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A Feasibility Study on the Integration of Henan's Local Cultural Resources with Modern Technology to Promote Cultural Heritage Preservation

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Abstract This paper takes Henan local culture as an example to explore the impact of the integration of cultural resources and modern technology on cultural heritage. First, based on factor analysis, five common factors were extracted from the 12 evaluation factors of the integration of cultural resources and modern technology, named cultural diversity, current status of cultural resource inheritance, application of digital technology, application of intelligent technology, and cultural participation. Next, the five common factors were used as independent variables, and villagers' willingness to preserve cultural heritage was used as the dependent variable. Pearson's correlation coefficient was employed to explore the correlation between the variables. Finally, a multiple linear regression model was constructed to analyze the relationship between the independent and dependent variables. Based on the analysis of the multiple linear regression model, it was found that the regression coefficients corresponding to the five common factors all had a significant positive impact on villagers' willingness to inherit culture. Among them, digital technology application (36.3%), intelligent technology application (26.3%), and cultural participation (22.1%) had a significant influence on villagers' willingness to inherit culture.

Index Terms factor analysis, Pearson correlation coefficient, multiple linear regression, cultural inheritance

I. Introduction

Henan Province is located in central China and is one of the cradles of Chinese civilization, boasting abundant local cultural resources. With the rapid development of the social economy and the acceleration of modernization, the protection and inheritance of Henan's local cultural resources face new challenges [1]-[4]. The protection and inheritance of local cultural resources are of great significance for maintaining the diversity of ethnic cultures, promoting cultural exchange and mutual learning, and enhancing cultural soft power [5], [6].

Inheritance is a crucial guarantee for the continuous development of Henan's local cultural resources, and advancements in modern technology have opened up new possibilities for this inheritance [7], [8]. For example, the development of digital resources, such as digital museums, digital libraries, and digital archives [9]. These digital resources enable more convenient access to and dissemination of Henan's local culture, such as browsing collections from museums and libraries across the country through online platforms [10]-[12]. Additionally, there are diverse online cultural activities, such as online cultural performances and exhibitions [13]. These digital resources not only expand the dissemination channels for the inheritance of Henan's local cultural resources but also inject new vitality into cultural inheritance [14], [15]. In the process of integrating cultural resources with technology, it is crucial to find a balance, which means respecting tradition while encouraging innovation [16], [17]. While innovation is always necessary, we must not allow tradition to lose its unique charm [18]. The preservation of culture should begin with classical methods, and the transmission of cultural classics requires a historical perspective [19]. The inheritance of Henan's local cultural resources requires the dedication and perseverance of generation after generation. If we only pursue the cold technology of the future, the responsibility of cultural inheritance may be neglected or forgotten [20]-[22]. Encouraging innovation does not necessarily mean abandoning tradition; new technologies can also be improvements to tradition, creating more possibilities.

The study takes County A in Henan Province as an example to explore the promotional effect of combining local cultural resources with modern technology on cultural heritage. After conducting reliability and validity tests on the questionnaire data, factor analysis was used to extract common factors through maximum variance rotation. The extracted common factors were used as independent variables, and villagers' willingness to preserve cultural heritage was used as the dependent variable. Pearson's correlation coefficient was used to analyze the correlation between the variables. Subsequently, a multiple linear regression model was established to determine the impact of the integration of cultural resources and modern technology on villagers' willingness to preserve cultural heritage.

II. Method

In order to explore whether the integration of Henan's local cultural resources with modern technology can effectively promote cultural heritage, this chapter provides a detailed introduction to the methods involved in the research process.

II. A.Factor analysis method

Factor analysis (FA) is a model analysis method that can extract common factors that cannot be directly observed but influence the changes in observable variables. The extracted common factors can reflect most of the information of the original variables, thereby simplifying the variables to a certain extent, reducing the number of variables, and reinterpreting the original variables [23]. There are two main methods of factor analysis: confirmatory analysis and exploratory analysis. In confirmatory factor analysis, it is assumed that certain factors are related to the measurement items. In contrast, exploratory factor analysis does not require any prior assumptions about the relationships between factors and measurements. Instead, it relies on data analysis to determine the results, with the most typical method being principal component analysis.

II. A. 1) Factor analysis model

The factor analysis model is described as follows:

The original p variables are expressed as a linear combination of m factors. Let the p original variables be $X_1, X_2, \cdots, X_p$. We seek to find m factors $(m < p)$ as $F_1, F_2, \cdots, F_m$. The relationship between the principal components and the original variables is expressed as:

$$\begin{aligned} X_1 &= a_{11}F_1 + a_{12}F_2 + \cdots + a_{1m}F_m + \varepsilon_1 \\ X_2 &= a_{21}F_1 + a_{22}F_2 + \cdots + a_{2m}F_m + \varepsilon_2 \\ &\cdots \\ X_p &= a_{p1}F_1 + a_{p2}F_2 + \cdots + a_{pm}F_m + \varepsilon_p \end{aligned} \tag{1}$$

In the above relationship:

(a) $X = (X_1, X_2, \cdots, X_p)$ is p original observable variables, with a mean of 0 and a standard deviation of 1, belonging to standardized variables.

