

Exploring the dissemination of world-level intangible cultural heritage Guqin culture in Xiamen, Zhangquan

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Abstract. In recent years, the Chinese guqin culture has received more and more attention. And whether the target group of guqin culture dissemination is willing to carry out guqin culture dissemination is the result of a variety of factors, so this paper establishes a binary choice model and uses appropriate methods to filter variables to determine the base characteristics of the general group that is more willing to carry out guqin culture dissemination. The groups that are inclined to guqin cultural transmission among the general population have certain foundational characteristics. To this end, an in-depth investigation was conducted to examine the influencing factors that affect the dissemination of guqin culture among the general population. Based on the results of structural equation modeling, the model of influencing factors of Guqin culture dissemination is further fitted and practically used for potential groups of Guqin culture promotion.

Keywords: Guqin culture; structural equation model; binary choice model.

1. Introduction

In recent years, Chinese guqin culture has received more and more attention. From theory to practice, from inheritance and conservation to innovation and development, the theoretical achievements of various disciplines have been enriched[1]. Due to the vigorous promotion and inheritance of the guqin slogan, the guqin has also gradually come into people's view, and inheritance and praise of the guqin is the slogan of the day, yet, in reality, very few people actually go into the guqin and take the initiative to learn to play it[2]. Therefore, there are several questions that need to be addressed: Why do so few people take the initiative to learn the guqin, despite all the publicity it has received in recent years? What factors have influenced people to learn the guqin, and how deeply? After understanding these factors, this paper offers advice and suggestions for the development of the Chinese guqin culture and its transmission and development, helping to promote it[3].

Whether the target group of guzheng culture dissemination is willing to engage in guzheng culture dissemination is the result of multiple factors, so a binary choice model is established and appropriate methods are used to filter the variables in order to determine the basic characteristics of the general group that is more willing to engage in guzheng culture dissemination.

There are certain basic characteristics of the groups that are inclined to guzheng culture dissemination in the general population. For this purpose, an in-depth investigation was conducted to examine the influencing factors that affect the dissemination of guzheng culture among the general population.

Based on the results of structural equation modeling, the model of influencing factors of guzheng culture dissemination can be further fitted and applied practically to explore the potential groups of guzheng culture promotion.

2. Propagation object modeling

2.1. Model selection

The binary choice model is a model built from the individual choice behavior of choosing one of the two options. Considering that the willingness to engage in guqin cultural communication involves only two responses, which are dummy variables, the binary choice model was established, setting the willingness to engage in guqin cultural communication as the dependent variable, and conducting regression analysis on factors such as age, occupational category, and highest education level to investigate which variables can significantly affect the engagement in guqin cultural communication, respectively, based on which the target group is located and the target characteristics are summarized[4-6].

2.2. Construction of binary choice model

Since a large amount of data are subtyped, when they are directly coded for analysis, it is equivalent to assuming that they have a uniform degree of numerical influence on the dependent variable, an assumption that does not correspond to reality, and since many variables do not have quantitative high and low comparisons, dummy variables are used to fit them.

$$\text{Logit}(P) = \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 \dots + \beta_k X_k \quad (1)$$

Based on this model, regression analysis was performed on the survey data. Variable definitions are not elaborated.

2.3. Model solution results and testing

The model was solved using R and the test results were obtained. Since the Logit regression model is nonlinear, the test used is the likelihood ratio test since it is a great likelihood estimation method. The likelihood ratio statistic approximately obeys the χ^2 distribution, and the χ^2 test was performed on the regression model to obtain the results Table 1.

Table 1 Logit regression model significance test results table

Statistical quantities	Value of the statistic	P-value
Chisq	135.14	$2.2e^{-16***}$

From the results, it is found that the P-value of the test is much less than the significance level of 0.05, then the original hypothesis is rejected and the established Logit regression model is considered significant.

