

Research on the dissemination of classic choral works in modern society

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Abstract The rapid development of internet technology in modern society has brought about changes in the ways and channels of information dissemination, presenting new opportunities for the dissemination of classical choral works. Based on this, this paper takes the textual and video-related data of classical choral works as its research object, adopts a dissemination perspective, and employs TF-IDF algorithms and sentiment analysis to analyze the dissemination cognition and emotional effects of classical choral works. Overall, the attitudes held by the dissemination audience toward classical choral works are primarily characterized by anticipation, joy, and surprise, while negative emotions account for a relatively small proportion. Additionally, a dissemination effect model for choral works is constructed, and based on this model, linear regression and configurational analysis methods are employed to further explore the current state and existing issues of classical choral works in modern society, and targeted innovative strategies for the dissemination and development of classical choral works are proposed. According to the regression analysis results, the dissemination effects of choral works are significantly positively correlated ($P < 0.001$) with multiple variables such as “publisher identity,” “fan base,” “editing style,” “innovation,” and “language type.”

Index Terms TF-IDF, sentiment analysis, linear regression, choral works, dissemination

I. Introduction

Different ethnic groups showcase distinct ethnic characteristics, while different regions also possess unique local cultures. Choral music serves as an artistic expression form that promotes ethnic and local cultures through song [1]. Every ethnic group and every region has its own culture, and different ethnic groups and regions have various choral works. However, these outstanding and classic choral works have been overlooked, resulting in limited dissemination and being buried, causing these treasures to remain hidden from the world [2]–[4]. The focus on creating pop songs while neglecting ethnic works has led to a declining trend in people's understanding of art, aesthetics, and culture [5], [6]. Therefore, ethnic groups and regions should actively promote their distinctive works, enabling those little-known, nearly extinct ethnic choral works to gain broader dissemination. This will stimulate composers' enthusiasm for creating ethnic works, leading to an abundance of high-quality ethnic choral pieces [7]–[10].

In modern society, internet technology has developed rapidly, and the methods and channels of information dissemination are also undergoing changes [11]. Especially in the field of cultural arts, the widespread application of internet technology has significantly enhanced the scope and speed of art work dissemination [12], [13]. As one of the most popular forms of musical art, choral art is undergoing profound transformations in its dissemination methods, participation models, and aesthetic forms [14], [15]. Traditional choirs typically have fixed performance venues and target a limited audience. However, the emergence of online media has broken the constraints of fixed venues and a narrow audience, creating favorable conditions for the general public to engage with choirs and choral art, and fostering new understandings and attention toward choral art [16]–[19]. Modern internet technology has enabled a transformative breakthrough in the dissemination of choral works, breaking through physical and temporal constraints, while also establishing an artistic ecosystem that encourages widespread participation, allowing more people to engage in the learning and experience of choral art [20]–[22].

This paper focuses on the current state of dissemination of classic choral works in modern society. It uses the TF-IDF algorithm to extract keywords from the text and video data of the collected choral works, calculates the TF-IDF values corresponding to different keywords, and ranks the keywords in descending order. Emotional analysis is used to calculate the intensity of emotional words in the dissemination-related data of classical choral works, clarifying the emotional tendencies of the audience. Fine-grained emotional analysis categorizes all emotional tendencies into eight categories: expectation, joy, surprise, sadness, disgust, trust, fear, and anger. The validity of the thematic clustering is verified based on the emotional

distribution results. Based on Hovland's persuasion theory, a choral work dissemination effectiveness model is constructed with three core dimensions: "information source characteristics," "recipient characteristics," and "dissemination content characteristics." Variables such as the identity of the disseminator, technology usage, and audiovisual language are set. Based on the choral work dissemination effectiveness model, a linear regression model is used to measure and test whether the linear relationship between different variables and the dissemination effectiveness of classical choral works is significant. Finally, based on the analysis of the dissemination effects of classical choral works, innovative strategies for the development of classical choral work dissemination are proposed.

II. Research design

II. A. Research Objectives

As a higher form of performance in the field of vocal music, choral art has its own distinctive artistic characteristics. It can give people a multi-form, multi-tone, multi-part, and multi-level artistic enjoyment. Compared with other forms of singing, it is more conducive to creating musical works with profound artistic conception and grand momentum. Many classic choral works have been born, such as "River Snow," "The Great River Flows Eastward," and "Chilekuan."

