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Research on Influencing Factors of Consumers' Continuous Use Behavior of Virtual Digital Display Platforms

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Abstract: *At present, virtual digital display platforms are facing problems such as low information transmission efficiency, weak continuous participation and poor user attachment. Based on the Expectation Confirmation Theory and from the perspective of users' continuous use behavior, this paper introduces four dimensions of design factors: information quality, display vividness, exhibit interaction and empathy experience, and constructs a research model of factors influencing users' continuance intention of virtual digital display platforms. A questionnaire was compiled and distributed, and the data were collected. The continuous use behavior of consumers of the virtual digital display platform was analyzed, and the following conclusions were drawn: First, the design factors of the virtual digital display platform were found to directly affect the perceived usefulness, and indirectly affect the continuance intention through the perceived usefulness; Second, satisfaction had a significant direct impact on users' continuance intention; Third, the level of expectation confirmation indirectly affects the continuance intention, and perceived usefulness also has a direct impact on satisfaction. However, the impact of expectation confirmation level on perceived usefulness was unable to be confirmed.*

Keywords: *Expected confirmation model, Virtual digital display platform, continuance intention, Influencing factors*

I. Introduction

The "virtual digital display platform" is a general term used for digital resources across different fields, including virtual museums, graduation exhibitions and art galleries. At present, it has become an important resource for science popularization and education worldwide (Li J, Nie J-W&Ye J, 2022). As an online system that transmits information through dynamic, all-round, three-dimensional and other technological means (Schweibenz W, 2004), it has aroused extensive discussion in academic circles since its emergence.

In the existing research, discussions on virtual digital display platforms are mostly based on the perspective of user experience and technical implementation. From the perspective of user experience, Lee (Hyunae Lee, Timothy Soojung, M. Claudia Tom Dieck & Nam Ho Chung, 2019), Pupasari (Pupasari, S, Ermatita, & Zulkardi, 2023) and others discuss the influencing factors of user experience in virtual museums, and explore the degree of users' acceptance of application information. Boloran (2021) and others explore the relationship between students' course satisfaction and engagement in the process of using e-learning portals (Baloran, E.T., Hernan, J.T. & Taoy, J.S., 2021). From the perspective of digital information technology, research mainly

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focuses on the receiving mode, receiving type and development of a functional module for virtual digital display platforms. Sfodera (2020) explores how technology affects the learning experience of cultural heritage (Sfodera, F, Mingo, I, Mattiacci, A., & Colurcio, M, 2020). Zhang (2017) discusses the innovative application of virtual display technology in virtual museums from the perspective of technical expression (Zhang J, 2017). Wu (Wu Y, Jiang Q, Liang HH. E.,&Ni, S., 2022) and others focus on the influence of technological innovation on users' behavior intentions in the virtual clothing museum.

Although current researchers have conducted in-depth research on the users' experience, immersion, technical implementation and other topics of the virtual digital display platform, there is little discussion of the influencing factors of users' information reception performance concerning the virtual digital display platform. As a digital platform providing online information dissemination services, it is of great significance for users to receive information effectively (Bhattacherjee, A, 2001). Compared with the traditional offline learning methods, the current online e-learning portal has a higher user circulation rate (Clay, M.N., Rowland, S., & Packard, A, 2008), and the learning methods presented therein also bring many uncertain factors. As a new online learning mode, the virtual digital platform has not solved this problem well. On the contrary, due to a large number of homogeneous developments of virtual digital platforms, this trend has made the problem more noticeable. Literature shows that there are some phenomena in the use of virtual digital display platforms, such as low information transmission efficiency (Kexue, Yifei Li & Xiaoxiaomeng, 2019), weak continuous participation, and poor user attachment. As a new science popularization and education resource, virtual digital display platforms urgently need to effectively improve the information reception performance, in which the information reception performance refers to the degree of consistency and information income between the dissemination content of the digital platform and the learners' perception during the online experience using a virtual display, so as to enhance the users' intention of continuous use of the information system.

In order to effectively improve the information reception performance, this study will focus on the factors that affect the information reception performance during the use of consumers (users), and analyze how they affect the users' behavior intention of continuous use. Therefore, the expectation-confirmation theory was selected for the study, and an attempt is made to construct a theoretical model to explain and predict the information reception performance of users of virtual digital platforms, so as to provide a theoretical basis for the construction and enhancement of virtual digital display platforms.

II. Literature review

2.1 Research on Information Reception Performance

The concept of information reception is incorporated within the concept of information behavior, and information behavior mainly refers to the user's demand for all types of information and the behavior of searching, transmitting, receiving, processing and absorbing information. Davenport (**insert year – I could not find in references below) believes that information behavior includes the activities of searching information, using information, verifying information, sharing information, saving information and ignoring useless information, etc., and information reception performance is considered as the information benefits obtained by users.

In previous studies the foci have mainly included the dimensions of information diffusion and reception performance. The first category is mostly based on the extended research of information systems adopting classical theories, such as Task-technology Fit (TIF) and Innovation Diffusion Theory (IDT), combined TAM and TPB (C-TAM-TPB) and Social Cognitive Theory, SCT), etc., which have all been proven to have corresponding explanatory power in specific fields. This kind of research studies the user's continuous use behavior by introducing new influencing factors or using new research methods, and most of them reflect the user's previous use behavior (previous experience, frequency, personal situation, etc.). For example, Anubhav (2023) uses the Meta-analysis Structural Equation Model (MASEM) to study and expand the acceptance model of information system continuity, indicating that users should get a sense of enjoyment and satisfaction from technology, so as to ensure the continuous use of information systems (Mishra Anubhav, Shukla Anuja, Rananri Pendra P, Currie Wendy L & Dwiwedi Yogesh K, 2023). In addition, the second kind of research is to introduce new theoretical bases, and study the information reception performance by citing the theoretical bases of other disciplines. For example, QIN et al. (2016) introduce Social Cognitive Theory to empirically explore the influencing factors of knowledge sharing in the online learning space, and believe that users' knowledge sharing experience can be optimized from both the internal learners and the external environment of the online learning space, thus creating a better information receiving environment. Zhao et al. (2017) introduce the Self-Determination Theory to explore the influencing factors of college students' use of the online learning space, and believes that the perceived usefulness of online learning spaces significantly affects college students' use intention.

Judging from the existing research results, there is relatively little research on the factors affecting information reception performance. In this study, the Expectation-Confirmation Theory in consumer behavior is introduced to explain the influencing factors and behaviors of users' information reception performance using virtual digital display platforms.

2.2 Application of Expectation-Confirmation Theory

Oliver (1980) introduced the Expectation-Confirmation Theory, which originated from market research. In previous literature on consumer behavior, it was widely used to evaluate the satisfaction of users and consumers' post-purchase behavior (such as product repurchase, complaints, etc.) and general service marketing. This theory holds that consumers will compare their expectations before the purchase of products and services with their cognition generated after the purchase behavior, that is, the difference between perceived performance and pre-use expectations.

Bhattacherjee (2001) believes that the use intention of information systems is very similar to the purchase intention of users after their consumption behavior. Based on the Expectation-Confirmation Theory (ECT), this paper analyzes the relationship among user satisfaction, expectation confirmation and continuance intention, and constructs an expectation confirmation model of is continuity (ECM) in the field of information systems. The relationship among the four core factors in the ECM model is shown in Figure 1.

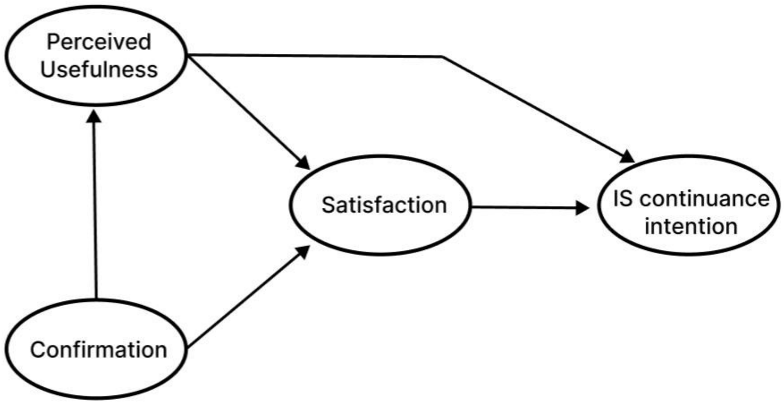

Fig.1 Expectation-Confirmation Model

According to the Expectation Confirmation Model, users' continuance intention of information systems is mainly influenced by three factors: the degree of expectation confirmation, perceived usefulness and perceived satisfaction. Two different behavioral intentions are distinguished: initial adoption and continuous use. In the ECM model, perceived usefulness is defined as "the subjective probability that potential users will improve their work performance in the organizational environment by using a specific application system." That is, the information benefits obtained by users from the information system and the degree of user satisfaction and expectation confirmation are integrated into the framework in order to better understand users' information system use behavior. A review of the relevant literature shows that since the ECM model was introduced, it has been applied by relevant scholars across different fields, such as instant messaging (MIM), electronic portals, learning systems, mobile applications and so on.