According to the output of the regression coefficients, there are some regression coefficients that are not significant. A factor is considered to be significant in the equation when the coefficient corresponding to the dummy variable under a factor is significant. At the significance level of $\alpha = 0.1$, the coefficient estimates, standard deviations, Wald statistics, corresponding P-values and incidence ratios $\text{Exp}(B)$ for each variable are obtained. Logit regression coefficient significance test table is shown in Table 2.

Table 2 Logit regression coefficient significance test table

Explanatory variables	Coefficient	Standard deviation S.E.	WaldStatistical quantities	P	Exp (B)
female	0.696	0.226	9.534	*	0.514
age00-05	-1.789	0.657	7.411	.006**	5.982
age70-80	-1.855	0.618	7.312	.004**	6.231
junior_below	0.732	0.438	2.799	.094*	0.165
college	1.679	0.621	7.322	0.007**	0.781
senior	1.329	0.529	6.305	0.012**	0.481
res	-1.981	0.737	7.227	0.007**	7.248
aff	-1.212	0.709	2.920	0.088*	3.360
skill	-1.553	0.690	5.062	0.024**	4.724
ope	-1.214	0.702	2.988	.084*	3.366
soc	-1.338	0.747	3.213	0.073*	3.813
morein	-0.771	0.294	6.885	.009**	2.163
little	-2.642	0.275	92.249	.000**	14.047
unknow	-3.491	0.436	64.082	.000**	32.825
constant	2.860	1.120	6.519	0.011	

The coefficient estimates of the remaining variables after exclusion are all significant at the 0.1 level of significance, so the binary choice model is

$$\begin{aligned}
 \text{Logit}(P) &= \ln\left(\frac{P}{1-P}\right) = \beta_0 + \beta_1 X_1 \dots + \beta_k X_k (k = 14) \quad (2) \\
 &= 2.86 + 0.696 * \text{female} - 1.789 * \text{age 00_05} - 1.855 * \text{age 70_80} \\
 &\quad + 0.732 * \text{junior_below} + 1.679 * \text{college} + 1.329 * \text{senior} \\
 &\quad + 1.981 * \text{res} - 1.212 * \text{aff} - 1.553 * \text{skill} - 1.214 * \text{ope} - 1.338 * \text{soc} \\
 &\quad - 0.771 * \text{morein} - 2.642 * \text{little} - 3.491 * \text{unknow}
 \end{aligned}$$

2.4. Analysis of model results

From the regression results, it can be seen that there is a significant effect of gender on the willingness of the general group to engage in performing guqin cultural transmission. From the EXP (B), the probability of occurrence of guqin culture dissemination among women is 1.05 times higher than that of men, which shows that women in the general group are more inclined to engage in guqin culture dissemination.

The regression model sets the base type of the age dummy variable to before post-70 i.e. above 52 years old, and the regression results show that except for the coefficients of the variables age00-05 and age70-80, which are significantly negative, all other variables are not significant, and from EXP (B), the probability of occurrence of Guqin cultural transmission in the post-00 group and the middle-aged and older groups is greater, about 6 times that of the base variable, which shows that the post-00, middle-aged and older groups have better Guqin culture dissemination and also have more generous energy and interest, so the significance is higher.

The highest education is postgraduate and above as the base type, and the regression coefficients of the variables junior_below, senior and college are all greater than zero compared to the base type, indicating that the level of education has a significant effect on the willingness to disseminate guqin culture, and from EXP (B), the tendency of the situation to disseminate guqin culture becomes stronger gradually with the increase of education.

Dividing the occupation types into six categories, the regression coefficients of the explanatory variables corresponding to each category are negative and all significant, indicating that the basic type artistic type is more inclined to the dissemination of guqin culture than other occupation types.

The regression results show that the regression coefficients of the explanatory variables morein are significantly negative, while the coefficients of the variables introvert and extrovert are not significant, indicating that the introverted group is less inclined to the dissemination of guqin culture than the other personality groups.

