMATIONS

The estimations of the negative binomial regression models delivered pseudo R^2 values similar to those of previous studies, as illustrated in Table 1. Recall that Hypothesis 1 proposes that lengthy videos are less likely to attract citizen engagement. This was fully supported by the likes model, which showed that the duration of the videos had a negative and statistically significant relationship with the number of likes (incidence rate ratio [IRR] = −0.01, p<.001). This means that the rate of increasing the video duration would be 1% times as high as the rate of liking among videos of normal duration. In addition, this metric is significantly associated with the number of comments or shares.

Models of comments, likes, and shares in relation to title length partially supported Hypothesis 2, proposing that shorter titles leveled up citizen engagement. The estimation results of the models demonstrated that title length was negatively associated with the number of shares (IRR = −0.04, P<.001), meaning that the rate of increasing the number of characters was 4% times as high as the rate of sharing among videos of normal title length. However, this was not significant for the remaining dimensions.

Hypothesis 3 posited that videos with more replies from the account owner garnered more citizen engagement. Surprisingly, the models in this case served as convincing proof of the statistically significant relationship between formal response and all dimensions of citizen engagement. According to the models, replies played an important role in predicting the number of comments (IRR=0.16, P=.001), likes (IRR=0.09, P<.001), and shares (IRR=0.07, P<.001). The rate of change was 16.2% times as high as the rate among the number of comments, 8.8% times as high as the rate among the number of likes, and 7.3% times as high as the rate among the number of shares.

Hypotheses 4 and 5 posited that the common themes and music genres covered in mobile short-form video entertainment contribute to the level of citizen engagement and are supported by the models. Note that in this case, videos elaborating progress on transport and infrastructure were used as the reference for estimating the models. The models showed that the topics of human resource development and public policies (IRR=1.18, P<.001) were the main contributors to the number of likes for stories on sustainable poverty alleviation. Content related to human resource development played

TABLE 1. Summary of the negative binomial models.

Variables	Comment's coefficient (*P* value)	Like's coefficient (*P* value)	Share's coefficient (*P* value)
Video length	-0.004 (<.001)	-0.01 (<.001)	-0.002 (<.001)
Title length	-0.03 (.06)	-0.02 (.18)	-0.04 (<.001)
Account owner reply	0.16 (.001)	0.09 (<.001)	0.07 (<.001)
Common theme topics	0.82 (<.001)	1.02 (<.001)	0.94 (<.001)
Music genres	0.27 (.10)	0.08 (.62)	-0.10 (.50)
Media level	-0.64 (.003)	0.75 (.01)	0.28 (.28)
Constant	3.25 (<.001	5.24 (<.001)	3.23 (<.001
Observations	647 (N/Aᵃ)	647 (N/Aᵃ)	647 (N/Aᵃ)
LR	63.38 (N/A)	184.1(N/A)	76.15 (N/A)
R^2 (%)	5.95 (N/A)	2.15 (N/A)	2.79 (N/A)

ᵃN/A: not applicable

a significant role in the number of comments (IRR=2.02, p <.001), likes (IRR=3.00, p <.001), and shares (IRR=2.62, p <.001), and the topic of public policies resulted in increases in the former two dimensions. In comparison to information on transport and infrastructure, subject matters related to domestic community workers and the government's efforts to maintain a good order resulted in their consequential rate of change more than 100% times as high as the rate among almost all metrics. The conservation program was significantly associated with the number of comments and likes; however, this did not apply to the shares.

C. ANALYZING SENTIMENT'S MODERATING EFFECT

Although it varied across engagement behaviors, sentiment played a moderating role in the relationships between common themes, music genres, and citizen engagement. By constructing interaction variables in existing models, it is possible to display the conditional impacts of particular predictors. Table 2 demonstrates that the association between common themes and citizen engagement was moderated by the sentiment in the item's title. Videos related to public policies (IRR = −1.58, P=.01) received more comments when their titles included higher levels of adversary feelings. Interestingly, the title's sentiment had a weak or no effect on the relationship between common themes and other types of engagement behavior. This paled in comparison to the music genres, in which the interaction between the sentiment and the light music style was negatively associated with the number of likes (IRR = −3.81, P=.002) and shares (IRR = −4.23, P=.001). For the electronic music style, the more upsetting a video's title, the higher the number of comments (IRR = −3.08, p =.01), likes (IRR = −4.13, P=.002), and shares (IRR = −2.65, P=.04) the video received.

The moderating effect of sentiment was found not to be significant among most metrics. However, as long as the value increased, there was a general decreasing tendency in engagement, regardless of the video and title length. To examine the consequences of interacting variables that result in higher levels of citizen engagement, a thorough visualization was

TABLE 2. Summary of the negative binomial models with interacting variables.