(b) $F = (F_1, F_2, \cdots, F_m)$ represents m factor variables, where $m < p$, which are unobservable variables, i.e., common factors, that explain the correlations among variables and are shared by all observed variables.

(c) a_{ij} is the factor loading, which refers to the loading of the i th observed variable on the j th common factor.

(d) $\varepsilon_p = (\varepsilon_1, \varepsilon_2, \cdots, \varepsilon_p)$ is a special factor that cannot be explained by common factors and can be used as a substitute.

Since the factor analysis model not only applies to variables but also assumes that common factors and special factors are independent of each other, and special factors are orthogonal, it is also referred to as the R -type orthogonal model, with the formula as follows:

$$X = AF + \varepsilon \tag{2}$$

In the equation, F is called the common factor of X and can be understood as m mutually perpendicular coordinate axes in high-dimensional space. A is the factor loading matrix. ε is a special factor representing factors other than common factors.

(a) Common assumptions:

$$\begin{aligned} &E(F) = 0, \text{var}(F) = I_m \\ &E(\varepsilon) = 0, \text{var}(\varepsilon) = D = diag\left(\varepsilon_1^2, \varepsilon_2^2, \varepsilon_3^2, \cdots, \varepsilon_p^2\right) \\ &\text{cov}(F, \varepsilon) = 0 \end{aligned} \tag{3}$$

As can be seen from the above formula, there is no correlation between the common factors and the specific factors, and they are also mutually independent.

(b) Variable commonality

Variable commonality reflects the proportion of the total variance of the original variable X_i explained by all common factor variables, that is:

$$h_i^2 = \sum_{j=1}^{m} \varepsilon_{ij}^2 \left(i = 1, 2, \cdots, p \right) \tag{4}$$

In the above equation:

a) h_i^2 : The proportion of variance explained by the common factor relative to the original variables.

b) ε_i^2 : The portion of the variance of the original variables that cannot be explained by the common factors.

(c) Variance contribution rate of common factors

The variance contribution of common factor F_j is defined as the sum of the squares of the elements in the j th column of the factor loading matrix A , i.e.:

$$S_j = \sum_{i=1}^{p} a_{ij}^2 \left(j = 1, 2, \cdots, m \right) \tag{5}$$

The variance contribution rate of the common factor F_j indicates the importance of the factor.

II. A. 2) Calculation steps for factor analysis

(1) Select indicators. Select variable indicators based on the research objectives of this paper.

(2) Test whether the variable indicators are suitable for factor analysis. Therefore, the variables are first subjected to KMO measurement and Bartlett's test. The range of KMO measurement values can determine whether the variables are suitable for factor analysis.

(3) Factor extraction. The number of factors can be determined based on the cumulative contribution rates of the first m principal components. The most commonly used method is principal component analysis (PCA) for factor extraction. If the number of factors cannot be determined, the orthogonal rotation method with maximum variance should be used. Factors are rotated using the maximum variance rotation method to ensure that the loadings of each common factor exhibit significant differences.

(4) Calculate factor scores. Factor scores are calculated using methods such as linear regression combinations, weighted least squares, and regression analysis.

(5) Calculate composite scores. Common factors still reflect villagers' satisfaction levels from various aspects but cannot provide a comprehensive evaluation. Therefore, composite scores are calculated using the variance contribution rates of each common factor as weights. The composite evaluation indicator function is obtained through the linear combination of common factors:

$$F = \frac{w_1 F_1 + w_2 F_2 + \cdots + w_m F_m}{w_1 + w_2 + \cdots + w_m} \tag{6}$$

In the formula, w_i is the variance contribution rate of the common factor before or after rotation.

(6) Score ranking. The score ranking can be calculated using the comprehensive score.

II. B. Correlation Analysis

Correlation analysis, as a statistical analysis technique, aims to explore the intrinsic relationship between two or more variables. It helps us understand the correlation and directional strength between variables and quantifies this correlation through the calculation of correlation coefficients [24]. Correlation is categorized into three types: positive correlation, negative correlation, and no correlation. Assuming a linear correlation exists, the correlation coefficient serves as a statistical indicator reflecting the degree of closeness between two variables, denoted by r . When r is greater than 0, it indicates a positive correlation between the variables. When r is less than 0, it indicates a negative correlation between the variables. When r equals 0, it indicates no linear correlation between the variables.

Through correlation analysis, we can gain insights into the interrelationships between variables and use the values of one variable to estimate the possible values of another variable, which is of great value. This paper will use Pearson's correlation coefficient for correlation analysis.