The binary choice model analysis shows that the work type variable is not significant, indicating that this factor does not have a significant effect on the general group's performance in the dissemination of guqin culture.

The regression model shows that the coefficients of the two explanatory variables little and unknown are negative and significant, indicating that knowledge of guqin has a significant effect on the general group's communication of guqin culture. From Exp (B), there are still many people who do not know much about guqin culture.

3. Study of influencing factors

3.1. Structural equation modeling of the influencing factors of guqin transmission

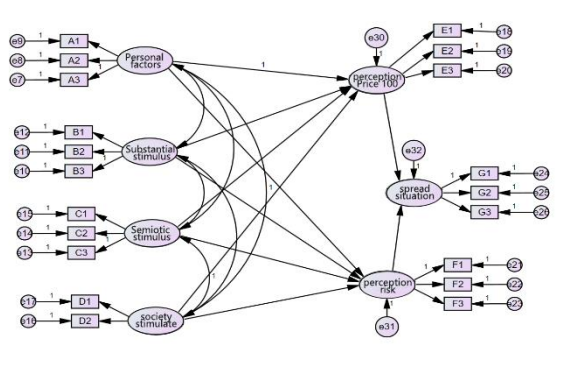


Figure 1 Structural equation model diagram

After reviewing the past data and preliminary interview research, and combining the knowledge of consumer behavior, the model was constructed into seven structural variables, of which four independent variables were guqin communication factors, i.e., personal factors, substantive stimuli, symbolic stimuli, and social stimuli; two mediating variables, i.e., perceived risk, perceived value, and one dependent variable, i.e., intention to communicate. The structural equation model of guqin communication is shown in Figure 1 [7,8].

3.2. Goodness-of-fit analysis of the guqin propagation model

The overall fit of the model is generally based on the goodness-of-fit λ^2 as the test indicator, which is transformed into a chi-square distribution when there exists sample data that is large enough and conforms to the positive-terrestrial distribution. The cardinality test requires the smaller the cardinality value, and in theory, when the cardinality value is 0, the model has achieved a perfect fit. λ^2 is not only related to the data itself, but the sample size (degrees of freedom) will also have an impact on the cardinality value, i.e., the larger the sample size (degrees of freedom), the larger the cardinality value will be accordingly. Therefore, the chi-squared degrees of freedom ratio (CMIN/DF) is used as the overall fit index. When the chi-squared degrees of freedom ratio is less than 3, the model is considered to be a good fit.

In addition to the overall chi-square test, the goodness-of-fit index (GFI) and the adjusted goodness-of-fit index (AGFI) were also used as indicators of the model fit. The initial model fit indices are shown in Table 3 below.

Table 3 Table of initial model fitting indicators for structural equations

Fitting index	Numerical value	Judgment Criteria	Analysis of results
CMIN/DF	3.265	Values less than 5, fair fit; less than 3, good fit	Fair fit
GFI	0.797	Values between 0 and 1, the larger the value, the better the fit	Fair fit
AGFI	0.778	Values between 0 and 1, the larger the value, the better the fit	Average fit
CFI	0.775	Values between 0 and 1, the larger the value, the better the fit	Fair fit
RMSEA	0.103	A value < 0.05 indicates a very good fit	Good fit

The CMIN/DF is greater than 3 and less than 5, and the model fit is average; the GFI and AGFI are both less than 0.8, and the fit is average; the CFI value is 0.775, and the fit is average; the RMSEA is about equal to 0.1, and the model fit can be considered good. In summary, the overall fitting effect of the model is general, and some of the fitting indicators are inadequate, and a small part of the model correction is needed.

3.3. Model explanation

(1) People who learn guqin are more likely to do so out of hobby

The coefficients between potential variables imply that the correlation between this variable and the current variable. According to the coefficient plot of the modified model, it is easy to find that there is a significant high correlation between personal factors on both perceived value and perceived risk. This indicates that the spread of guqin also relies heavily on personal factors, which is consistent with the phenomenon that many people who learn guqin are motivated by hobbies, as found in the previous research.