With the rapid development of internet technology, the methods and channels of information dissemination are also undergoing changes, particularly in the field of cultural arts. The widespread application of internet technology has significantly expanded the scope and speed of dissemination for classic choral works. In the process of choral art dissemination, the internet has brought new opportunities for classic choral works, enabling traditional choral art forms to break free from the limitations of face-to-face dissemination methods. Through internet technology, the expressive forms of classic choral works have been further enriched and developed.

This study aims to deeply explore the current state of the dissemination of classic choral works in the modern social environment and propose corresponding dissemination development strategies in response to the challenges faced in the dissemination and inheritance of classic choral works.

II. B. Research subjects

The research subject of this paper is text and video data related to classic choral works on the Internet in the modern social environment. Data was collected using crawler technology, covering the period from March 2010 to March 2025. The data involved platforms such as Douyin and Data. A total of 738,642 research data items were obtained and retained.

II. C. Research Methods

II. C. 1) TF-IDF Algorithm

TF-IDF is a statistical method used to estimate the importance of a word in a document collection. The basic idea behind TF-IDF is that if the number of times a word appears in a document is inversely proportional to the number of times it appears in other corpora, and the greater the difference, then the word is considered to be very important in the document, indicating that it can be used for classification [23]. The TF-IDF calculation method involves multiplying TF by IDF, where TF represents the term frequency, i.e., the number of times term w appears in document D , and IDF represents the inverse document frequency, i.e., the reciprocal of the number of times term w appears in the text corpus. Thus:

$$TF = \frac{\text{count}(w)}{|D_i|} \quad (1)$$

Among them, $\text{count}(w)$ represents the number of times keyword w appears in the document, and $|D_i|$ represents the number of all words in document D_i :

$$IDF = \log \frac{N}{\sum_{i=1}^N I(w, D_i)} \quad (2)$$

Among them, N is the total number of documents, and $I(w, D_i)$ indicates whether document D_i contains keyword w . If it contains keyword w , the value is 1; if it does not contain keyword w , the value is 0.

$$TF - IDF = TF * IDF \quad (3)$$

The larger the TF-IDF value, the higher the probability that the word will be a keyword in the text.

By calculating TF-IDF, keywords can be sorted in descending order. However, the resulting keyword set is still quite large, and among these keywords, some hold significant meaning within the text while others do not. This necessitates further

dimensionality reduction. To facilitate subsequent calculations and analysis, it is necessary to pre-construct the keyword set, as detailed below:

(1) After crawling the data, it undergoes a series of preprocessing steps, with each data point represented by the meaningful words that constitute its theme. The processed data forms a text corpus, represented as:

$$W = \{(w_i) | i = 1, 2, \dots, m\} \quad (4)$$

(2) Based on the IF-IDF algorithm, the IF-IDF value of each word can be calculated as $q(k_i)$. By setting a threshold q_0 , the keywords of each data item can be filtered to obtain the keyword set K of each data item, which is expressed as:

$$K = \{(k_i) | q(k_i) > q_0, i = 1, 2, \dots, n\} \quad (5)$$

II. C. 2) Sentiment Analysis Method

In terms of sentiment analysis, the method used in this paper is a dictionary-based sentiment analysis method. The sentiment analysis uses a dictionary constructed by Xu et al. to calculate the sentiment word strength in the communication data and selects the sentiment word category with the highest sentiment word strength as the sentiment orientation of this data. A fine-grained sentiment analysis is adopted, dividing all sentiment orientations into eight categories: expectation, joy, surprise, sadness, disgust, trust, fear, and anger. The emotion orientation is divided into eight categories for two reasons: first, eight categories provide a more precise description of the emotional orientation contained in a piece of data compared to three categories; second, dividing emotions into eight categories facilitates subsequent analysis of changes in user emotions. If the data contains emotional words, the formula for calculating the emotional intensity of this data is as follows:

$$p_i = \sum_j^m score_j \quad (6)$$

where $score_j$ represents the emotional intensity of emotion words of type j ; m represents the number of emotion words of type i in a piece of data.

The value of $score_j$ is calculated using mutual information, using the corpus to calculate the probability of word occurrence. The calculation formula is as follows:

$$PMI(word_1, word_2) = \log_2 \frac{N \times df(word_1, word_2)}{df(word_1)df(word_2)} \quad (7)$$

In this formula, $df(word)$ represents the number of documents in the corpus that contain the word $word$, and N represents the total number of documents in the corpus. The larger this value, the stronger the correlation between the two words. Therefore, the sentiment strength value of an unknown sentiment word $word$ is calculated as follows:

$$score_j = \sum_{pword \in Pwords} PMI(word, pword) - \sum_{nword \in Nwords} PMI(word, nword) \quad (8)$$

Among them, $Pwords$ is a collection of positive sentiment seed words, and $Nwords$ is a collection of negative sentiment seed words.