Pearson's correlation coefficient, also known as the product-moment correlation coefficient, is a measure used to quantify the degree of linear correlation between two variables x and y . It is a value between 1 and -1, where 1 indicates a perfect positive correlation. When studying the relationship between two variables, covariance can reveal their overall trend of change. When x increases, whether y changes in the same direction or decreases in the opposite direction—that is, when x increases, y also increases—indicates that the two variables exhibit a positive correlation, and the covariance is positive. If x increases but y decreases in the opposite direction, it indicates an inverse relationship, and the covariance is negative. Covariance can be expressed as:

$$Cov = \sum_{i=1}^{n}(x_i - \overline{x})(y_i - \overline{y}) \tag{7}$$

Therefore, covariance can be used to represent the correlation between two variables. However, the value of covariance is affected by dimensions, so we need to further introduce the Pearson correlation coefficient. This coefficient eliminates the influence of dimensions by calculating the product of the standard deviations of variables x, y, thereby more accurately reflecting the degree of linear correlation between the two variables. From another perspective, the Pearson correlation coefficient is a special type of covariance, and its formula is:

$$r = Corr(x, y) = \frac{Cov(x, y)}{\delta_x \delta_y} \tag{8}$$

II. C.Multiple linear regression model

Multiple linear regression is an important linear regression model commonly used for parameter estimation and prediction variables. It is widely used in the field of data analysis to predict and analyze the relationships between multiple variables. The model assumes that the independent variables and dependent variables are linearly correlated and that a linear function can be used to describe the relationship between them [25].

(1) General form of the multiple linear regression model:

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_p x_p + \varepsilon \tag{9}$$

Among them, ε is a random disturbance term, and $E(\varepsilon) = 0$.

Assuming that n independent samples are observed, resulting in n sets of observed data, for each sample, equation (9) is expressed as:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_p x_{ip} + \varepsilon_i, i = 1, 2, \cdots, n \tag{10}$$

The above multiple linear regression equation can also be expressed as a matrix:

$$Y = X\beta + e \tag{11}$$

Among them:

$$Y = \left(y_1, y_2, \cdots, y_n\right)^T \tag{12}$$

$$X = \begin{pmatrix} 1 & X_{11} & X_{12} & \cdots & X_{1p} \\ 1 & X_{21} & X_{22} & \cdots & X_{2p} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ 1 & X_{n1} & X_{n2} & \cdots & X_{np} \end{pmatrix} \tag{13}$$

$$\beta = \left(\beta_0, \beta_1, \beta_2, \cdots, \beta_p\right)^T \tag{14}$$

$$e = \left(e_1, e_2, \cdots, e_n\right)^T \tag{15}$$

(2) Parameter estimation of the multiple linear regression model

Based on the principle of the least squares method, the model parameters are estimated by minimizing the error square Q and so that the sum of the squares of the residual values ε_i between the estimated values $\hat{y}_i$ and the observed values y_i is minimized, i.e., Q is minimized:

$$Q = \sum_{i=1}^{n}\left(y_i - \hat{y}_i\right)^2 = \varepsilon^T \varepsilon = \left(Y - X\hat{\beta}\right)^T \left(Y - X\hat{\beta}\right) \tag{16}$$

The estimated value $\hat{\beta}$ of the regression parameter β in equation (16) is obtained as follows:

$$\hat{\beta} = \left(X^T X\right)^{-1} X^T Y \tag{17}$$

(3) Significance test for multiple linear regression models

A significance test is a statistical test used to determine whether the coefficients of each variable in a regression equation are significant. It compares the significance level corresponding to the test statistic to determine whether the coefficient is significant, thereby determining whether the variables in the regression equation are meaningful.

a) Significance test of the regression equation

The sum of squared deviations from the mean of the dependent variable SS_T can be decomposed into two parts:

$$\begin{aligned} SS_T &= \sum_{i=1}^{n}\left(y_i-\bar{y}\right)^2=\sum_{i=1}^{n}\left(y_i-\hat{y}_i\right)^2+\sum_{i=1}^{n}\left(\hat{y}-\bar{y}\right)^2 \\ &= SS_R+SS_E \end{aligned} \tag{18}$$

Degrees of freedom are also divided into two parts, of which the degrees of freedom of regression are the number of independent variables:

$$df_R = p, df_E = df_T - df_R = (n-1)-p = n-p-1 \tag{19}$$

Thus, calculate the two parts of the mean square sum in equation (18) separately:

$$MS_R = SS_R / df_R = \sum_{i=1}^{n}(\hat{y}_i-\bar{y})^2 / p \tag{20}$$

$$MS_E = SS_E / df_E = \sum_{i=1}^{n}(y_i-\hat{y}_i)^2 / (n-p-1) \tag{21}$$

The F statistic is generally used to test whether a multiple regression equation is meaningful. When the null hypothesis of the hypothesis test is true, the test statistic should follow the F distribution, with degrees of freedom $(p, n-p-1)$, and the expression is:

$$F = \frac{MS_R}{MS_E} \sim F(p, n-p-1) \tag{22}$$

At the α significance level, if the absolute value of the F statistic is greater than or equal to $F_{1-\alpha}(p, n-p-1)$, the null hypothesis is rejected, indicating that there is a good linear significant relationship between the independent variable and the dependent variable.

b) Significance test of regression equation coefficients

If the significance test of the multiple regression equation passes, it does not necessarily mean that all partial regression coefficients $\beta_j (j=1,2,\cdots,p)$ are meaningful. Each partial regression coefficient must be tested for significance. Generally, the t statistic is used to test the significance of the regression coefficients. When the null hypothesis of the hypothesis test holds, the test statistic follows a t distribution with $(n-1)$ degrees of freedom:

$$t_j = \frac{\hat{\beta}_j - \beta_j}{s_{\hat{\beta}_j}}, j=1,2,\cdots,p \tag{23}$$

Among them:

$$s_{\hat{\beta}_j} = \sqrt{c_{jj} MS_E} \tag{24}$$

c_{jj} is the j th element on the diagonal of the matrix $(X^T X)^{-1}$.