Generally speaking, most of the current research focuses on 2D electronic portals or mobile applications, while the field of 3D virtual digital display has not been specifically discussed. Compared with the traditional 2D electronic portals, this kind of information system that creates a static 3D space has a higher sense of presence and interactivity, and the influencing factors are more complex. In this study, the ECM is extended to study the problems that affect the user's information reception performance, combining with the characteristics of the virtual digital display information system.

III. Research model and hypothesis

3.1 Hypothetical research

3.1.1 Information quality (IQ)

Arain defines information quality as "the output quality of the content, accuracy, format and consistency of any information system." In this paper, information quality refers to the display content quality provided for the virtual digital display platform. In addition, according to Lin et al.' s research conclusion, if users feel that the information content is of high quality when using the digital learning platform, they will perceive a higher degree of effectiveness of the course content, thus improving the level of useful knowledge and expectation confirmation. Therefore, the following assumptions are addressed in the study.

H1a: The quality of display information provided by the virtual digital display platform has a significant positive impact on perceived usefulness.

H1b: The quality of display information provided by the virtual digital display platform has a significant positive impact on the user's expectation confirmation level.

3.1.2 Display Vividness (DV)

Vividness is defined by Steuer (1992) as the way in which the "mediated environment" presents information to the senses. In the field of product display, vividness can be broadly understood as the comprehensive use quality of multimedia. The virtual digital display system includes elements such as text information description, overall and partial display of pictures, dynamic display of animation, sound closely related to the exhibit itself, product video advertisement, 360° 3D detail model display and so on. In the research of Lim et al., it is presented that multimedia presentations can organically combine symbolic and real information processing processes, so as to create a rich information system and improve the information transmission effectiveness. Sewak et al. show in their research on website design and attitude concerning product that a highly vivid website can generate for users a more positive attitude towards the product under the condition of consistent information content. Therefore, the following assumptions are analyzed in the study:

H2a: The vividness of display has a significant positive impact on perceived usefulness.

H2b: The vividness of the exhibition has a significant positive impact on the level of users' expectation confirmation.

3.1.3 Exhibit Interaction (EI)

Kabiss et al. define the interactive feedback of display information as "the close coordination between user's actions and performances, that is, the quality of the reaction between user's actions and performances" in the VR heuristic evaluation scale developed by Sutciffe and Gault (2004), and verifies that the interactive feedback of display has a significant impact on the virtual museum experience. Stella et al. (2010) confirm that users' satisfaction with interaction perception affects their pleasure on the basis of research by Chin and others. In Pagano's research, it is discussed that improving interaction behavior is beneficial to improving user experience. Therefore, the following assumptions are addressed in the study:

H3a: The interactive perception displayed has a significant positive impact on the perceived usefulness.

H3b: The interactive perception of presentation has a significant positive impact on the level of user's expectation confirmation.

3.1.4 Perceived Usefulness (PU)

Perceived usefulness is defined as "the subjective probability that potential users will improve their work performance in an organizational environment by using a specific application system". As with the perceived ease of use, this structure is adapted from the TAM model. In empirical research, perceived usefulness has proven to be the key factor affecting users' satisfaction and continuance intention, and users' learning behavior in the digital environment is an influential predictor. Venkatesh et al. (2003) also use perceived usefulness as a performance index in the UTAUT and UTAUT2 models, and confirm its significant influence on behavior intention. Therefore, the following assumptions are analyzed in the study:

H4a: The perceived usefulness of users when using the virtual digital platform has a significant positive impact on satisfaction.

H4b: The perceived usefulness of users when using the virtual digital platforms has a significant positive impact on consumers' intention to continue using them.

3.1.5 Expectation Confirmation（EC）

Expectation confirmation refers to the degree of feedback confirmation after the user's expectation before using the product. Bhattacherjee (2001) believes that expectation confirmation is an important factor affecting users' perceived usefulness and satisfaction. However, the feedback of the user's degree of confirmation after using the product will affect the behavioral intention and satisfaction in continuing to use it. Therefore, the following assumptions are put forward in the study:

H5a: The expectation confirmation level of users when using the virtual digital platform has a significant positive impact on satisfaction.

H5b: The expectation confirmation level of users when using the virtual digital platform has a significant positive impact on perceived usefulness.

3.1.6 Satisfaction (SAT)

The element of satisfaction can be summarized as "If people have expectations about the results of using a specific product and these expectations are confirmed, then they will be satisfied." As a comprehensive evaluation after using the product, satisfaction directly reflects the user's attitude of continuing to use it. In Hassenzahl et al.' s (2003) research, satisfaction is a positive and important factor in the intention to use digital learning services. According to the research of Chang et al. (2013), it is also found that improving users' satisfaction can enhance users' behavior intention of continuous use. Therefore, the following assumption is addressed in the study:

H6a: The satisfaction of users after using the virtual digital platform has a significant positive impact on their continuance intention.

3.1.7 Empathy Experience (EE)

Empathy experience refers to the user's understanding of and feelings towards a product and the environment they are in, which is formed by the coordination of three systems: individual cognition, emotion, and behavior, and is defined as the combined experience of cognitive ability and emotional ability. Marcus (2012) and others emphasize that emotional participation and empathetic experience triggered in the field of museum education can better stimulate users' understanding of historical knowledge. Silvers (2021) describes empathy as a tool and proves that it is of great significance to study empathy experience in the research and development of museums. Therefore, the following assumptions are anayzed in the study:

H7a: The empathy experience gained by users when using the virtual digital platform has a significant positive impact on perceived usefulness.

H7b: The empathy experience gained by users when using the virtual digital platform has a significant positive impact on expectation confirmation.

3.2 Model research

Based on the above analysis, the following research model is proposed, and the proposed research framework is shown in Figure 2, including four factors in the ECM model: perceived usefulness (PU), expectation confirmation (EC), satisfaction (SAT) and continuance intention of information systems (CI). Based on this, the model also introduces four factors: information quality (IQ), display vividness (DV), Exhibit Interaction (EI) and empathy experience (EE) to expand the theoretical model of information system continuous use.

Expectation confirmation theory is the basic theory utilized to study consumer satisfaction. The main concept is that consumers judge whether they are satisfied with products or services based on the comparison results of pre-purchase expectations and post-purchase performance, and satisfaction becomes the reference for the next purchase or use. In the context of virtual digital display platforms, there are many differences in the forms of information transmission media, interaction mode and presence in consumption scenarios, so the usefulness of information has a great impact on the performance of information transmission. Zhou et al. finds in their research that users accessing all kinds of information when using the digital platform will not use the digital platform again if the quality of information content is missing, outdated or the expression is difficult for users to understand. Zardari et al. (2021) find in empirical research that the degree of information quality has a significant impact on users' sustained intention to use online learning portals. Therefore, the influence of influencing factors on perceived usefulness and the expectation confirmation degree is analyzed emphatically, and the four factors introduced are both antecedent variables and design factors of the virtual digital platform. In the current research work, it is assumed that CI is influenced by SAT, PU and EC, and that both PU and EC are influenced by IQ, DV, EI and EE. SAT is influenced by PU and EC, and PU is influenced by EC.