The lack of significance in the path of perceived value <- social stimulation also confirms this view. People's value judgments about the guqin are not influenced by their surrounding friends or national environment, and they do not purposely learn the guqin because they have friends who are enjoying it or because the state is paying for it strongly.

(2) The public's understanding of guqin is still low

Generally speaking, people's perceived value judgment should correspond to the substantive qualities of the guqin, but in this model, the path of perceived value <- substantive stimulus is found to be insignificant. This means that people's value judgment of guqin is not based on the actual characteristics of guqin, such as its history and timbre, but more on personal factors such as their own personality preferences and symbolic stimuli such as surrounding advertisements. The reason for this phenomenon is the low level of understanding of the guqin among the general public. Since the public does not know the guqin, they are unable to judge the value of the guqin in terms of history, tunes and emotions. In order to help the culture of guqin spread better, the public can be further educated about guqin culture by increasing the publicity and carrying out various types of guqin activities.

4. Potential group mining

4.1. PCA analysis

Based on the structural equation model, it can be known that there are 8 factors related to the dependent variables and independent variables that affect the cultural situation of guqin, and it is necessary to explain the cultural situation of guqin with the smallest dimension, while using central value, mean value processing and other methods will lead to too much deviation from the actual, so principal component analysis (PCA) is used to linearly combine multiple indicators with certain

correlation, so that these indicators have the largest possible variance with each other, and thus to achieve dimensionality reduction. The steps of PCA analysis for the categories are as follows[9,10].

Calculate the covariance matrix R based on the standardized data set.

$$R = (r_{ij})_{n \times n} = \begin{bmatrix} r_{11} & r_{12} & \cdots & r_{1n} \\ r_{21} & r_{22} & \cdots & r_{2n} \\ \vdots & \vdots & & \vdots \\ r_{n1} & r_{n2} & \cdots & r_{nn} \end{bmatrix} \quad (3)$$

Calculate the matrix R eigenvectors

$$\left. \begin{aligned} y_1 &= u_{11}\bar{x}_1 + u_{21}\bar{x}_2 + \cdots + u_{n1}\bar{x}_n \\ y_2 &= u_{12}\bar{x}_1 + u_{22}\bar{x}_2 + \cdots + u_{n2}\bar{x}_n \\ &\vdots \\ y_n &= u_{1n}\bar{x}_1 + u_{2n}\bar{x}_2 + \cdots + u_{nn}\bar{x}_n \end{aligned} \right\} \quad (4)$$

Then.

$$b_j = \frac{\lambda_j}{\sum_{k=1}^n \lambda_k} \quad (j = 1, 2, \dots, n) \quad (5)$$

$$\alpha_p = \frac{\sum_{k=1}^p \lambda_k}{\sum_{k=1}^n \lambda_k} \quad (p \leq n) \quad (6)$$

The above model and the Bartlett's sphericity test lead to the following results in Figure 2.