Through the above calculation formula, we obtain a sentiment intensity matrix. $\{p_1, p_2, p_3, p_4, p_5, p_6\}$ The sentiment category of this piece of dissemination data is $i = \arg \max(p_i)$.

II. C. 3) Model for the dissemination effect of choral works

This study is based on Hovland's persuasion theory and existing relevant research at home and abroad. It constructs a model of the communication effectiveness of classical choral works from three dimensions: "information source characteristics," "recipient characteristics," and "communication content characteristics," as shown in Figure 1. Based on the collection and sorting of big data related to classical choral works, including text and video data, linear regression analysis and configuration analysis are used to explore the current status and existing problems in the communication and development of choral works.

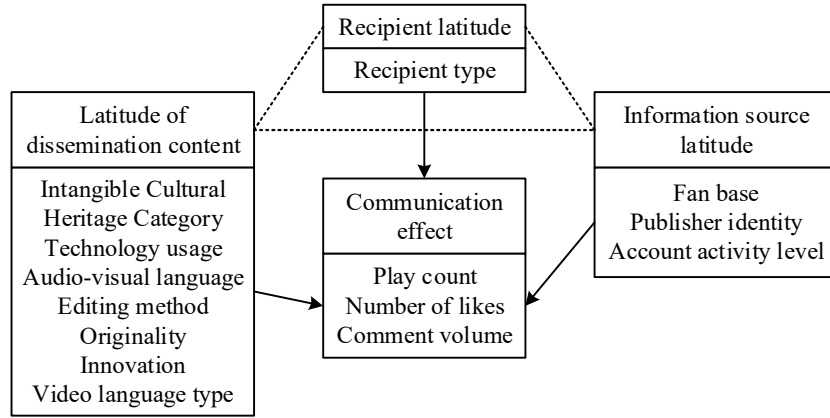


Figure 1: Model for the dissemination effect

Based on the variables involved in the constructed choral work dissemination effect model, measurement settings were established for the research data collected. The variables involved in this study are specifically shown in Table 1, which are mainly divided into three dimensions: information source, dissemination content, and recipient. Information sources include variables such as the identity of the publisher, account activity level, and fan base. The dissemination content dimension measures content through seven indicators, including work category, technology usage, audiovisual language, and originality. The measurement of recipients primarily reflects considerations of user identity.

Table 1: Research variable

Dimensions	Variables
Source of information	Publisher identity (PI)
	Account Activity (AC)
	Fan Base (FB)
Dissemination content	Category of Works (ICH)
	Use of Technology (ES)
	Audiovisual Language (AL)
	Editing method (CM)
	Originality (OR)
	Innovation (IN)
	language type (LT)
Recipient	Recipient type (RT)

II. C. 4) Linear regression analysis

(1) Estimating the regression model

where: β_0 and β_1 are called the parameters of the model, and β_0 and β_1 are the hypotheses. When performing regression analysis, it is first necessary to clearly identify which is the dependent variable and which is the independent variable. The dependent variable is the variable being predicted or explained, typically denoted as y . The one or more variables used to predict or explain the dependent variable are called independent variables, typically denoted as x .

For two variables with a linear relationship, the relationship between the dependent variable and the independent variable can be expressed using a linear equation. The equation describing how the independent variable x and the error term ε affect the dependent variable y is called the regression model. A linear regression model with only one independent variable is called a simple linear regression model and can be expressed as:

$$y = \beta_0 + \beta_1 x + \varepsilon \quad (9)$$

Parameters, whose specific values are unknown, are replaced by the sample statistics $\hat{\beta}_0$ and $\hat{\beta}_1$ for β_0 and β_1 . The error term ε is a normally distributed random independent variable. For simple linear regression, the estimated regression equation takes the form:

$$\hat{y} = \hat{\beta}_0 + \hat{\beta}_1 x_i \quad (10)$$

where: $\hat{\beta}_0$ is the estimated intercept of the regression equation on the y -axis; $\hat{\beta}_1$ is the slope of the regression equation, representing the average change in y for each unit change in x .