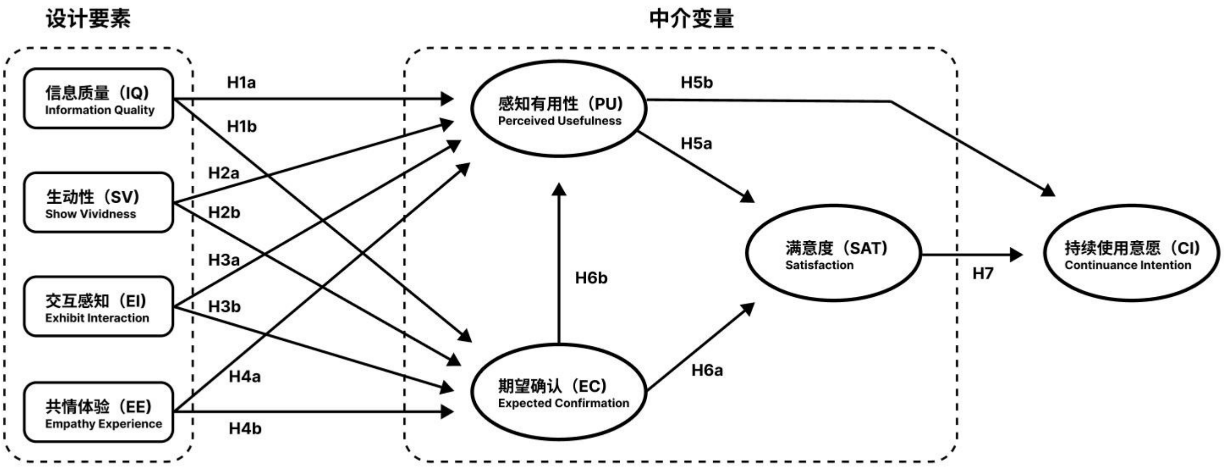

Fig.2 Expectation-Confirmation Model

IV. Research method

4.1 Research objects

The pre-test questionnaire was conducted using non-probabilistic sampling from March to mid-April, 2023, and the sample data were collected through a combination of offline and online questionnaires. Users were invited to visit the Department of Industrial Design of Zhejiang Sci-Tech University in China online, and to develop a virtual course display electronic portal for college students to store design works and provide information sharing and learning services (see Figure 3). Readers can experience it through visiting the following site: kuxiaoju-custom.kulchao.com.

Fig.3 Virtual digital platform

4.2 Design of questionnaire scale

The research involves four antecedent variables, including information quality, vividness, interactive perception and empathy experience, and two independent variables: satisfaction and continuous use intention. In this paper, the influence of four antecedent variables on perceived usefulness is studied in-depth. According to the design ideas of previous researchers, the research team has expanded some of the measurement items. All of the test items have been adapted from previous research, and slightly modified according to the situational characteristics of the virtual digital display system to ensure that the number of measurement items corresponding to each influencing factor reached more than three. The design of the questionnaire is divided into 8 latent variables, with a total of 36 questions, of which the number of basic social and demographic information survey questions is 3, and the number of expectation confirmation scale content test questions is 33, all of which use a Likert scale from 1 to 5 to express a high level of disagreement and a high level of agreement. As the measurement model mentioned above is based on the previous theory, it indicates the relationship between the projected variable and each target variable. The research team conducted a reliability test on the self-made measurement items and achieved ideal test results. A total of 123 pre-test questionnaires were collected, and the reliability and validity of the questionnaire were tested. The results of the reliability analysis are shown in Table 3, and the reliability coefficients of all variables are within the range of 0.9-1, which shows that the scale used in this study has good internal consistency. Items were selected with reliability and validity load factors of greater than 0.50, and consequently 30 items were chosen, and then formally issued after semantic expression modification. The specific contents of the questionnaire are shown in Table 1.

Table1. Test items and sources

Constructs	Items	References
Perceived Usefulness	PU1 使用虚拟数字展示平台可以提高我对学习认知绩效	Vebkatesh et al. (2012)
	PU2 使用虚拟数字展示平台可以提高我的学习认知效率	Bhattacherjee et al.(2012)
	PU3 使用虚拟数字展示平台可以提高我的知识储备	
	PU4 使用虚拟数字展示平台可以帮助我节省时间	
	PU5 总的来说，在虚拟数字展示平台中学习对我而言是有帮助的	
Information Quality	IQ1 虚拟数字展示平台的展品展示信息很容易理解	Lin Wang et al. (2012)
	IQ2 虚拟数字展示平台的展品展示信息丰富，能满足我的学习需求	
	IQ3 虚拟数字展示平台的展品展示信息质量高，有利于了解学习	
	IQ4 虚拟数字展示平台的展品展示信息对我来说十分有用	
Display Vividness	SV1 虚拟数字展示平台中的生动性水平（如文字、图片、视频、360°模型、配音等元素）能让我更方便了解和学习	Sorebo et al. (2014)
	SV2 虚拟数字展示平台中的生动性水平（如文字、图片、视频、360°模型、配音等元素）能让我更好的参与互动	
	SV3 虚拟数字展示平台中的生动性水平（如文字、图片、视频、360°模型、配音等元素）能增加我对平台的吸引力	
	SV4 虚拟数字展示平台中的生动性水平（如文字、图片、视频、360°模型、配音等元素）能提高我的学习认知欲望	
Exhibit interaction	EI1 虚拟数字展示平台设置的交互功能方式多样，能满足我的需求	Vebkatesh et al. (2012）
	EI2 虚拟数字展示平台设置的交互功能对我来说是非常有效的	
	EI3 即使没有人提供帮助，我也能使用好虚拟数字展示平台中所设置的交互功能	
	EI4 在虚拟数字展示平台中使用交互功能后所发生的行为反馈总是符合我的心理预期	
Empathy Experience	DE1 虚拟数字展示平台中与展品的共情体验能让我引发对展品信息的思考	Roca. Gagne et al. (2016）
	DE2 虚拟数字展示平台中与展品的共情体验能让我更好的了解展品创作的背景意义	
	DE3 虚拟数字展示平台中与展品的共情体验能让我更好的了解展品的社会价值	
Expectation Confirmation	EC1 我使用虚拟数字展示平台的学习经历比我预期的还要好	Lin Wang et al. (2012)
	EC2 我使用虚拟数字展示平台提供的功能服务比我预期的还要好	
	EC3 虚拟数字展示平台提供的语义信息与我所预期的一致	

4.3 Data analysis

As the measurement model proposed in the appeal is based on a previous theory, it indicates the relationship between the projected variable and each target variable. In this study, the main factors are measured in the form of scales. Therefore, the data quality of reliability and validity of the measured items is tested by confirmatory factor analysis (CFA) to ensure the significance of the subsequent analysis. The structural validity, convergence validity, combination reliability and discrimination validity of the model are discussed in the study, and normality tests are conducted. Then, the path analysis is carried out to test the importance and strength of the hypothetical relationship in the proposed model.

V. Result

According to the socio-demographic information of the participants, in terms of gender, 54.30% of the respondents are male and 45.70% are female, with a small distribution of differences in the number of males and females, which meets the condition that gender is a regulating variable. In terms of age distribution, the age group from 18 to 44 is the largest, accounting for 42.90% of study participants, and the age groups below 17, 45 to 59 and over 60 account for 17.70%, 31.10% and 8.90%, respectively. From the frequency of use, 18.10% of the respondents have never used the virtual digital display platform before, 58.70% use it occasionally, and 23.20% use it frequently. According to the collected samples, there is no serious sample deviation, and the overall sample characteristics are representative.

5.1 Measurement model evaluation

In the measurement model, the convergence validity (AVE) and combination reliability (CR) are first evaluated. The standardized factor load of each measurement item in the corresponding dimension was calculated. Then, through the calculation formulas of AVE and CR, the convergence validity and combined reliability of each dimension are obtained.

Table 3. Convergence validity and combined reliability in all dimensions

			Estimate	AVE	CR
		IQ1	0. 919		
Information_Quality	<---	IQ2	0. 892	0. 813	0. 945
		IQ3	0. 914		
		IQ4	0. 880		
		SV1	0. 949		
		SV2	0. 881		
		SV3	0. 872		
		SV4	0. 872		
		EI1	0. 953		
Exhibit_Interaction	<---	EI2	0. 900	0. 830	0. 951
		EI3	0. 910		
		EI4	0. 880		
		DE1	0. 965		
Empathy_Experince	<---	DE2	0. 901	0. 842	0. 941
		DE3	0. 884		
		PU1	0. 959		
		PU2	0. 873		
Perceived_Usefulness	<---	PU3	0. 873	0. 805	0. 954
		PU4	0. 907		
		PU5	0. 870		
		EC1	0. 969		
	<---	EC2	0. 880	0. 841	0. 941
		EC3	0. 900		
		SAT1	0. 974		
Satisfaction	<---	SAT2	0. 844	0. 788	0. 937
		SAT3	0. 861		
		SAT4	0. 865		
		CI1	0. 984		
Continuance_Intention	<---	CI2	0. 880	0. 836	0. 939
		CI3	0. 875		

In the validity test of this scale, the AVE values of all dimensions are above 0.7, and the CR values are above 0.9. These values are suitable for further analysis. Based on the results, it is comprehensively demonstrated that all dimensions have good convergence validity and combination reliability.