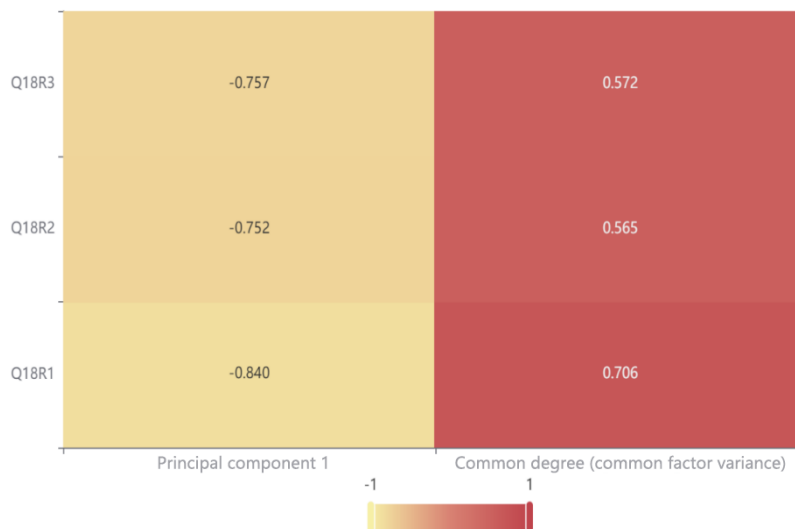


Figure 2 Factor load matrix heat map

Q18R1 has the largest loadings on the common factor in the case of guqin culture transmission, reflecting the relative importance of Q18R1 to it, followed by Q18R3. while Q18R2 and Q18R3 have similar commonness, i.e., both have lower relative importance in the case of guqin transmission.

The other factors were solved as above and are not repeated here.

4.2. Random Forest Model

Training set

$$S = \{(x_1, y_1), i = 1, 2, \dots, n\}, (X, Y) \in R^d \times R \quad (7)$$

Sample to be tested

$$x_t \in R^d$$

For $i = 1, 2, 3 \dots, N_{tree}$

Bootstrap sampling of the original training set S to generate the training set S_i .

Use S_i to generate a family of trees without pruning h_i ;

- A. randomly select M features from each of d features.
- B. at each node select the best feature from the features based on the Gini metric
- C. Nodes are split until the growth limit is reached

Output.

- A.the set of trees $\{h_i, i = 1, 2, \dots, N\}$
- B. Output of the decision tree h_i to the measured sample $h_i(x_i)$

4.3. RF model results analysis

Based on PCA analysis, the collected questionnaires were randomly divided into training and testing groups in the ratio of 7:3 by building a random forest model, and the model was trained using the training group to obtain the desired model and results. Here, for data visualization, the quantitative data obtained from the dependent variable of the cultural situation of guqin were classified as ABCD, respectively, according to the average classification of percentages, with A being the top 20% of the values and E being the bottom 20% of the values. The random forest estimated the error of the model by out-of-bag error, and the out-of-bag error in the model was 5.90%, and the model was better.

The machine learning model can be trained by substituting the training set into the random forest model, and then the data in the test set is substituted into the model to test the accuracy of the model prediction. The prediction accuracy is 91.11%, which means that the model can predict the respondents' promotion of guqin culture more accurately, and can be practically used for potential users of guqin culture promotion. It can be obtained as shown in Figure 3 below.

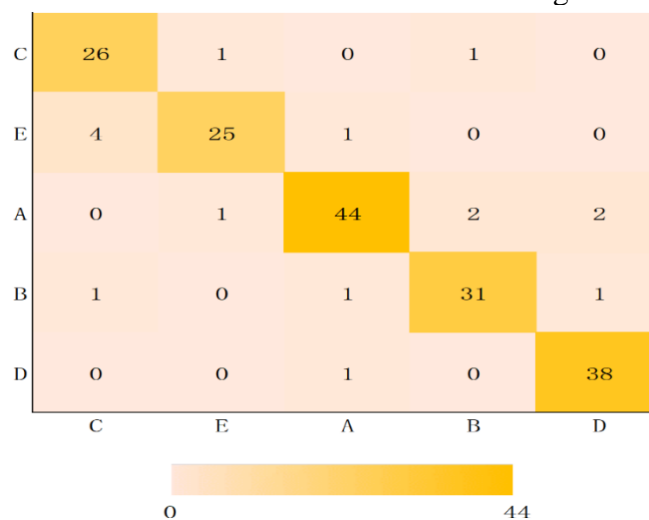


Figure 3 Confusion Matrix Heat Map

It can be seen that personal factors have a greater influence on the dissemination of guqin culture, followed by substantive stimuli, while perceived risk has less influence on the dissemination of guqin culture.