If there is more than one independent variable in the linear regression model, it is called multiple linear regression, represented as [24]:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_k x_k + \varepsilon \quad (11)$$

Among them: β_0 to β_k are the parameters of the model, and β_0 to β_k in the model are also assumed parameters, so they are replaced by $\hat{\beta}_0$ to $\hat{\beta}_k$. For multiple linear regression, the estimated regression equation takes the form:

$$y = \hat{\beta}_0 + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2 + \cdots + \hat{\beta}_k x_k \quad (12)$$

(2) Brief introduction to test statistics

The estimated regression equation cannot be used directly to predict cases. It must first undergo statistical testing. Only after passing the test can the estimated regression equation be deemed suitable for predicting cases.

a) Multiple determination coefficient

The multiple determination coefficient, also known as the coefficient of determination or R-squared, is denoted as R^2 . It measures the goodness of fit of the estimated regression equation, i.e., it indicates the strength of the regression equation's ability to fit the data. The specific formula is:

$$R^2 = \frac{SSR}{SST} = \frac{\sum_{i=1}^n (\hat{y}_i - \bar{y})^2}{\sum_{i=1}^n (y_i - \bar{y})^2} \quad (13)$$

In linear regression, it is generally believed that when $R^2 > 0.60$, i.e., $|R| > 0.8$, the estimated parameters have good fitting ability.

In multiple linear regression, the multiple determination coefficient R^2 has an issue: as the number of independent variables increases, R^2 also increases, making the model appear to have a higher fit, but this is not actually the case. The main issue with R^2 is that it does not account for degrees of freedom. To avoid overestimating R^2 due to an increase in degrees of freedom, adjustments are necessary. The adjusted multiple determination coefficient R_a^2 takes into account both the sample size n and the degrees of freedom k , effectively preventing the multiple determination coefficient from being artificially inflated due to an increase in degrees of freedom.

b) Linear relationship test

The linear relationship test is used to test whether the linear relationship between the independent variable x and the dependent variable y is significant. When conducting the test, a statistic F must first be constructed, with the specific formula being:

$$F = \frac{MSR}{MSE} = \frac{SSR / k}{SSE / n - k - 1} \sim F_{\alpha}(k, n - k - 1) \quad (14)$$

where n is the number of data points; k is the number of independent variables in the regression equation; α is the given significance level, which refers to the probability that the estimated population parameter falls within the error interval. Typically, the significance level is set to 0.05; $F_{\alpha}(k, n - k - 1)$ is the critical value. The linear relationship test compares the value of the F statistic with the critical value. If the value of the F statistic is greater than the critical value, then the linear relationship between the independent variable x and the dependent variable y is considered significant, i.e., the F test is passed.

c) Regression coefficient test

The regression coefficient test is primarily used to test whether the independent variable has a significant effect on the dependent variable. In a simple linear regression equation, if the regression coefficient $\beta_1 = 0$, then the regression equation is a horizontal line with a slope of 0, meaning that changes in the independent variable do not affect the dependent variable. However, $\beta_1 \neq 0$ does not necessarily indicate a linear relationship between the independent and dependent variables; it is necessary to verify whether there is statistical significance. The testing approach is to test whether β_1 is equal to 0, so the null hypothesis is $H_0: \beta_1 = 0$, the alternative hypothesis is $H_1: \beta_1 \neq 0$ requires constructing a statistic t to test for statistical significance.

Once the t statistic is obtained, the critical value can be calculated and compared with the t statistic. The degrees of freedom are $n - k - 1$, where k is the number of independent variables. Given a significance level of $\alpha = 0.05$, the critical

value can be looked up. If $|t| > t_{\alpha}(n-k-1)$, the null hypothesis H_0 is rejected, meaning that the probability of the regression coefficient being zero is less than 0.05, and it can be concluded that there is a statistically significant relationship between the independent and dependent variables. Conversely, the null hypothesis is accepted, and it is concluded that there is no significant linear relationship between the two.

III. Analysis of the dissemination effect of classic choral works

This chapter will delve into the current status and effectiveness of the dissemination of classical choral works in the modern social environment, providing a basis for the subsequent discussion of strategies for the development of choral work dissemination.

III. A. Analysis of the cognitive effects of communication based on TF-IDF

Using the TF-IDF algorithm, we extracted keywords from the text and video data related to the collected choral works and calculated the TF-IDF values for each word. The results were then sorted based on the TF-IDF values. The sorting results are shown in Table 2. As can be seen from the sorting results in the table, the term “digital dissemination” occupies a central position. This is because the innovation of internet technology has brought about an iteration in communication methods, and digital dissemination has increasingly become the primary means of information dissemination. Compared to other terms, the term “digital dissemination” appears more concentrated and frequently. Other terms with high frequency include modern adaptations, cultural heritage, digital restoration, and cross-border collaboration. These keywords reflect the multifaceted influences of technological innovation, cultural integration, and social issues on the dissemination of classical choral works in modern society.