Variables	Comment's coefficient (*P* value)	Like's coefficient (*P* value)	Share's coefficient (*P* value)
Video length	-0.004 (.12)	-0.005 (.11)	-0.004 (.34)
Title length	.011 (.59)	-0.02 (.35)	0.01 (.83)
Account owner reply	0.17 (<.001)	0.09 (<.001)	0.08 (.001)
Emotion	3.95 (.005)	2.89 (.04)	3.25 (.03)
Emotion × Video length	0.001 (.80)	-0.001 (.84)	0.003 (.57)
Emotion × Title length	-0.05 (.03)	-0.003 (.91)	-0.004 (.35)
Emotion × Agriculture	-0.95 (.16)	-1.37 (.06)	-0.76 (.28)
Emotion × HR	-1.85 (.03)	-1.98 (.03)	-1.40 (.15)
Emotion × Public policy	-1.58 (.01)	-0.67 (.38)	-0.99 (.18)
Emotion × Conservation program	-0.56 (.71)	0.67 (.58)	-1.25 (.56)
Emotion × Popular	1.01 (.49)	-0.88 (.48)	-0.10 (.44)
Emotion × Epic	-2.06 (.10)	-2.70 (.03)	-1.44 (.24)
Emotion × Country	-1.12 (.35)	-2.17 (.06)	-0.44 (.72)
Emotion × Light	-1.84 (.13)	-3.81 (.002)	-4.23 (.001)
Emotion × Electronics	-3.08 (.01)	-4.13 (.002)	-2.65 (.04
Media level	-0.50 (.007)	0.51 (.01)	-0.03 (.86)
Constant	1.70 (.10)	4.97 (<.001)	2.51 (.01)
Observations	647 (N/A[a])	647 (N/A)	647 (N/A)
LR	-2201.79 (N/A)	-4865.68 (N/A)	-2587.42 (N/A)
R^2 (%)	8.87 (N/A)	4.36 (N/A)	6.37 (N/A)

[a]N/A: not applicable

FIGURE 6. Interaction effects of title length, video length and sentiment on the level of citizen engagement received by short-form videos: (a) comments; (b) likes; (c) shares.

FIGURE 7. Interaction effects of common theme and sentiment on the level of engagement received by short-form videos: (a) comments; (b) likes; (c) shares.

performed with common themes and music genres. As illustrated in Fig. 6, the number of comments decreased more slowly for videos of shorter durations and titles, whereas large differences were observed for the number of likes across the format variables. The number of shares was the only exception, to level off first and then increase again.

First, the moderating effect of sentiment was significant for common themes, which confirmed Hypothesis 6a. The results of the moderating effect analysis are visualized in Fig. 7 to identify a substantial change in the sentiment corresponding to the interval between 0.1 and 0.4; that is, if the content was related to human resource development, the number of comments would drop from a thousand to a few. For conservation purposes, the number of likes and shares remained almost unaffected. Therefore, the impact of sentiment on citizenship engagement can be considered negligible compared to that of other common theme topics.

Sentiment still dominated the prediction of human resource development, but all eventually approached the curves of public policies, showing a strong impact of interaction that only applies to a single topic.
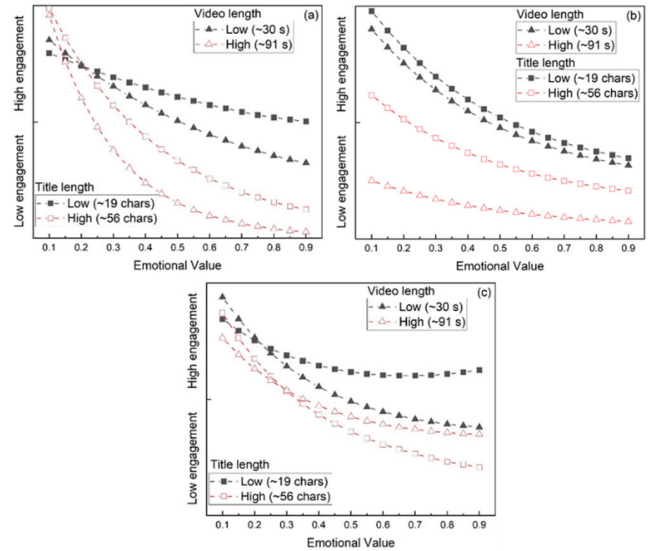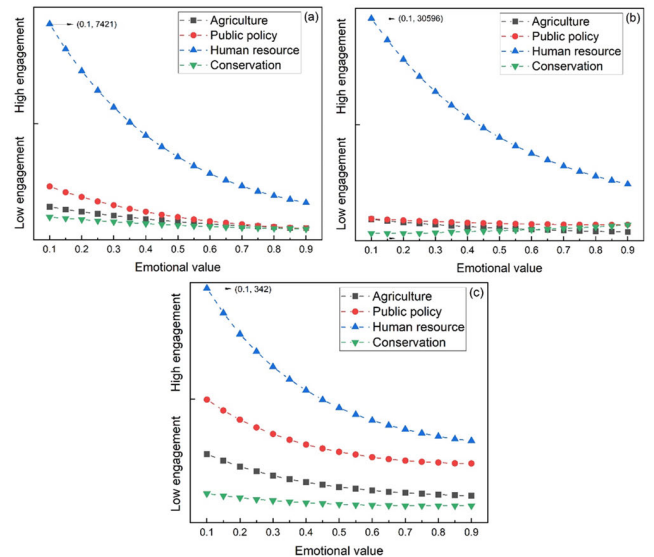
Finally, sentiment was expected to moderate music genres, partially confirming hypothesis 6b. As shown in Fig. 8, a rightful combination of music genre and common theme fostered citizen engagement. For the number of comments, the moderating effect became noticeable with sentiment, together with popular music genre. This surpassed those of light and country music genres, indicating that enthusiastic, eager, and pleasant video titles should be better suited to communicating how affairs address poverty-related issues.