Table4. Discriminant validity

变量	信息质量	生动	交互	共情	感知	期望	满意	持续使用
信息质量	0.813							
生动性	0.381	0.799						
交互感知	0.424	0.260	0.830					
共情体验	0.403	0.377	0.322	0.842				
感知有用性	0.342	0.330	0.298	0.397	0.805			
期望确认	0.499	0.406	0.423	0.421	0.349	0.841		
满意度	0.304	0.194	0.232	0.335	0.254	0.429	0.788	
持续使用意愿	0.458	0.374	0.387	0.480	0.307	0.473	0.325	0.836
AVE 值平方根	0.901	0.894	0.911	0.917	0.897	0.917	0.887	0.914

In addition, discrimination validity is also measured based on variance or covariance differences between factors and factor correlation, therefore, the discrimination validity of the measurement scale to test the discrimination of each dimension in the scale was discussed. Table 4 shows the correlation coefficients of all factors. In this test of discriminant validity, the standardized correlation coefficients between pairwise dimensions are less than the square root of the AVE value corresponding to the dimensions, so the discriminant validity at the construction level is confirmed.

5.2 Structural equation model verification

Finally, the structural equation model is tested for fitness. According to the model fitness test results in Table 9, it can be seen that CMIN/DF (chi-square freedom ratio) is 1.898, within the range of 1-3, and RMSEA (root mean square error) is within a good range of < 0.08. In addition, the test results of IFI, TLI and CFI all reached an acceptable level above 0.9. Therefore, based on the comprehensive analysis results of this study, it can be concluded that the virtual digital display platform has a good adaptability for continuous use of the scale. Indirectly, the structure of the pre-set scale is proved to be acceptable as well.

Table7. Model fitness test

指标	实测结果	推荐标准
CMIN/DF	1.898	1-3 为优秀，3-5 为良好
RMSEA	0.053	<0.05 为优秀，<0.08 为良好
IFI	0.964	>0.9 为优秀，>0.8 为良好
TLI	0.960	>0.9 为优秀，>0.8 为良好
CFI	0.964	>0.9 为优秀，>0.8 为良好

According to the analysis results in Table 10, it can be seen that in the path hypothesis test of this study, the positive prediction with significant information quality is expected to be confirmed (β=0.306, P < 0.001), therefore, assumption H1 holds; The positive forecast with significant vividness is expected to be confirmed (β=0.207, P < 0.001), therefore, it is assumed that H2 holds; The positive prediction of significant interaction perception is expected to be confirmed (β=0.232, P < 0.001), therefore, it is assumed that H3 holds; The positive prediction with empathy experiences is expected to be confirmed (β=0.206, P < 0.001), therefore, it is assumed that H4 holds; Information quality positively predicts perceived usefulness (β=0.119, P < 0.05), therefore, it is assumed that H5 holds; Vividness positively predicts perceived usefulness (β=0.150, P < 0.01), therefore, it is assumed that H6 holds; Interactive perception positively predicts perceived usefulness (β=0.114, P < 0.05), therefore, it is assumed that H7 holds; Empathy experiences positively predict perceived usefulness (β=0.246, P < 0.001), therefore, it is assumed that H8 holds; Expected confirmation has no significant predictive effect on perceived usefulness (β=0.097, P>0.05), therefore, it is assumed that H9 is not valid. In addition, findings also include the expected confirmation of the significant positive prediction satisfaction (β=0.365, P < 0.001), therefore, is is assumed that H10 holds; Perceived usefulness positively predicts satisfaction (β=0.113, P < 0.05), therefore, it is assumed that H11 holds; Significant satisfaction positively predicted the willingness to continue using (β=0.264, P < 0.001), therefore, it is assumed that H12 is established. Lastly, the perceived usefulness positively predicted the intention of continuous use (β=0.237, P < 0.001), therefore, H13 is assumed to be true. The final model is shown in the figure.

Table10. SEM Path Relationship Inspection Results

	路径关系		Estimate	S.E.	C.R.	P
Expectation_Confirmation	<---	Information_Quality	0. 306	0. 053	5. 623	***
Expectation_Confirmation	<---	Display_Vividness	0. 207	0. 048	3. 873	***
Expectation_Confirmation	<---	Exhibit_Interaction	0. 232	0. 049	4. 338	***
Expectation_Confirmation	<---	Empathy_Experience	0. 206	0. 051	3. 878	***
Perceived_Usefulness	<---	Information_Quality	0. 119	0. 062	2. 027	0. 043
Perceived_Usefulness	<---	Display_Vividness	0. 150	0. 054	2. 63	0. 009
Perceived_Usefulness	<---	Exhibit_Interaction	0. 114	0. 056	1. 991	0. 047
Perceived_Usefulness	<---	Empathy_Experience	0. 246	0. 058	4. 321	***
Perceived_Usefulness	<---	Expected_Confirmation	0. 097	0. 068	1. 518	0. 129
Satisfaction	<---	Expected_Confirmation	0. 365	0. 063	6. 375	***
Satisfaction	<---	Perceived_Usefulness	0. 113	0. 058	2. 015	0. 044
Continuance_Intention	<---	Satisfaction	0. 264	0. 066	4. 766	***
Continuance_Intention	<---	Perceived_Usefulness	0. 237	0. 068	4. 261	***

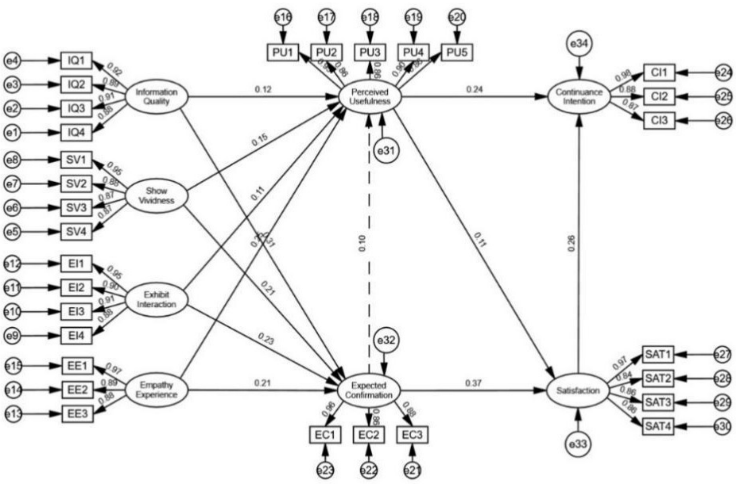

Fig.5 Model of structural equations

VI. Discussion

6.1 The influence of the design of virtual digital display platforms on users' continuance intention

Virtual digital display platforms are an online education service that mainly provides content to a consumer (user). According to the hypothesis of the model, the research focuses on analyzing the influence of four dimensions of virtual digital display platform design factors on perceived usefulness. First of all, the results of the structural model verification show that the four pre-variables in the design factors of virtual digital display platform have a direct impact on perceived usefulness and expectation confirmation, and indirectly affect the continuance intention through perceived usefulness. These results are consistent with previous studies on online learning platforms. According to these results, perceived usefulness and expectation confirmation structure, as mediating effects, have a significant importance between satisfaction and continuance intention, indicating that they are an indispensable part of the proposed model to improve users' intention to continue utilizing the platform. Among them, empathy experience for perceived usefulness (β=0.246, $P < 0.001$) is the highest compared with information quality, vividness and interactive perception, reaching 0.25, and the path coefficients between the other three influencing factors and perceived usefulness are 0.12, 0.15 and 0.11, respectively. This shows that in the learning behavior of the virtual digital display platform, the design of empathy experience plays a very important role for users and is an important influencing factor for their continuance intention of virtual digital display platforms. Further, empathy experience plays an important driving role in meeting users' needs and achieving educational goals. In this regard, the construction of scenes may give users an immersive feeling, thus stimulating users' cognition and emotional dimensions. In addition, the impact of vividness on perceived usefulness (β=0.150, $P < 0.01$) is only limited to empathy experience. In the virtual digital display platform, the comprehensive quality of use of multimedia is a design content that cannot be ignored. It is necessary to comprehensively display different types of exhibits by combining the characteristics of exhibits, so as to improve the effect of display information transmission and improve the positive attitude of users. Finally, the influence of information quality (β=0.119, $P < 0.05$) and interactive perception (β=0.114, $P < 0.05$) on perceived usefulness is low, indicating that users' experience of information quality and interactive feedback in the process of using virtual digital display platforms are relatively low for the benefit of information reception. The comprehensive results show that users believe that the design level of information quality, vividness, interactive perception and empathy experience in using the virtual digital display platform is high, and these design factors can better motivate users to participate in online learning activities, thus improving users' continuance intention.