At the α significance level, if the absolute value of the t statistic is greater than or equal to $t_{\alpha/2}(n-1)$, reject the null hypothesis and conclude that the j th partial regression coefficient β_j is significantly different from zero, i.e., the linear effect of the independent variable x_j on the dependent variable y is significant.

III. Results and Discussion

This chapter primarily employs statistical analysis methods such as factor analysis, Pearson correlation coefficient analysis, multiple linear regression analysis, mean analysis, and significance analysis using SPSS 23.0 statistical analysis software to conduct data statistical analysis.

(1) Factor Analysis

Factor analysis is a multivariate statistical method that utilizes the concept of dimensionality reduction to reorganize original variables into a set of new, mutually independent composite variables while minimizing information loss. In this study, after conducting reliability and validity tests on the scale data from the survey questionnaire, principal component analysis was used to extract common factors through maximum variance rotation, and exploratory factor analysis was conducted using the factor loading matrix to verify the scientific rationality of the questionnaire scale design. Additionally, confirmatory factor analysis was conducted based on the average variance extracted (AVE) and composite reliability (CR) of each dimension scale to verify the convergent validity of the questionnaire scale.

(2) Pearson correlation coefficient analysis

Pearson correlation coefficient analysis is an important type of correlation analysis. It is primarily used to measure and describe the strength of relationships between variables, with the characteristics of having no strict requirements on data distribution and being insensitive to outliers [26]. It is suitable for exploring the factors influencing Henan villagers' willingness to inherit culture and analyzing the correlation between perceived intention and willingness to inherit.

(3) Multiple linear regression analysis

Multiple linear regression, as a commonly used regression analysis method, is a statistical analysis method for examining the deterministic dependent relationship between multiple independent variables and one dependent variable. By establishing a regression model for villagers' willingness to preserve cultural heritage using multiple linear regression, and verifying the reliability of the regression model based on the measured parameters, it is possible to determine whether the integration of cultural resources with modern technology has a causal relationship with villagers' willingness to preserve cultural heritage.

III. A. Data processing

This survey was conducted in County A, Henan Province, with a questionnaire administered to 200 villagers in the area. Males accounted for 48.5% of the total sample, while females made up 51.5%, resulting in a balanced gender ratio. The surveyed villagers spanned three generations—young, middle-aged, and elderly—but were predominantly middle-aged and elderly, with the majority concentrated in three age groups: 31–40 years old, 41–50 years old, and 51–60 years old (together accounting for 70% of the sample). Over half (59%) of the respondents had lived in the surveyed village for more than 20 years. Among them, 73.2% of the villagers had an educational attainment of junior high school or high school (or vocational school), while only 9.6% had an educational attainment of elementary school or below. The primary occupations of the surveyed villagers were self-employment (40.3%), employment in enterprises or public institutions (16.6%), and farming (15.3%). County A has a thriving population, with 71.1% of households having four or more members. The majority of households have annual incomes of 30,000 to 80,000 yuan (16.9%) and 80,000 to 150,000 yuan (36.8%), indicating that the overall material and cultural living standards are at a moderately prosperous level. Based on the demographic characteristics and social attributes of the sample population, the survey data collected is considered ideal, with uniform sampling, typicality, and randomness, making it highly valuable for data analysis and conducive to subsequent differential analysis.

III. B. Reliability and validity analysis

This questionnaire is designed to assess 12 aspects of cultural heritage preservation, including traditional architectural cultural resources (X1), folk cultural resources (X2), historical relic cultural resources (X3), the scale and age structure of the population engaged in cultural heritage transmission (X4), the diversity of cultural heritage transmission methods (X5), the degree of digitalization of cultural resources (X6), the application of VR/AR technology (X7), the application of social media dissemination technology (X8), intelligent recommendation systems (X9), intelligent language and image recognition technology (X10), frequency of participation in cultural activities (X11), and level of participation in cultural creation (X12).

Using SPSS 23.0 statistical analysis software, the internal reliability of the questionnaire scale was validated using Cronbach's alpha coefficient, with values ranging from 0 to 1. Generally, a Cronbach's alpha coefficient greater than 0.7 for the total scale indicates high data reliability. The Cronbach's α coefficient for the total scale was 0.782, and the α coefficients for each dimension ranged from 0.652 to 0.796, all exceeding 0.6, indicating that the reliability of the questionnaire data is relatively high and generally acceptable.