Combining the gender and age distribution of users, it is clear that more respondents are less willing to learn about guqin culture due to their own factors, while the middle-aged and elderly groups are less affected by the cost and time of learning guqin, instead they learn guqin because they want to know more people or things to make their lives more colorful and spread guqin culture. In this regard, it is possible to target potential groups so that more people will be more willing to learn about guqin culture and even promote it.

5. Conclusion

5.1. Findings of the Guqin Research

In-depth interviews were conducted to form a preliminary impression of the current situation of the guqin, and a preliminary version of the questionnaire was designed based on the interview results,

which mainly included the basic characteristics of the survey group and the degree of influence of related factors, so as to analyze the public's concerns about the guqin. Then a combination of stratified sampling and three-stage sampling was used to conduct a study on the relevant portrayal of the public group, generate relevant data, and conduct a study on the factors influencing the inheritance of the guqin for the sampled respondents.

1. In terms of willingness to learn

The willingness to learn the guqin was stronger among women, 23-32 age group, those with a bachelor's degree, and those working in enterprises and institutions. Through data analysis, it was found that in terms of gender, women have a stronger willingness to learn, with the ratio of women to men being about 11:9; in terms of age, those in the 23-32 age group have a stronger willingness to learn, accounting for about 31% of the respondents who are willing to purchase; in terms of education, those with bachelor's and specialist degrees have a stronger willingness to learn, accounting for more than 92% of the respondents; and in terms of income, those with middle and higher income have a stronger willingness to learn. In terms of income, the middle and high income groups have a stronger willingness to learn.

2. In terms of learning channels for guqin

Guqin short videos are a quick way for residents of Xiamen-Zhangzhou-Quan to learn about guqin. The proportion of the matrix scale shows that the respondents are more inclined to video learning and live performance of guqin, accounting for 40.47% and 44.65% respectively, so the respondents are more inclined to understand the culture of guqin by their own feelings, and less willing to learn from video learning and live performance than from advertising of training extension.

3. In terms of the emotional significance of the guqin

The proportion of respondents who think that contact with guqin culture can better help them improve their state of mind and train their emotions is 35.81%, with an average score of 4.19. This shows that respondents are more interested in learning guqin to express their emotions and improve their state of mind. This type of Xiamen-Zhangzhou-Quan residents are more inclined to the rendering of guqin culture and to improve their mood so that they can be willing to learn guqin.

4. Main reasons for not wanting to learn guqin

According to the results of the survey, 49.93% of the residents of Xiamen-Zhangzhou-Quan are in favor of the guzheng being moderately innovative, incorporating modern elements, innovating the guzheng and combining it with popular music. Appreciation of the classical meaning of the guqin is relatively niche. It can be seen that modern people's musical and cultural aesthetics have undergone a radical change. Residents of Xiamen-Zhangzhou-Quan are more willing to accept the modern diversified musical field and need to be able to consign the emotions of modern society to others through modern musical styles, while emphasizing appreciation of the elegance, commonality and entertainment of others.

5. Influencing factors of respondents who are willing to learn guqin

72.25% of the residents of Xiamen-Zhangzhouquan who are willing to learn guqin think that the cost is high and are unwilling to learn guqin. Such residents of Xiamen-Zhangzhouquan tend to learn guqin more often by watching guqin movies and dramas, music, short videos and other media, and an average of 48.87% of the respondents would choose this learning method.

6. Learning scenes with high willingness to learn guqin

In the choice of learning scenes for guqin (including guqin concerts, cultural surroundings, guqin CDs, etc.), 31.63% of the residents of Xiamen-Zhangzhouquan think that the immersion experience gu shed is the best place for the residents of Xiamen-Zhangzhouquan to learn guqin, while the rest of the learning scenes are scattered to occupy a small share, the immersion experience gu shed is about the need for the residents of Xiamen-Zhangzhouquan to experience and feel firsthand, and the atmosphere of the gu shed is more capable of Experience the emotions of the guqin atmosphere. The creation of immersion houses can help the residents of Xiamen-Zhangzhou-Quan to experience and actively want to learn the guqin.

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