6.2 Influence of satisfaction on users' continuance intention

It is found that satisfaction has a direct impact on users' continuance intention of the virtual digital display platform. According to the structural model verification results, satisfaction (β=0.264, $P < 0.001$) and perceived usefulness (β=0.237, $P < 0.001$) have a significant positive impact on users' continuance intention of the platform. As far as the path coefficient is concerned, the influence of satisfaction on the continuance intention is greater than the perceived usefulness, therefore, improving the satisfaction of users can enhance the behavior intention of users to continue to use the virtual digital display platform. Among them, perceived usefulness (β=0.113, $P < 0.05$) and expectation confirmation level (β=0.365, $P < 0.001$) also have a direct impact on satisfaction, and expectation confirmation level is greater than perceived usefulness' ability to influence satisfaction. This shows that the user's experience in the virtual digital display platform is an important factor for users' continuance intention, which is consistent with the hypothesis of ECT. Therefore, the design factors of virtual digital display platforms, as the four pre-variables of perceived usefulness and expectation confirmation, have an indirect impact on improving satisfaction.

6.3 The influence of expectation confirmation on users' continuance intention

According to the analysis of the structural model, it is found that the expectation confirmation model (β=0.365, $P < 0.001$) has a direct impact on satisfaction, and indirectly affects the continuance intention of the virtual digital display platform through satisfaction. It can be seen that the degree to which users' expectations before using the virtual digital display platform are confirmed after using it will have an important impact on their satisfaction and continuance intention. The results indicate that a higher degree of expectation confirmation and a higher satisfaction level of users equates to a stronger continuance intention. Users' expectations of the virtual digital display platform before use are mainly reflected in four aspects: information quality, vividness, interactive perception and empathy experience. The path coefficient of satisfaction reaches 0.37, but the hypothesis that "expectation confirmation has a significant positive impact on perceived usefulness" is not supported.

VII. Conclusion

This study expands the expectation confirmation model by introducing the design factors of virtual digital display platforms, analyzes the influencing factors of users' continuance intention of the virtual digital display platform, verifies the research model, and draws the following conclusions. First, the perceived usefulness, expectation confirmation and satisfaction in the classic expectation confirmation model are still the core factors affecting continuance intention of the virtual digital display platform. Secondly, the extended expectation confirmation model is effective in predicting and explaining users' continuance intention of the virtual digital display platform, which shows that the proposed design factors are complementary to the expectation confirmation model. Thirdly, expectation confirmation has a significant positive impact on satisfaction and users' continuance intention, but the significant assumption of perceived usefulness has not been supported accordingly. Fourthly, from the design factors of the virtual digital display platform, users place greater emphasis on empathy experience and vividness in the learning process, while paying relatively less attention to information quality and interactive perception. The above conclusions provide theoretical support for the reform and innovative application of virtual digital display platforms in higher education, specifically. There are also limitations in this study, such as the average young age of participants as the main research objects, and the possible differences in the demand of other users for the design elements of the virtual digital display platform are not considered. In subsequent research, the differences in the number of user age groups should be reduced as much as possible and further explored.

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Analysis of influencing factors of designers' willingness to participate in rural cultural and creative design

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Abstract: *Rural creative culture plays a vital role in promoting rural economic development and cultural identity. Current issues it faces include homogeneity, blindness, and symbolism. Designers, as a vital force in rural creativity, have fundamental influences on attitudes and results through their willingness to participate. Based on the theory of planned behavior, this study constructed a research model of the influential factors on designers' willingness to participate in rural creative design from four dimensions: attitudes towards the cultural value goals of rural creation, environmental support, expected risks and benefits, and perceived behavioral control. An empirical structural equation model was tested on 280 designers who have participated in designs of rural creative culture (Male=54.3%, 42.90%). Analysis indicates that the main factors influencing the designers' willingness to innovate creative products are, in order of impact: expected risks and benefits, perceived behavioral control, subjective norms, and attitudes towards behavior. The expected risks and benefits are the most crucial factor driving the willingness to innovate rural products, and perceived behavioral control has a direct impact on product innovation behavior. It can provide theoretical references and suggestions for the application of planned behavior theory in rural scenarios and help designers better complete rural product innovation.*

Keywords: *Theory of planned behavior (TP), Rural literature and innovation, Design intention, Meta-analysis*

I. Introduction

In recent years, the topic of design aiding rural revitalization has become hot. In 2023, the Opinions of the Central Committee of the Communist Party of China and the State Council on Doing a Good Job in the Key Work of Rural Revitalization in 2023 emphasized that industrial development will become a crucial support for rural revitalization. Rural creative industry design is one of the important ways for industrial revitalization. According to the survey of related cultural industries published by the National Bureau of Statistics website in 2023[1], the output value of the national cultural industry manufacturing will reach 10.7 trillion yuan, an increase of 17.43% compared with 9.1 trillion yuan in 2021, accounting for 39.7% of the total output value of the national cultural industry.

The "creative and cultural industry" is an innovative industry based on culture, combined with diverse history, humanities, science and technology, and information technology[2]. It combines traditional rural culture with modern technology, and through innovative design and development, it realizes cultural creative breakthroughs and promotes the development of the cultural industry. With the rapid development of the creative and cultural industry, a large number of homogeneities, blindness, and symbolism have emerged

(Zhenyu Fu (2019), Wenhao Dun (2021), Xi Wang (2020)). Rural cultural creation is an effective means to excavate, inherit and innovate rural culture, which can not only make rural people understand their culture more deeply, but also strengthen their sense of belonging and identification, and promote the common development of rural and urban areas[3].

How design can more effectively intervene in the rural creative cultural industry is a concern in academia. Existing research mainly revolves around cultural tourism product design strategies and innovation motives, development paths, etc. Liping Tao (2019) believes that in order to successfully promote rural tourism products, it is essential to produce refined "cultural value," create traditional cultural products with distinctive features[4], establish a good brand, expand market share, and treat it as a complete value chain. For example, Yinman Guo (2021) pointed out that by incorporating traditional manufacturing activities into the current economic system, we can hope to achieve a leap from traditional to modern[5]. Zhuping Zhang (2021) pointed out that by incorporating traditional manufacturing activities into the modern economic system, we can expect to achieve the organic combination of cultural tourism industry and ecological agriculture[6]. Research on the theory of planned behavior shows that the stronger the individual's willingness to participate, the easier it is to be successful[7]. Currently, there are fewer studies about what influences the designer's willingness to participate in the design of rural creative products, so this study intends to explore the influential factors in designers' willingness to innovate in rural creations.

The theory of planned behavior is an effective theory deeply exploring the individual decision-making process, based on expectancy-value theory[8]. It can effectively explain and predict behavior and can be widely applied in various behavioral fields. This study plans to introduce the theory of planned behavior to analyze the expectations and motivations of designers in rural product innovation, to better improve the designer's willingness and behavior for innovation. This research can provide new theoretical basis and practical guidance for local governments to improve rural performance with design aid, promote integration of rural cultural tourism, and ecological development, which has significant practical significance.

1.1 Theoretical Basis

Through the study of the Theory of Planned Behavior (1991), we have found some factors that help stimulate innovation in rural creative products, including the planned behavior theory advocated by Ajzen. Fishbein's Theory of Multi-attribute Attitude is seen as the basis for the theory of planned behavior. He pointed out that the motivation for behavior depends on the state of the actor, and the actor’s prediction of the future and reaction to behavior also affects their actions. The theory suggests that subjective expectations and action methods may change a person's behavior, but such improvement often does not come from their heart. Only by adjusting relevant parameters can we better understand their emotions, will, and other external environments, thus forming a more effective behavioral theory.

This theory was initially applied in the field of psychology to study the factors affecting people's mental activities. RL Lenne (2019) aims to understand how the beliefs of parents and adolescents affect each other's health behaviors, and how the background of the duality between parents and adolescents regulates these influences [9]. This theory is then discussed around consumers and enterprises, and explores the influence of consumers' own factors and external factors of consumers' perception on consumer activities. Lokov (2013) explored in depth how external environmental factors affect people's green consumer behavior mechanisms. Seyed Nasir Ketabi (2014) explored the factors influencing online purchase intentions. He created a conceptual framework for the impact of online purchase intentions[10]. Some scholars have explored the application of the theory of planned behavior in rural tourism scenarios against the background of rural revitalization. Fang Wang (2021) built a participatory governance model of the rural ecological environment based on the theory of planned behavior[11].