Validity refers to the accuracy of the scale, i.e., whether the scale can correctly measure the intended target. Validity testing of the questionnaire scale is primarily conducted through the KMO test and Bartlett's sphericity test. The KMO statistic ranges from 0 to 1, with values closer to 1 indicating stronger correlations between variables. Generally, a KMO value greater than 0.7, combined with a significant P-value less than 0.05 from the Bartlett sphericity test, indicates high scale validity and a reliable factor matrix after rotation, making it suitable for factor analysis. The analysis results show that the KMO value for the entire questionnaire is 0.755, with a P-value of 0.000, indicating that the data has high validity and is suitable for exploratory factor analysis.

Based on the reliability and validity tests of the questionnaire, the data is reliable, stable, and valid, and can be used for further analysis.

III. C. Factor analysis

The fundamental objective of factor analysis is to simplify data. Factors extracted through factor analysis are more scientific and can yield more accurate conclusions. This study conducted a factor analysis of the factors influencing villagers' willingness to preserve cultural heritage. The results of the overall variance explanation of the data are shown in Table 1, which extracted five common factors. The explanatory power was 79.87%, which is greater than 60% and therefore acceptable.

Table 1: The overall variance explains the result

Constituent	Initial eigenvalue			Extracting the load of the load			Rotational load squared		
	Total	Percentage of variance	Cumulation (%)	Total	Percentage of variance	Cumulation (%)	Total	Percentage of variance	Cumulation (%)
1	3.957	32.98	32.98	3.957	32.98	32.98	3.713	18.63	18.63
2	1.792	14.93	47.91	1.792	14.93	47.91	3.665	17.96	35.59
3	1.512	12.6	60.51	1.512	12.6	60.51	3.541	15.74	52.33
4	1.301	10.84	71.35	1.301	10.84	71.35	3.228	14.69	67.02
5	1.022	8.52	79.87	1.022	8.52	79.87	2.25	12.85	79.87
6	0.674	5.62	85.49						
7	0.574	4.77	90.26						
8	0.517	4.31	94.57						
9	0.264	2.2	96.77						
10	0.139	1.16	97.93						
11	0.134	1.12	99.05						
12	0.114	0.95	100						

The rotated component matrix is shown in Table 2. The factor loadings of the 12 evaluation factors are all greater than 0.5. Generally, factor loadings above 0.4 are acceptable. Therefore, the survey data in this study has good validity and can be used for further analysis and research.

Table 2: The component matrix after rotation

	1	2	3	4	5
X1	0.86				
X2	0.827				
X3	0.877				
X4		0.771			
X5		0.719			
X6			0.81		
X7			0.795		
X8			0.814		
X9				0.812	
X10				0.886	
X11					0.791
X12					0.872

III. D. Descriptive statistics

Factor analysis identified five main components. Traditional architectural cultural resources, folk cultural resources, and historical relic cultural resources can be categorized under cultural diversity (CD). The scale and age structure of the inheriting population and the diversity of inheritance methods can be categorized under the current state of cultural resource inheritance (CRH). The digitalization level of cultural resources, application of VR/AR technology, and application of social media dissemination technology can be categorized under digital technology application (DTA). Intelligent recommendation systems and intelligent language and image recognition technology can be categorized under intelligent technology application (ITA). The frequency of participation in cultural activities and the degree of participation in cultural creation can be categorized under cultural participation (CP).

This section describes the variables influencing the cultural inheritance intentions of villagers in County A. The statistical results are shown in Table 3. It can be seen that the mean and standard deviation of the dependent variable and all independent variables are as follows: the mean of the dependent variable "villagers' cultural inheritance intentions (VCH)" is 3.62, and the standard deviation is 1.362. The independent variables are ranked in descending order of mean values as follows: digital technology application (DTA) 4.13, cultural participation (CP) 4.09, intelligent technology application (ITA) 3.52, cultural diversity (CD) 3.26, and current status of cultural resource inheritance (CRH) 2.63.

Table 3: Descriptive statistics

	Mean	SD	N
VCH	3.62	1.362	200
CD	3.26	0.563	200
CRH	2.63	1.021	200
DTA	4.13	0.362	200
ITA	3.52	1.055	200
CP	4.09	0.214	200

III. E. Correlation Analysis

Correlation analysis is a statistical method used to measure the degree of association between multiple independent variables and a dependent variable. It is employed to investigate the strength and direction of the relationship between variables, primarily by examining the magnitude and sign of the correlation coefficient to determine the nature of the relationship between variables. Generally, if the correlation coefficient is greater than or equal to 0, it indicates a positive correlation between variables; if the correlation coefficient is less than 0, it indicates a negative correlation between variables. The p-value is used to reflect whether the relationship between variables is statistically significant. In this study, a correlation analysis was conducted on cultural type diversity, the current status of cultural resource inheritance, digital technology application, intelligent technology application, cultural participation, and villagers' willingness to inherit culture. The analysis results are shown in Table 4. Based on the correlation analysis results, the P-values for cultural diversity, the current state of cultural resource inheritance, digital technology application, intelligent technology application, cultural participation, and villagers' willingness to inherit culture are all less than 0.01, indicating that there is a significant correlation between the independent variables and the dependent variable. The correlation coefficients between the independent variables and the dependent variable are 0.253, 0.333, 0.315, 0.313, and 0.354, respectively, all of which are greater than 0, indicating that the five dimensions are positively correlated with villagers' willingness to inherit culture. This provides a basis and guarantee for subsequent factor analysis.