Table 2: TF-IDF results of word segmentation

Number	Keywords	TF-IDF value	Number	Keywords	TF-IDF value
1	Digital communication	0.1251	11	Crowdfunding creation	0.0252
2	Modern adaptation	0.0595	12	Music open source	0.0245
3	Cultural heritage	0.0469	13	Short video	0.0229
4	Digital repair	0.0411	14	Nationalization deduction	0.0226
5	Cross-border cooperation	0.0398	15	Star effect	0.0224
6	Virtual Choir	0.0396	16	Controversial interpretation	0.0221
7	Film and television application	0.0384	17	Live performance revival	0.0218
8	Popularization of education	0.0369	18	Commercial advertising applications	0.0207
9	AI generates music	0.0312	19	Political symbolization	0.0194
10	Streaming media algorithm	0.0285	20	Environmental protection subject	0.0188

Using the BTM model to cluster keywords, the classification results are shown in Table 3. Three main themes were identified: communication media and technological innovation, cultural integration and artistic innovation, and social value and participation models.

(1) Theme 1: Communication Media and Technological Innovation

Focusing on how technological means and communication media have adapted the presentation of classical choral works, the ways in which audiences access and participate in these works have also undergone significant changes. The viewing patterns of classical choral works have shifted from traditional offline viewing modes toward a combination of online and offline viewing modes. The emergence and widespread adoption of AI technology have given rise to the phenomenon of AI-generated music, with AI algorithm-based composition challenging traditional creative processes.

(2) Theme 2: Cultural Integration and Artistic Innovation

Choral works are increasingly breaking through traditional boundaries, with applications in film and television and commercial advertising becoming increasingly common. Classic choral works are also being widely reinterpreted and reimagined, such as the collision of classical and pop-rock styles, or reinterpretations in electronic or jazz styles. Cross-cultural integration facilitates the popularization of classic choral works. Funding support for folk choral projects and the revival of modern performances also bring new opportunities for the dissemination and inheritance of classic choral works.

(3) Theme 3: Social Value and Participation Models

Choral works hold a significant place in cultural heritage, education, and ideology. Taking educational outreach as an example, the establishment of school choirs and the organization of competitions for classic choral works play an important role in promoting aesthetic education in schools. Classic choral works can transcend their musical value in specific contexts.

Table 3: Classification of keywords

Number of the theme	Subject content
Theme 1	Digital communication, digital repair, virtual choir, streaming media algorithm, short video, AI generated music, music score open source
Theme 2	Modern adaptation, cross-border cooperation, film and television application, nationalization deduction, commercial advertising application, star effect, live performance revival
Theme 3	Cultural heritage, education popularization, controversial interpretation, political symbolization, environmental protection theme, crowdfunding creation

III. B. Analysis of communication emotional effects based on emotional analysis methods

(1) Sentiment Polarity Analysis

Use sentiment analysis technology to perform sentiment polarity analysis on text and video data related to topics 1 to 3. Use a score of ± 0.05 as the cutoff point. Scores in the range $[-1, -0.05)$ indicate negative sentiment, with scores closer to -1 indicating stronger negative sentiment in the text; scores in the range $(0.05, 1)$ indicate positive sentiment, with scores closer to 1 indicating stronger positive sentiment in the text; scores in the range $[-0.05, 0.05)$ indicate neutral sentiment, indicating no obvious emotional bias in the text. The theme-emotion polarity heatmap is shown in Figure 2. According to the results in the figure, the audience's emotional recognition of classical choral works is mostly positive or neutral, and the emotional distribution is closely related to the theme content. The emotional polarity in Theme 1 shows significant differentiation. Communication media and technological innovations have also impacted the audience's auditory experience. For innovative interpretations of classical choral works and emerging performance formats represented by virtual choirs, the audience's emotional responses exhibit significant differences. In Theme 2, neutral and positive emotions form the primary emotional tone, indicating that the audience generally holds a positive attitude toward cultural integration and stylistic innovation in classical choral works. In Theme 3, positive emotional expressions are the strongest, accounting for over 65%, reflecting the audience's affirmation of the social value of classical choral works. The aforementioned emotional distribution results validate the rationality of the thematic clustering, with the emotional polarity distribution within each theme highly consistent with its content characteristics.