The reasons for introducing and developing the theory of planned behavior are twofold: First, in the development and construction of rural areas, the role of designers has transformed from creators to promoters, which imposes higher demands on designers. According to the theory of planned behavior, the intention to behave can be seen as the motivation for a person to take specific actions[8], which determines how much effort and time they are willing to invest to achieve these goals. The innovative intentions of designers can reflect the degree to which designers are willing to pay in terms of money, time and energy for innovative behaviors and the difficulties and influencing factors they face. It can serve as an important basis for improving designers' innovative behaviors and improving design quality. At present, there is scarce research focusing on designers' innovative intentions. By introducing the theory of planned behavior and studying the expectations and motivations of designers participating in rural culture creation, it can provide a theoretical basis for governments to formulate assistance policies and better mobilize the enthusiasm of designers. Second, current research on the theory of planned behavior mainly focuses on consumers' intentions and behaviors. Existing research has extended it in rural areas, but it is still focused on the intentions of tourists and farmers. There are no related studies on the characteristics of designers engaging in rural creative innovation, so it is necessary to expand on the basis of the Theory of Planned Behavior (TPB) and model.

In line with the research aim, this paper will use empirical methods to analyze the main factors affecting designers' willingness to innovate in rural creative products. Effective elements affecting designers' participation in innovation are sorted out and refined from existing literature, concentrated on subjective norms, attitudes towards behavior, perceived behavioral control, and expected risks and rewards. Secondly, using the model of planned behavior theory, a new model consistent with the intentions and behaviors of designers participating in rural creative activities is established. The research looks into the impact of different factors on innovation intentions and behaviors, explaining the internal motivation of rural creative designers' intentions and behaviors.

1.2 Research Hypothesis

1.2.1 Behavior attitude and behavior intention

According to Fishbein and Ajzen's (1975) expectancy-value theory, individuals have a lot of beliefs about possible results of behavior, referred to as attitude towards behavior[12]. These expectancy-values include what they believe the activity will result in, hence known as expectancy-values. The better an individual's overall performance, the stronger their desire to act, which directly impacts their decision-making[7].

In this study, the attitude towards behavior of rural designers refers to their attitude and objectives towards the cultural values and needs of rural subjects. Designers involved in rural designs need to respect the villagers' values and culture, understanding their needs and desires[13].

Plewa and Quester point out that in the co-creation process by the designers, each participant will observe problems from their unique perspective, and their actions will move in similar directions. This action leads to differences in their cognition of cultural values[15], thus influencing their decision-making. To ensure effective collaboration between designers and continuous technological progress, every participant must clarify their cooperative purposes[14], and implement their ideas.

Based on the above discussions, we propose the following hypothesis:

H1: A designer's product innovation intention is positively influenced by their cultural identification attitude and objectives.

1.2.2 Subjective norms and behavioral intentions

The formation of subjective norms depends on normative beliefs, with two meanings: first, choosing an appropriate method based on personal will and values to achieve the best results. The second is choosing an appropriate method based on social standards and customs to ensure the best results. Ade, Bowale and Oyelaran, Oyeyinka pointed out [16] that effective technical support and investment by the government will bring significant benefits to businesses [17].

In this article, the subjective norms in rural creation activities refer to the external factors perceived by designers when deciding whether to participate in rural creative activities. The crude concepts and customs of Chinese rural culture can influence and restrict designer behavior. This specifically shows up in whether others are willing to participate in or support rural creative activities. Support from businesses or schools, support from family members, support from the countryside for creative activities. Designers are more willing to follow social and community norms to fit in with other members, seeking the realization of social value, to participate in value co-creation activities more actively [18].

With the emergence of new markets and products, businesses must constantly strengthen technical cooperation and look for new participants[19]. The intensity of competition and the rapid development of technology compel designers on the road to innovation to continually explore new possibilities and establish effective technology alliances with various different groups. After this research, we found that participants in the pursuit of cooperation are influenced by external environmental factors, support level, and many other factors.

Therefore, the higher the support for designers to participate in rural creation activities, the stronger the subjective norms of designers, and the stronger their desire to behave.

H2: A designer's product innovation intention is positively influenced by their subjective norms.

1.2.3 Expected risks and rewards and intention to behave

Expected risks and rewards refer to the benefit evaluation and satisfaction level that co-creative participants get during the cooperation process. Designers are striving to promote innovation in rural products to stimulate all participants to pursue their own benefits, thus advancing technical research and development.

Designers can gain a sense of achievement of varying degrees through rural creative projects, which encourages them to join the rural revitalization co-creation[20]. The economic profit motive will also affect designers' motivations to participate in innovative rural products[21]. When designers believe that product innovation will benefit them, they are more likely to actively take measures to carry out innovative activities.

Expected benefits will affect the attitude towards behavior of co-creating participants. Jery emphasized that the risks and costs of co-innovating technology are both high, which may lead to large research and development investments, longer feedback cycles, out-of-control R&D costs, and unpredictable final results[22].

By working together, we can obtain strategic technological resources and enhance information exchange through technology, thereby reducing innovation costs[23], dispersing risks, overcoming the impact of information asymmetry, and ensuring the continuous improvement of products and technology. Shao Jingfeng, Wang Jinfu and others pointed out that, in the process of co-creation by designers, the key factor in technical cooperation is to disperse risks and minimize innovation costs as much as possible.

After careful consideration, we concluded that by making reasonable predictions and management, unnecessary risks can be effectively reduced, which promotes cooperation and motivates participants to be more actively involved in science.

Based on the above arguments, the following hypothesis is proposed:

H3: The expected benefits and risk control have a significant positive impact on a designer's intention to innovate cultural creative products.

1.2.4 Perceived behavior control and intention to behave

Perceived behavioral control is defined as "a belief of an individual regarding their ability to achieve innovative results." It evaluates how strong people's mastery is by realizing how they achieve their specific actions by mastering and using their internal factors[24].

In this study, the perceived behavior control of rural creators during their activities refers to how difficult it is to implement co-creation activities based on their resources and ability, among other personal factors. It is a self-evaluation of a person's ability to perform a certain behavior. Perceived behavioral control does not refer to the actual innovative capability of the designer, but rather to the designer's subjective expectation of their ability to complete creative tasks. The experiences and information individuals get from past experiences influence their perception of behavior control[26]. In rural creation activities, the stronger is the designer's perception of behavior control, the stronger the will to behave. Such an expectation not only affects individuals' choice of work goals but also affects how much effort they are willing to make in their work. Designers with higher perceived behavior control capabilities tend to be confident that they can generate more novel ideas than others and, therefore, face design problems more calmly and are more willing to accept challenging tasks. Simultaneously, in the process of collaborating on research and development with rural areas, perceived behavior control also enhances designers' control and perception of value co-creation behaviors, which is beneficial for the transformation of design co-creation results[27].

Based on the above arguments, we propose the following hypothesis:

H4: A designer's product innovation intention is positively influenced by their perceived behavior control.

1.2.5 Innovation intention and innovation behavior

Intention indicates the motivation of an individual to consciously formulate plans or make decisions[28]. Intent is often viewed as a motivational factor that can influence behavior. It represents the resources and energy an individual intends or is willing to expend to implement this behavior[7].

In this study, innovative behavior refers to the innovation activities that the designer has carried out in aspects such as the appearance, process, or connotation of the product, and are affected by various factors. Cai Ruilin's concept (2019) is: by integrating multifaceted knowledge, technology, and culture into the process of product and service production, to achieve a thorough understanding, and to achieve a perfect combination of technology, art, and function[29]. Other scholars have explored the mechanisms of design innovation and proposed and developed a design-driven innovation model. Verganti (2003) first proposed the concept of design-driven innovation. He believes design is an independent innovation strategy besides technology and market which can add unique meaning to products[30]. (2013) Weiwei Ye and others propose that design is not just a reintegration of innovative components, but a complex process that is constrained and influenced by three dimensions of knowledge: technology, market demand, and product semantics[31]. They inherited Verganti's design-driven innovation theory.

This study believes that the innovative behavior of rural creative designers is influenced by their internal and external factors. The innovative capabilities of rural creative designers mainly include product function design capabilities and product semantics design capabilities[32]. The functional value of creative products is to meet the usage needs of consumers and tourists, and the semantic value of the product is to meet consumers' emotional and cultural needs for the countryside. According to Zhuangzhen Yu and Jin Chen's (2017) study, design innovation capability refers to the ability to transform concepts into practical solutions[33]. They divide design innovation capabilities into two levels: internal, external, and technical. This conclusion is consistent with the perceived behavior control in the theory of planned behavior. Besides, they believe that internal design innovation capabilities have the greatest impact on innovation performance, which is also consistent with the theory of attitude towards behavior.

Based on the above discussion, the following hypotheses are proposed:

H5: The innovative behavior of a designer is positively affected by their perceived behavior control.