Table 4: Correlation analysis results

Dimension		CD	CRH	DTA	ITA	CP	VCH
CD	Pearson correlation	1	0.251**	0.255**	0.291**	0.375**	0.253**
	P		0	0	0	0.001	0
CRH	Pearson correlation	0.251**	1	0.388**	0.263**	0.36**	0.333**
	P	0		0	0	0	0
DTA	Pearson correlation	0.255**	0.388**	1	0.395**	0.4**	0.315**
	P	0	0		0.001	0.002	0
ITA	Pearson correlation	0.291**	0.263**	0.395**	1	0.322**	0.313**
	P	0	0	0.001		0.001	0.001
CP	Pearson correlation	0.375**	0.36**	0.4**	0.322**	1	0.354**
	P	0.001	0	0.002	0.001	0.218	0
VCH	Pearson correlation	0.253**	0.333**	0.315**	0.313**	0.354**	1
	P	0	0	0	0.001	0	

III. F. Multiple linear regression analysis

Based on the research questions in this paper, the regression equation should be:

$$Y = a + \beta_1 CD + \beta_2 CRH + \beta_3 DTA + \beta_4 ITA + \beta_5 CP \quad (25)$$

The summary of the multiple linear regression model is shown in Table 5. The R value (0.757) in the summary table is referred to as the multiple correlation coefficient, which indicates the strength of the association between the original values of the dependent variable and the predicted values of the dependent variable obtained through the regression equation. Its value ranges between 0 and 1. R^2 (0.596) multiplied by 100% indicates the extent to which all independent variables as a whole can explain the total variation in the dependent variable. In this study, the five independent variables as a whole can explain 59.6% of the variation in the dependent variable.

Table 5: Multiple linear regression model summary table

Model	R	R^2	Adj_R^2	SER
1	0.757^a	0.596	0.559	0.742

The results of the analysis of variance for multiple linear regression are shown in Table 6. The significance test results for the overall predictive power of the regression equation represented by R^2 are provided. The test in this study was conducted for the null hypothesis H0, using analysis of variance as the testing method. According to Table 6, F = 32.615, $\beta < 0.05$. This indicates that R^2 is significantly non-zero, and the overall predictive power of the regression equation is significant.

Table 6: Multivariate linear regression variance analysis

Anova[b]						
Model		Sum of squares	DF	Mean square	F	Sig.
1	Regression	98.632	11	18.634	32.615	0.000
	Residual error	75.613	125	0.526		
	Total	163.521	152			

The regression coefficient table displays regression coefficients categorized into two types: unstandardized and standardized. These are used to establish unstandardized regression equations and standardized regression equations, respectively. Unstandardized regression equations are used to predict dependent variable scores and are more practical. Standardized regression equations are used to describe research results. Another difference between the two is that unstandardized regression equations include a constant term and error, while standardized regression equations do not include these two terms and only contain the regression coefficient β. Standardized coefficients reflect the extent to which different independent variables influence the dependent variable, while unstandardized coefficients represent the absolute magnitude of the effect. Since this study aims to examine the extent to which each independent variable influences the dependent variable, standardized coefficients are selected.

The multiple linear regression coefficients are shown in Table 7. The table presents the standardized and unstandardized regression coefficients of the multiple regression equation, along with the results of the significance tests for these coefficients. The significance criterion for Sig is 0.05; when Sig ≤ 0.05, the predictive effect of the independent variable is significant. The overall significance coefficient of the five independent variables is less than 0.05, indicating that the overall predictive effect of the five independent variables is significant. The multiple linear regression coefficient table also provides multicollinearity tests. When the variance inflation factor (VIF) is greater than 10, or greater than 5 in some data, it is suspected that there is a multicollinearity issue among the independent variables. In this paper, the variance inflation factor (VIF) coefficients of all independent variables are less than 10, indicating that there is no multicollinearity issue among the five independent variables.

Table 7: Multivariate linear regression coefficient

Model		Nonnormalized coefficient		Standard coefficient	T	Sig.	Common linear statistics	
		B	SE				Tolerance	VIF
1	Constants	-2.786	0.641	-	-4.306	0	-	-
	CD	0.45	0.156	0.125	1.991	0.001	0.631	1.678
	CRH	0.492	0.121	0.028	2.979	0	0.521	1.618
	DTA	0.521	0.112	0.363	4.995	0	0.314	1.587
	ITA	0.204	0.097	0.263	1.995	0.034	0.042	1.861
	CP	0.059	0.064	0.221	0.822	0.032	0.811	1.123