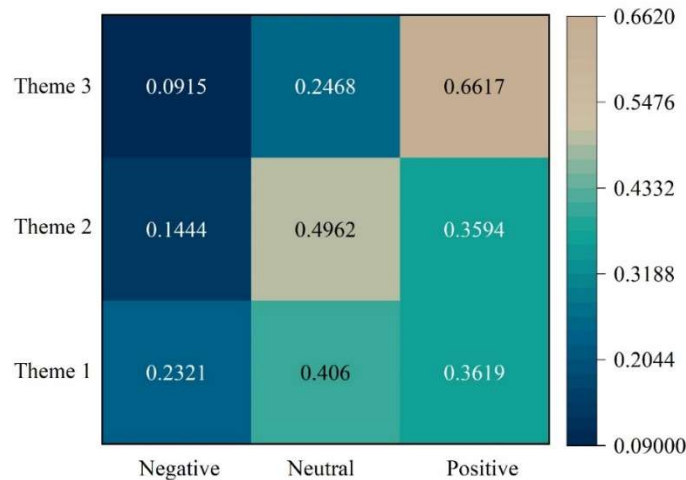


Figure 2: Heatmap of topic and sentiment polarity

(2) Emotional Category Analysis

Emotional words were identified from the keywords in themes 1–3 to further study the emotions evoked by each theme. The comments within each theme were classified according to Plutchik's emotion model, and the frequency of each type of word was counted to obtain the proportion of emotions in each theme, as shown in Figure 3. Overall, the audience's attitude toward classical choral works is primarily characterized by anticipation, joy, and surprise, while negative emotions account for a relatively small proportion, with expressions of sadness and disgust being the main negative emotions. In the future, it is still necessary to strengthen the diversification of content in the dissemination of classical choral works, expand the breadth and depth of content offerings, promptly respond to audience needs, and develop more inclusive and diverse cultural exchange models.

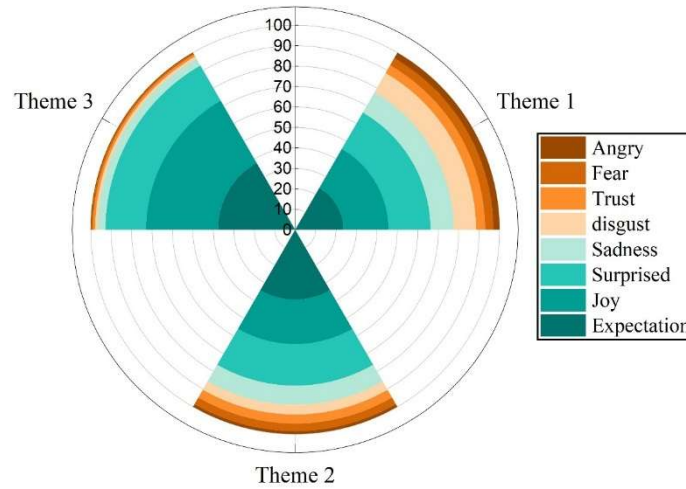


Figure 3: Proportion of each emotion in topics 1–3

III. C. Linear regression analysis based on the dissemination effect model of choral works

Based on the choral work dissemination effectiveness model constructed in this paper, linear regression analysis was conducted using SPSS 29 on the variables involved in the model to determine whether there is a correlation between the condition variables and the outcome variables, as well as the specific degree of correlation. The results of the linear regression analysis are shown in Table 4. The results indicate that there are eight variables correlated with the dissemination effectiveness of classical choral works, and $VIF < 10$, indicating that there is no multicollinearity among the variables. Specifically, in the information source dimension, “publisher identity” and “fan base” are correlated with dissemination effectiveness; in the dissemination content dimension, “editing style,” “innovation,” and “language type” are correlated with dissemination effectiveness, while “work category,” “technology use,” and “audiovisual language” exhibit a significant positive correlation with dissemination effectiveness; in the recipient dimension, the correlation between recipient type and dissemination effectiveness is not significant.

Table 4: Linear regression of variables

Variables	Not standardized		Standardization coefficient β	T value	Prominence	Colinearity statistics	
	Coefficient β	Standard error				Tolerance	VIF
PI	-0.276	0.07	-0.154	-3.771	<0.001	0.74	1.272
AC	0.007	-0.01	-0.061	-1.852	0.068	0.928	1.132
FB	-0.001	0.002	0.26	6.148	<0.001	0.605	1.613
ICH	0.852	0.085	0.445	8.937	<0.001	0.468	2.145
ES	0.334	0.11	0.178	2.897	0.008	0.313	3.177
AL	0.509	0.22	0.228	2.256	0.0262	0.104	9.236
CM	-1.906	0.243	-0.815	-8.03	<0.001	0.109	8.916
OR	-0.171	0.149	-0.081	-1.295	0.327	0.275	3.654
IN	-0.529	0.104	-0.269	-5.299	<0.001	0.422	2.36
LT	-0.474	0.082	-0.225	-5.147	<0.001	0.609	1.733
RT	-0.004	0.072	-0.003	-0.039	0.844	0.618	1.557
$R^2=0.478$							
$F=40.218$							