For the rest genres, the highest number of comments occurred when the video encountered negative feelings. This pattern was essentially the same as the curve for the number of
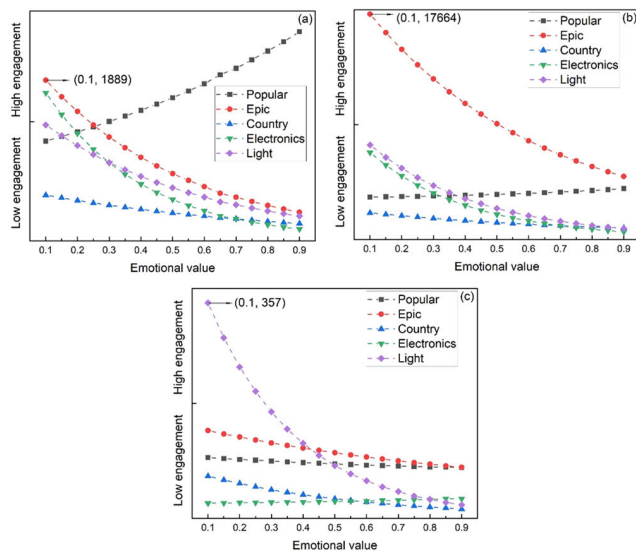
FIGURE 8. Interaction effects of music genre and sentiment on the level of engagement received by short-form videos: (a) comments; (b) likes; (c) shares.

likes; the more passive the title, the lower the number of likes. It is worth noting that increasing sentiment resulted in fewer likes for the videos if they played epic and light music. In contrast, sentiment barely moderated the relationship between music genre and the number of shares, with the exception of the light music genre. Unlike the former curves, where the differences endured, the increase in citizen engagement was independent of the rate of change per sentiment, resulting in a different plot.

Citizen engagement in the number of comments and shares are enhanced by the level of sentiment in the text, with videos playing popular and electronic music, respectively. The opposite trajectory, however, existed for common theme topics, where the number of shares changed almost proportionally to the sentiment.

V. DISCUSSION

This study modelled citizen engagement with mobile short-form video entertainment. The model consisted of a far-reaching collection of variables that offered a direct connection between all the dimensions and video characteristics. No previous studies have reached the depth and accuracy of behavioral modelling in this regard. More importantly, this model investigated sentiment's moderating effect. The results showed that, similar to engagement with conventional topics, mobile short-form videos on a topical series were often key attractors that provided information on public policies and human resource development in domestic areas.

A wide variety of proxy attributes were investigated in our analysis, allowing for an item-by-item examination of the impact factors on their statistical relationship with social media metrics. The association between the measured quantities and the magnitude of the incidence rate ratio for public

accounts was comparable to that in health communication. This means that recognition in a connected virtual community hinges on digital media design strategies. Trading off the duration against the other dimensions of video characteristics is possible by either enriching the quality itself or improving communication efficiency via conventions, styles, and manners.

Kim and Yang characterized the importance of behaviors on social media [39], assuming that the implications might differ and that message features should be adapted to fit communication goals. Based on a survey of Facebook users, posts with photos that stimulated any of the five mentioned senses were preferred over ordinary posts. Users were more likely to comment on messages soliciting positive responses and presenting logical information. According to Markowitz-Elfassi, likes, comments, and shares are used to reflect the popularity of online posts, allowing users to better disseminate messages on social media platforms [40]. Similar social media evaluation studies have been performed, considering more available options of quantitative indicators for improving citizen engagement [41].

A. LIMITATIONS
The optimal content included information on human resource development and public policies to mitigate surging poverty issues. In the case of TikTok, where several common themes define public accounts, posts may receive limited attention and are not assigned the same level of citizen engagement. The implications of common themes are profound: they can be the best outlets for presenting important issues in poverty-striking areas that may not receive attention from the mainstream media.