H6: Product innovation intention has a significant positive impact on product innovation behavior.

To discuss the influencing factors of designers participating in rural creative product innovation, the planned behavior model is reconstructed, and hypotheses are made, as shown in the hypothesis model below:

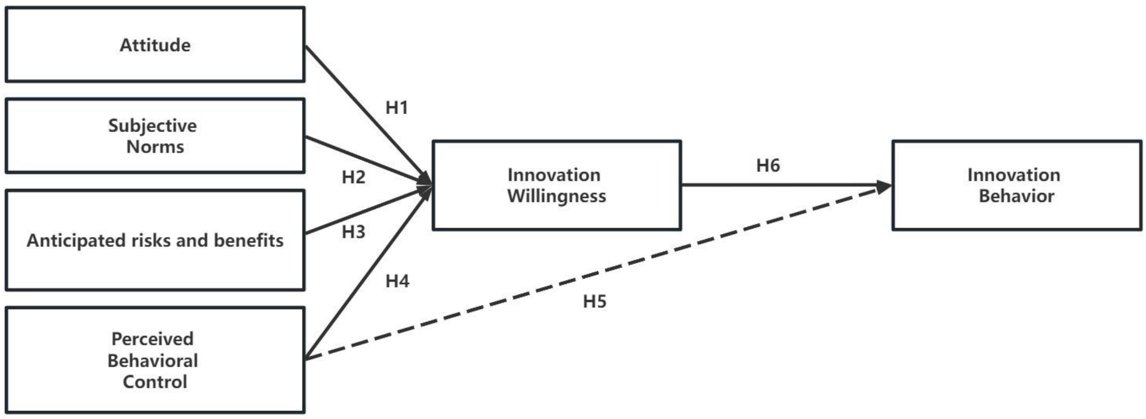

Fig.1 Planned Behavior Theory (TPB theory) hypothesis model

II. Method

2.1 Research Questionnaire design and investigation

In this study, we used a 5-point Likert scale to measure the impact of various variables, where 1 represents extreme disagreement and 5 represents extreme agreement. These variables cover: attitude towards behavior, subjective norms, expected risks and rewards, perceived behavior control, product innovation intention, and behavior. After thorough screening, we determined the evaluation criteria of the above five potential variables.

The questionnaire consists of two parts: one part is the profile of the respondent, and the other part is the research objective. The goal is to understand the individual circumstances of the target in terms of rural product innovation and to explore the significance of these data by analyzing other similar data. According to Likert's 5-point attitude scale, we created a 5-point evaluation system, which is composed of positive, negative, and neutral parts. The score for each part ranges from 1 to 5, with the extreme disapproval portion scoring 1 and the extreme approval portion scoring 5. Based on Churchill's survey data, we carried out an in-depth analysis of related issues and made specific plans accordingly[34].

Table 1

The dependent variable measures the item

Latent Variable	Item	Source
Attitude（BA）	BA1. I believe understanding rural culture is essential for product innovation. BA2. I am willing to venture into rural areas to accept and understand their culture. BA3. I respect aspects of rural culture that differ from mainstream culture. BA4. I respect the wishes of rural villagers. BA5. I think that innovation in rural products is very valuable.	Fang Xiaofeng（2018）、Ji Tie（2018）、Amit-Cohen I（2016）
Subject norm (SN)	SN1. Competitive pressure makes me value rural product innovation more. SN2. Technological progress makes me more capable of innovating rural products. SN3. Government policies are in place to better support my rural product innovation. SN4. Market demand makes me pay more attention to product innovation. SN5. I recognize and abide by the relevant systems and guidelines for rural management.	Cottrell C A（2007）
Expected risk and return (RAR)	RAR1. I hope to complete my courses, graduation project, or design projects. RAR2. I hope to realize personal achievements through rural product innovation. RAR3. I feel a sense of accomplishment through rural product innovation. RAR4. I believe the risk of costs such as time and funds would affect my rural product innovation.	Mark E（2006）、Plewa C（2007）
Perceived behavior control (PBC)	PBC1. I am well versed in rural culture and the needs of the villagers. PBC2. I can calmly face various risks because I trust my problem-solving ability. PBC3. I am confident in controlling the entire design process and ultimately completing the design plan. PBC4. I have sufficient ability to complete rural product innovation.	Tierney（2002）、Ajzen I（2002）、SuDan（2021）
Innovation willingness（IW）	BI1. I believe product innovation is crucial for rural co-creation. BI2. I will emphasize product innovation in rural product design. BI3. Considering the realities and various restrictions, I would still opt for product innovation.	Damanpour（1991）、Ajzen I（1986）
Innovative behavior（IB）	AB1. I have innovated the rural product's technical craftsmanship, appearance, and functions. AB2. I have innovated the design of the rural product's artistic, cultural, and emotional connotations.	Tang Jingzhe，（2018）

After collecting preliminary data, we conducted field visits to some teachers who had once engaged in rural product creative design at the school and finally determined 34 valid samples. Next, we evaluated the responses of these respondents using SPSS software and determined which responses were more representative and which were more common based on the mean T. By comparing, we found that the recognition of the issues involved in attitude towards behavior and perceived behavior control was relatively low. Therefore, we eliminated them and retained only 23 identifiable issues and then carried out formal research.

The formal questionnaire survey was conducted in universities in Jiangsu, Zhejiang, and Shanghai areas, targeting designers who have participated in rural creative design. In this survey, a total of 300 questionnaires were distributed, and in the end, 280 valid questionnaires were collected, resulting in a valid response rate of 93%. The descriptive statistical analysis results are as follows: in terms of gender, males account for 49.64% and females account for 50.35%; in terms of age, those under 19 accounted for 16.78%, 19-26 years old made up 72.85%, and those over 24 accounted for 10.35%; in terms of education level, those with an undergraduate degree or below accounted for 7.35%, those with a bachelor's degree accounted for 78.57%, and those with a master's degree or above accounted for 15.07%, as shown in Table 2.

Table 2

Demographic characteristics of the sample

	Category	Frequency	Percentage
Gender	male	139	49.64%
	female	141	50.35%
Age	Age 19 and under	47	16.78%
	19 to 26 years old	204	72.85%
	Age 24 and older	29	10.35%
Education	Below undergraduate level	20	7.35%
	undergraduate	219	78.57%
	Master degree or above	41	15.07%
Work	student	240	85.61%
	designer	40	14.39%

III. Measures

3.1 Reliability and validity test

Upon evaluation, the overall reliability of the scale reached 0.940, and latent variables such as SN, BA, PBC, MN, CTB, their Cronbach's α coefficient values also reached 0.933~0.956 and 0.934~0.956 respectively, confirming the reliability of the scale. According to the data in Table 1, the range of standardized factor loadings for each indicator is 0.855~1.03, the related t-values range from 16.784~30.255, and the overall reliability and ave are 0.934~0.956 and 0.781~0.895 respectively, showing they have a good integration performance. After this evaluation, we found that, from the analysis in Table 2, the differences between different dimensions are very low, and the square root of their AVE values is also very low, which confirms that these dimensions have significant differences.

Table 3

Results of reliability and convergence validity 2

Constructs	Variables	Factor loading	C.R.	CR	CA	AVE
Attitude (BA)	BA1	0.962	—	0.956	0.956	0.815
	BA2	0.907	29.556			
	BA3	0.859	24.493			
	BA4	0.878	26.308			
	BA5	0.905	29.249			
Subject norm (SN)	SN1	0.957	—	0.95	0.951	0.797
	SN2	0.919	30.225			
	SN3	0.828	21.816			
	SN4	0.862	24.373			
	SN5	0.893	27.253			
Expected risk and return (BF)	BF1	0.944	—	0.943	0.934	0.781
	BF2	0.85	22.02			
	BF3	0.849	21.953			
	BF4	0.889	24.751			
Perceived behavior control (PBC)	PBC1	0.888	26.704	0.933	0.943	0.807
	PBC2	0.862	24.327			
	PBC3	0.963	—			
	PBC4	0.878	25.752			
Innovation willingness (IW)	IW1	0.951	—	0.942	0.942	0.845
	IW2	0.905	26.584			
	IW3	0.901	26.3			
Innovative behavior (IB)	IB1	1.03	—	0.936	0.944	0.895
	IB2	0.855	16.784			

After this evaluation, we find that, from the analysis in Table 2, the differences in different dimensions are very low, and the square root of their AVE values is also very low, which confirms that the differences in these dimensions are very significant.