Using the fsQCA method, a configurational effect analysis was conducted on variables significantly influencing communication effectiveness to explore the configurational pathways affecting the communication effectiveness of classical choral works [25]. Before conducting the configurational analysis, consistency and coverage tests were performed, with the results shown in Table 5. As shown in the table, the consistency levels of all variables were below 0.9, so the necessary conditions were not met, and configurational analysis could be conducted. This also indicates that the dissemination effects of classical choral works are influenced by complex factors.

Table 5: Consistency and coverage detection results

Antecedent conditions	High propagation effect		Low propagation effect	
	Consistency	Coverage rate	Consistency	Coverage rate
PI	0.499735	0.525775	0.403016	0.483933
~PI	0.503424	0.421316	0.60519	0.56819
FB	0.589023	0.588533	0.648578	0.744205
~FB	0.74477	0.641076	0.63982	0.625518
ICH	0.524244	0.494635	0.493446	0.522091
~ICH	0.489485	0.455774	0.506274	0.550564
ES	0.45972	0.471342	0.440647	0.522809
~ES	0.537724	0.470433	0.556246	0.538662
AL	0.668064	0.430935	0.810329	0.582185
~AL	0.326195	0.623674	0.181474	0.383811
CM	0.570193	0.405472	0.839402	0.589505
~CM	0.333811	0.630339	0.162272	0.355343
IN	0.341131	0.359023	0.553416	0.63818
~IN	0.663108	0.564373	0.451268	0.429377
LT	0.2498	0.396192	0.342527	0.598945
~LT	0.751339	0.490947	0.654467	0.508707

Note: '~' represents 'non'.

The configuration of the dissemination of classic choral works is shown in Table 6. As can be seen from the table, the overall consistency level is 0.966, and the consistency of each antecedent is higher than 0.8, indicating an ideal effect. From the perspective of combination conditions, the eight condition variables form seven paths that influence the dissemination effect of classic choral works. By further categorizing the antecedent configurations with similar core conditions, the following four path configurations were ultimately obtained.

(1) Configuration 1: Audiovisual Richness Type, primarily based on Scheme 1. Its core conditions are fan base, intangible cultural heritage form, smart technology usage, and audiovisual language. According to regression analysis results, compared to single-mode audiovisual methods, audiences are more easily attracted by rich audiovisual content, leading to higher viewing intent and thereby enhancing the dissemination effectiveness of classical choral works.

(2) Technology-Supported Type, primarily based on Scheme 2. Its core conditions include the identity of the publisher, fan base, work category, and technology application. Content created using a variety of technologies tends to generate higher user viewing intent.

(3) Configuration 3: Bilingual Assistance Type, including Schemes 3 and 4. Its core conditions include fan base, work category, technology use, and language type. Using multilingual interpretations can more easily attract user attention, enabling the dissemination of classic choral works to reach an international audience.

(4) Configuration 4: Personal Creation-Based, encompassing Scheme 5, Scheme 6, and Scheme 7. The core criteria include creator identity, fan base, content category, technology usage, and audiovisual language. Content published by personal accounts with a large fan base is more likely to attract user attention. In the dissemination of classic choral works, collaboration with personal accounts that have a significant fan base should be considered.

Table 6: Configuration of international dissemination

Antecedent conditions	Solution						
	Scheme 1	Scheme 2	Scheme 3	Scheme 4	Scheme 5	Scheme 6	Scheme 7
PI	—	●	⊗	⊗	●	●	●
FB	●	●	●	•	•	●	●
ICH	●	●	●	●	●	●	•
ES	●	●	•	●	●	●	●
AL	●	⊗	⊗	⊗	●	●	•
CM	⊗	⊗	●	⊗	⊗	•	•
IN	⊗	⊗	⊗	⊗	⊗	•	•
LT	•	•	●	●	●	•	•
Original coverage rate	0.24	0.24	0.098	0.165	0.132	0.159	0.061
Unique coverage rate	0.187	0.062	0.11	0.812	0.642	0.642	0.601
Consistency	0.96	0.945	0.857	0.883	0.956	0.987	0.985
Overall Coverage	0.698						
Overall consistency	0.966						

Note: ● represents the existence of core conditions; • represents the existence of edge conditions; ⊗ represents the lack of core conditions; ⊗ represents that the edge condition does not exist; — Indicates that the condition does not exist influence relationship.