Because mobile short-form video entertainment was studied in TikTok, a pioneering popular social media platform, model specification required making a series of assumptions about the impact of video characteristics. The impact of replies from the account owner was tested to judge public–private interactions on citizen engagement. High levels of interaction from the account owner were expected to bring more comments, likes, and shares, consistent with the conclusions of previous studies [38]. Proactively replying to questions and inquiries rather than posting threads allows for the explicit processing of any pointed criticism in the public sphere. It is worth continuing to measure interactions by carefully defining the text, accessions, images, and videos themselves.

B. DIRECTIONS FOR FUTURE RESEARCH
When considering TikTok, which enables hashtags, mentions, and polls, the selection of metrics becomes relevant [42]. In most cases, short-form video content has been analyzed based on the impact of technological features designed and implemented by fellow creators. However, citizen engagement with topics of great concern does not occur in personal accounts, but through public sites, which are prone to advance knowledge and understanding of important issues;

cases include humanitarian and economic measures in health crises, climate change, environmental protection, and poverty alleviation programs. To better understand the factors of citizen engagement and the impacts of video design strategies, modelling and behavior analysis should consider not only the performance of videos but also successful endeavors that lie ahead for a clear presence of the public agency in an increasingly personalized and accessible media environment. A comprehension of mechanisms based on behavioral models would help reveal how digital tools encourage constructive actions, cultivate innovative ideas, and produce content that reaches the mass audience.

Insofar what constitutes an adequately large sample size for model development is not receiving consensus. Sample size estimation with inferences is one of the research questions to be addressed in the authors' further studies. It should be noted that verified public accounts on TikTok display the location at which digital content is created. In addition, data specifying video publication dates are available. The public accounts used for the study were situated in provinces offering digital content of interest at the provincial, municipal, and county administrative levels. Therefore, the far-reaching collection of videos used in this research can be considered as a thorough representation of the theme, topic, and subjects. As such, the results of this study should be generalizable and should illustrate emerging design strategies in favor of mobile short-form video entertainment - it allows cross-sectional and quantitative comparisons.

VI. CONCLUSION

This study empirically examines citizen engagement with mobile short-form videos using TikTok public accounts. To reveal the communication mechanism, the video characteristics, format, and attributes were elucidated with the received number of comments, likes, and shares. Shorter videos were needed to satisfy user preferences, but longer videos potentially allowed for serious and thorough reflection on actual events. This provided more comments and shares. On the other hand, sentiment has a more than expected complex moderating effect on citizen engagement owing to its interplay with common themes and music genres. This recognition may contribute to a structured perspective of video design and the application of personalized content recommendations, content indexing, and effective video visualizations.

We used a negative binomial regression model because the distribution was skewed rather than normal (most posts received some attention, whereas a few posts brought in remarkable popularities). In such circumstances, negative binomial regression models have emerged as the most appropriate based on the dispersal dataset. Moreover, this is the proposed method, as long as the variable is represented by discrete count outcomes.

This study investigated whether the sentiment of an item's title moderates citizen engagement. Remarkably, breakeven points, as labeled in the figures, determine the direction of

the effect and variations across the behavioral metrics. While there is no consensus on sentiment's moderating role, our findings suggest that positive emotions are critical for short-form videos in human resource development. Furthermore, the number of likes can be further increased by introducing a more flexible design strategy, steered by a rightful combination of the common theme and exact emotional value. Assessing the potential of such a design concept requires the development of a more comprehensive communication model that precisely covers the relationships among video characteristics, engagement, and user experience.

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CEVIN ZHANG received the B.S. degree in traffic engineering from Beijing Jiaotong University, Beijing, China, in 2014, and the Ph.D. degree in technology and health from Kungliga Tekniska Högskolan, Stockholm, Sweden, in 2020.

Currently, he is a Lecturer and a Researcher with the School of Media and Design, Beijing Technology and Business University, Beijing. His research interests include gaming, simulation, and design. He was a recipient of the International Academy, Research, and Industry Association Best Paper Award, in 2017.
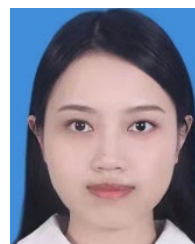
HEMINGXI ZHENG received the B.S. degree in new media from Shaoguan College, in 2017, and the M.S. degree in cultural industry management from the City University of Macau, Macau, in 2019, where she is currently pursuing the Ph.D. degree in media studies. Her research interests include digital media and communications.

QING WANG received the B.S., M.S., and Ph.D. degrees in communication from Beijing Normal University, Beijing, China, in 2006. She is currently a Professor at the School of Media and Design, Beijing Technology and Business University, Beijing. Her research interests include news media and communications.

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