To visually present the results of the linear regression analysis and summarize the discussion, the significance coefficients between each independent variable and the dependent variable are summarized in a table. The results of the multiple linear regression are shown in Table 8. By observing the relationship between the predicted variables and residuals in the multiple linear regression prediction variable and residual relationship diagram (Figure 1), it can be seen that most of the measured values are located within an ellipse centered at the origin of the coordinate system and bounded by ±1.8. (Note that the units of measurement for the horizontal and vertical axes in the coordinate system are different). This indicates that the error in the multiple linear regression analysis results of this model follows a normal distribution, which aligns with the statistical assumptions of multiple linear regression, thereby confirming the reliability of the results. All five independent variables have a good predictive effect on villagers' willingness to preserve cultural heritage, with an R^2 value of 0.596. This means that the combination of the five independent variables—cultural diversity, current status of cultural resource preservation, application of digital technology, application of smart technology, and cultural participation—can explain 59.6% of the variation in villagers' willingness to preserve cultural heritage.

Table 8: Multivariate linear regression

Variable		R	R^2	Adj_R^2	F	Beta	Sig.	Tolerance	VIF
Dependent variable	VCH	0.757	0.596	0.559	32.615		0.001	0.631	1.678
Independent variable	CD					0.125	0	0.521	1.618
	CRH					0.028	0	0.314	1.587
	DTA					0.363	0.034	0.042	1.861
	ITA					0.263	0.032	0.811	1.123
	CP					0.221	0.001	0.631	1.678

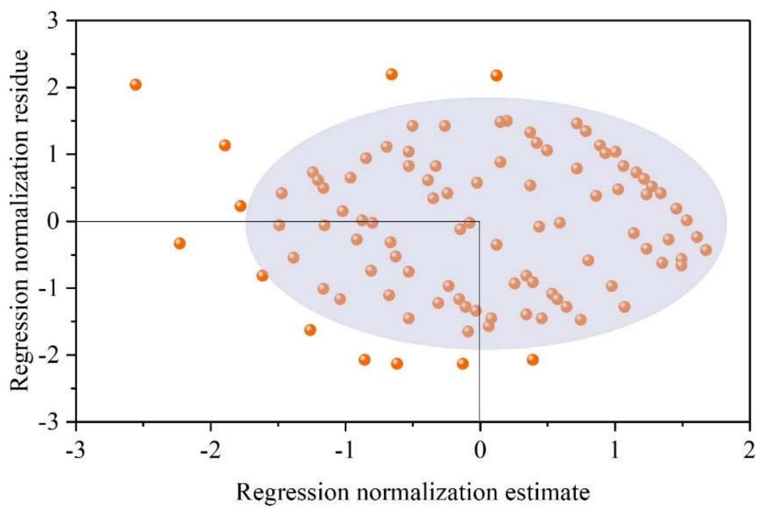

Figure 1: Multivariate linear regression prediction variable and the residual diagram

Based on the above research results, the combination of local cultural resources and modern technology can promote cultural inheritance. The standardized regression equation for measuring the effectiveness of cultural inheritance is:

$$Y = 0.125CD + 0.028CRH + 0.363DTA + 0.263ITA + 0.221CP \quad (26)$$

IV. Conclusion

This paper analyzes the feasibility of combining Henan's local cultural resources with modern technology to promote cultural heritage through factor analysis, correlation analysis, and the construction of a linear regression model. First, factor analysis was used to reduce the number of influencing factors and classify them into categories. The results showed that multiple influencing factors could be divided into five dimensions: cultural diversity, current status of cultural resource inheritance, application of digital technology, application of intelligent technology, and cultural participation. Using the aforementioned five variables as independent variables and villagers' willingness to preserve cultural heritage as the dependent variable, the linear regression equation constructed is: $Y = 0.125CD + 0.028CRH + 0.363DTA + 0.263ITA + 0.221CP$. Among these, the influence degrees of digital technology application (DTA), intelligent technology application (ITA), and cultural participation (CP) on villagers' willingness to preserve cultural heritage are 36.3%, 26.3%, and 22.1%, respectively. In conclusion, the integration of local cultural resources with modern technology can effectively promote cultural heritage preservation.

References

[1] Croddy, E. (2022). Henan Province. In China's Provinces and Populations: A Chronological and Geographical Survey (pp. 311-342). Cham: Springer International Publishing.

[2] Pu, M., Musib, A. F., & Ching, C. C. S. (2023). The Modern Heritage of Chinese Traditional Culture in the Perspective of Intangible Cultural Heritage Preservation-A Case Study of Henan Zhuizi. International Journal of Academic Research in Progressive Education and Development, 12(2), 1082-1096.

[3] Chunqing, Z. (2013). The Longshan culture in central Henan province, c. 2600–1900 BC. A companion to Chinese archaeology, 236-254.

[4] Cao, Y., & Boonsrianun, P. (2023). An examination of the history and development of Heluo Dagu in Henan Province, China. International Journal of Curriculum and Instruction, 15(2), 1049-1062.

[5] Awopetu, R. (2019). In defense of culture: Protecting traditional cultural expressions in intellectual property. Emory LJ, 69, 745.