IV. Innovative strategies for the dissemination and development of classic choral works

Building on the analysis of the dissemination effects of classical choral works presented in the previous chapter, this chapter will propose targeted strategies for the development of classical choral works dissemination, moving away from traditional, relatively conservative dissemination methods. In the modern social context, these strategies aim to infuse classical choral works with contemporary vitality and explore new pathways for the dissemination of choral art.

(1) Promoting the process of making classical choral works accessible to both the elite and the masses

If classical choral works are to achieve the widest possible dissemination, they must expand the audience capable of engaging in aesthetic communication with them, taking a step from the “highbrow” to the ‘lowbrow’ to achieve a “highbrow and lowbrow” effect. From a more practical perspective, this means disseminating choral art in forms more accessible to the general public. For example, in addition to choral performances in operas and musicals, choral art can be incorporated into film scenes. Beyond university and military choral activities, square choral events can be organized in public spaces like parks, which are closely tied to everyday life. When choral art lowers its stance to engage with the public, it inevitably enters a golden age of dissemination.

(2) Leveraging new media dissemination methods for mutual benefit

Utilizing new media platforms to disseminate serious culture and music is a highly worthwhile approach for the dissemination of classical choral works. The primary method of new media dissemination is through online platforms. From the broader trends in communication studies under the new media landscape, unlike the traditional one-way, passive dissemination methods of the past, the dissemination of choral art—and indeed all forms of art—now requires a focus on the active participation of its audience. Only by doing so can effective dissemination be truly achieved. Achieving mutual benefit through new media communication is an inevitable trend in art communication under the new media landscape. Choral art must find its own place within this trend.

(3) Accelerating the cultivation of professional choral talent

The cultivation of professional choral talent is a long and arduous process. Accelerating the cultivation of professional choral talent fundamentally involves improving teachers' teaching abilities and students' professional skills. Moderately adjust existing teaching philosophies and revise the current curriculum system. In the process of altering teaching philosophies, greater emphasis should be placed on students' central role, transforming passive learning into active learning. Students should not only acquire theoretical knowledge but also be guided to step beyond campus boundaries and engage with society to gain practical experience. Through repeated hands-on experiences, they can develop a sense of value and fulfillment, thereby enhancing their interest in choral art and genuinely improving their professional proficiency.

V. Conclusion

This paper first employs the TF-IDF algorithm to extract keywords from the text and video data related to the collected choral works, calculates the TF-IDF values for each word, and ranks them based on these values. The term “digital communication” occupies a central position, with a TF-IDF value as high as 0.1251. The extracted keywords are then clustered, yielding three main themes: communication media and technological innovation, cultural integration and artistic innovation, and social value and participation models. Further, sentiment analysis technology is applied to the text and video data related to themes 1–3 to analyze sentiment polarity. Sentiment polarity in theme 1 shows significant differentiation, while theme 2 is characterized by neutral and positive sentiments as the primary emotional tone. In theme 3, positive sentiment expressions account for over 65%, making it the theme with the strongest positive sentiment among all themes. Overall, the audience's attitude toward classic choral works is primarily characterized by anticipation, joy, and surprise, while negative emotions are relatively rare, with sadness and disgust being the primary expressions. Based on the constructed choral work dissemination effectiveness model, a linear regression analysis was conducted on the variables involved in the model. According to the results of the linear regression analysis, there are eight variables—“publisher identity,” “fan base,” “editing style,” “innovation,” “language type,” “work category,” “technology use,” and “audiovisual language”—that are correlated with the dissemination effects of classical choral works, and all have VIF < 10, indicating no multicollinearity among the variables. Using the fsQCA method to conduct configurational effect analysis on the variables significantly influencing dissemination effects, the consistency levels of all variables were below 0.9, failing to meet the necessary conditions for configurational analysis. In the configurational analysis, the overall consistency level was 0.966, with all antecedent consistency levels exceeding 0.8, achieving an ideal effect. By further categorizing the antecedent configurations with similar core conditions, four path configurations were identified: audiovisual-rich type, technology-supported type, bilingual-assisted type, and individual-creation type. Finally, based on the analysis results of the dissemination effectiveness of classical choral works, innovative strategies for the dissemination and development of classical choral works were proposed from three aspects: the works themselves, dissemination methods, and choral talent, providing references for the dissemination and development of classical choral works.

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