[6] Jiang, Z. (2019, June). Study on the Inheritance and Development of Local Culture in the Homestay. In 3rd International Conference on Economics and Management, Education, Humanities and Social Sciences (EMEHSS 2019) (pp. 449-455). Atlantis Press.

[7] Tang, Y., & Wang, Z. (2024). Preserving the Past: Digital Strategies for Cultural Heritage in Modern China. Profesional de la información, 33(3).

[8] Meifan, Z., & Wenjing, A. (2020). Inheritance and Innovation, Adjustment and Accumulation: On The Modernization Thinking of Chinese Traditional Culture from The Development of the Cultural and Creative Industry of the Forbidden City. Journal on Innovation and Sustainability RISUS, 11(4), 12-22.

[9] Wang, J., Li, M., Wang, J., & Ma, X. (2020). Inheritance and Development of Ancient Buildings Culture based on Digital Image Technology. In E3S Web of Conferences (Vol. 179, p. 01011). E3S Web of Conferences.

[10] Qiu, L., Rahman, A. R. A., & bin Dolah, M. S. (2024). Innovative design of agricultural tourism souvenirs to promote the inheritance and promotion of intangible cultural heritage. Pakistan Journal of Agricultural Sciences, 61(1), 359.

[11] Lin, Q., & Xing, Z. S. (2019). A study of the inheritance and education of intangible cultural heritage. In Engineering Innovation and Design (pp. 470-476). CRC Press.

[12] Yang, Z. (2023, August). Digital Technology is Used for the Innovative Inheritance Research of Meishan Nuo Opera. In Proceedings of the 2nd International Academic Conference on Blockchain, Information Technology and Smart Finance (ICBIS 2023) (pp. 865-872). Atlantis Press.

[13] Zhang, A., Gong, Y., Chen, Q., Jin, X., Mu, Y., & Lu, Y. (2025). Driving Innovation and Sustainable Development in Cultural Heritage Education Through Digital Transformation: The Role of Interactive Technologies. Sustainability, 17(1), 314.

[14] Tang, Y. (2024). Inheritance and Innovation of Traditional Culture in Primary School Chinese Curriculum. Journal of Modern Education and Culture, 1(1).

[15] Tu, B., & Chen, Y. (2025). Research on the Realization Path of Intangible Cultural Heritage Inheritance from the Perspective of Public Cultural Services: A Case Study of Yao Long-Drum Dance in S Town. Humanities and Social Science Research, 8(2), p30-p30.

[16] Peng, W., Ruangchewin, P., & Panthupakorn, P. (2024). The Research on Protection and Inheritance Strategies of Intangible Cultural Heritage: A Case Study of Traditional Tujia Brocade Weaving Technique in China. Journal of Roi Kaensarn Academi, 9(4), 716-727.

[17] Ma, Q., Mayusoh, C., Inkuer, A., & Puntien, P. (2024). Historical Inheritance and Contemporary Cultural and Creative Product Design of the Hai Hun Hou Culture. Herança, 7(2), 162-173.

[18] Wang, L. (2023, December). Digital Technology in Promoting Stakeholders Transforming in Cultural Inheritance. In 2023 16th International Symposium on Computational Intelligence and Design (ISCID) (pp. 165-168). IEEE.

[19] Yiguang, L. (2024). Cultural inheritance and media communication of national costumes in digital age. Academic Journal of Humanities & Social Sciences, 7(4), 73-77.

[20] Zhu, X., & Li, X. (2022). Research on the Path of New Media Promoting Undergraduates to Inherit Chinese Excellent Traditional Culture. Forest Chemicals Review, 313-321.

[21] Ma, L. (2021, December). The Inheritance Strategy of Intangible Cultural Heritage Based on Internet and Information Technolog--Taking Wuhu Iron Painting as an Example. In 2021 International Conference on Forthcoming Networks and Sustainability in AIoT Era (FoNeS-AIoT) (pp. 280-283). IEEE.

[22] Ye, H. (2025). Research on the Innovative Inheritance and Dynamic Development of Cultural Heritage Empowered by Digital and New Media Technologies in the Context of Interdisciplinary Art. In SHS Web of Conferences (Vol. 213, p. 02023). EDP Sciences.

[23] Bin Tu,Xiangyu Tao & Nian'en Guo. (2017). Governmental Spending on Public Cultural Services: Efficiency and Influencing Factors Analysis Based on DEA-Tobit. Journal of Service Science and Management,10(3),216-229.

[24] Yiyuan Cui,BinBin He,Kun Li & Yaoxuan Li. (2025). Analysis of the Correlation Between Factors Affecting Green Mining in Open-Pit Mines. Energy Exploration & Exploitation,43(3),1076-1099.

[25] Gu Zhenjing,Meng Da,Yang Hui & Liu Xiaofei. (2024). Influencing Factors of Museum Self-Improvement in China: A Multiple Linear Regression Analysis. Proceedings of Business and Economic Studies,7(6),238-250.

[26] Punya Tepsing,Kasetchai Laeheem & Buskorn Komontree. (2025). Predicting Cultural Acceptance Among Students in Thailand's Southern Border Provinces: Key Influencing Factors. Societies,15(4),76-76.