Table 4

Correlation coefcients between variables

	BA	SN	BF	PBC	IW	IB
BA	0.815					
SN	0.412	0.797				
BF	0.415	0.39	0.781			
PBC	0.414	0.322	0.433	0.807		
IW	0.407	0.425	0.452	0.452	0.845	
IB	0.404	0.411	0.401	0.404	0.404	0.895
AVE	0.903	0.893	0.884	0.898	0.919	0.946

3.2 Exploratory Factor Analysis

Through the overall fitting analysis of the measurement model corresponding to Figure 1, the results are shown as follows: $\chi 2/df=1.091$, RMR=0.046, RMSEA=0.018, GFI=0.934, AGFI=0.915, TLI=0.997, NFI=0.966, IFI=0.997, CFI=0.997, indicating that the overall fit was good.

Table 5
Model fit index

fit index		reference standard	structural model
Absolute fit index	X^2 / df	1 < X^2 /df<3	1.091
	GFI	>0.9	0.934
	RMSEA	<0.08	0.018
Incremental fit index	NFI	≥0.9	1.000
	CFI	≥0.9	0.997
	IFI	>0.9	0.997
Briefly fit the index	PGFI	> and <1	0.174

According to the results in Figure 3, we can find that the standardized coefficient of this model is not higher than 1, and its variance is not negative. In addition, we found that the overall variance of this model has a statistical significance of 0.01, which indicates that it meets the general requirements for a match. Additionally, we found that each observed variable in this model has the same statistical significance, which also confirms that it can effectively capture and forecast related latent factors.

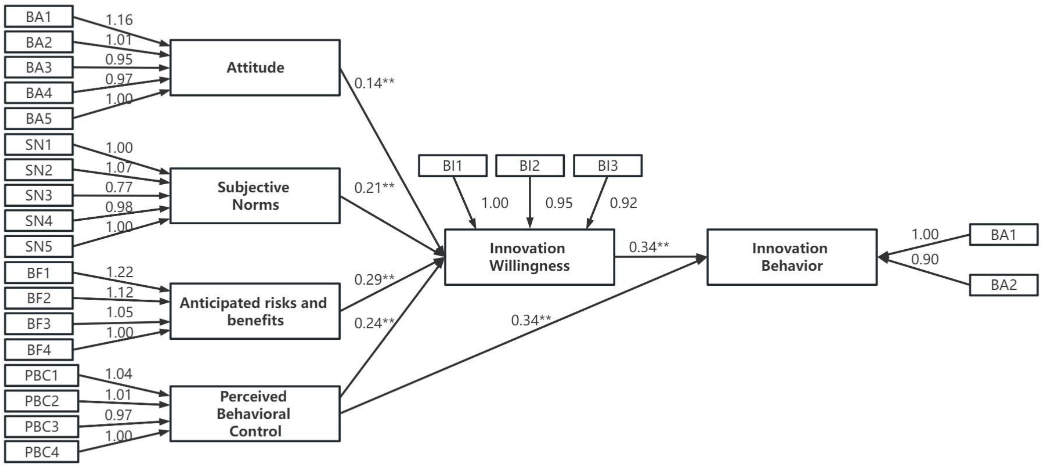

Fig. 2. The model fits the path coefficient graph

IV. Results

4.1 Structural equation modeling and hypothesis testing

By adopting the maximum likelihood method, we found that attitude towards behavior has a significant impact on product innovation intention (β=0.153,p<0.01), which was confirmed, thus proving the effectiveness of H1. The attitude towards behavior significantly affects product innovation intention (β=0.234, p<0.001), so H2 is established. The attitude towards behavior significantly affects product innovation intention (β=0.278, p<0.001), so H2 is established. The attitude towards behavior significantly affects product innovation intention (β=0.248, p<0.001), so H2 is established. The attitude towards behavior significantly affects product innovation intention (β=0.293, p<0.001), so H2 is established. The attitude towards behavior significantly affects product innovation intention (β=0.281, p<0.001), so H2 is established. The analysis results indicate that H1, H3, H4, H5, and H6 have all passed the hypothesis test. (See Table 3).

Table 6

The result of I-TPB

path	beta	SE	t-value	P value	Supported or not
H1:BA→IW	0.153	0.102	6.015	0.007	Supported
H2:SN→IW	0.234	0.090	6.229	***	Supported
H3:BF→IW	0.278	0.099	6.810	***	Supported
H4:PBC→IW	0.248	0.091	6.495	***	Supported
H5:PBC→IB	0.293	0.099	6.201	***	Supported
H6:IW→IB	0.281	0.101	6.257	***	Supported

***Signifcant at P<0.001; **Signifcant at P<0.01; *signifcant at P<0.05, ns non-signifcant

4.2 Path Analysis

To explore the expectations and motivations of designers when innovating rural products, this article, based on the theory of planned behavior, constructs a research model on the factors influencing designers' willingness to participate in rural creative design from four dimensions: attitudes towards the cultural value goals of rural creation, environmental support, expected risks and benefits, and perceived behavioral control. After conducting reliability and validity tests on the survey data, testing the model fit, performing path analysis, and testing the hypotheses, the following conclusions were drawn:

1. Unlike the traditional TPB model, expected risk and benefits are key factors driving agricultural product innovation (the path coefficient is 0.29). This finding suggests that introducing expected risks and benefits as a new variable can effectively improve the traditional TPB model.
2. Subjective norms have a significant direct positive impact on the desire for rural product innovation, second only to expected risks and benefits. As shown by the path coefficient, the effect of subjective norms on entrepreneurial intentions is 0.234 ($p<0.10$). This result essentially conforms to the current characteristics of the design intervention in rural areas. Rural creative designers tend to conform to the influence of social norms and yield to the expectations of others, themselves, or groups.
3. Perceived behavioral control has a significant direct positive impact on the desire for rural product innovation (the path coefficient is 0.24, $p<0.10$), and perceived behavioral control and product innovation intentions directly affect product innovation behavior, proving the importance of perceived behavioral control in rural creative product innovation behavior.
4. The attitude towards behavior is a less influential factor in the willingness of the designer to participate in rural product innovation among the four variables (the path coefficient is 0.153, $p<0.10$). The attitude towards behavior has a significant positive impact on the willingness to innovate products, but compared with other influences, it is less significant.

The results show that, first, the new model incorporating expected risks and benefits provides a better explanation for designers' intention to innovate cultural and creative products and expands the TPB theoretical model. Second, the main factors affecting designers' intention to innovate cultural and creative products, in order of influence, are expected risks and benefits, perceived behavior control, subjective norms, and attitudes towards behavior.

V. Discussion

Analysis of influencing factors of designers' willingness to participate in rural cultural and creative design

To explore the expectations and motivations of designers when innovating rural products, this paper, based on the theory of planned behavior, builds a research model of the influential factors on designers' willingness to participate in rural creative design from four dimensions: attitudes towards the cultural value goals of rural creation, environmental support, expected risks and benefits, and perceived behavioral control. After conducting reliability and validity tests, model fit tests, path analysis, and hypothesis testing on the survey data, the following conclusions were drawn.

1. Unlike the traditional TPB model, expected risk and return are key factors driving agricultural product innovation (the path coefficient is 0.29). This finding suggests that introducing expected risk and return as a new variable can effectively improve the traditional TPB model.
2. Subjective norms have a significant direct positive impact on the intention to innovate rural products, and they are second only to expected risk and return. From the path coefficients, we can see that the effect of subjective norms on entrepreneurial intentions is 0.234 ($p<0.10$). This result is essentially consistent with the current characteristics of design interventions in rural areas. Rural creative designers tend to conform to the influence of social norms and conform to other's expectations or the expectations of groups.
3. Perceived behavior control can significantly enhance the intention to innovate rural products, thereby promoting innovation behavior. In addition, according to the theory of planned behavior, as consumers' awareness and convenience of ethical shopping weaken, their ethical purchasing behavior will also be affected, thereby reducing their purchasing intention. When consumers buy rural products, they face additional cost pressures, and obtaining and recognizing information is their biggest challenge to achieving ethical purchases[36]. In rural areas, designers face local resource constraints and a lack of their own resources when obtaining information. As most modern designers’ study and accumulate design resources in cities, they tend to operate according to norms, procedures, and data, thereby facing difficulties in gaining sufficient experience and approaches to innovate in sensitive rural environments. Therefore, only by deeply understanding and integrating rural cultures can they exude unique charm and create entirely new design concepts[37].
4. The subjective norms have a significant positive impact on the intention to innovate rural products. This result is actually consistent with the current characteristics of design interventions in rural areas. Wang Xi (2020) pointed out that while rural designers often heavily uphold traditional social norms, they lack the integration of unique local cultures into tourism products, and the pursuit of perfection technologically which leads to many works lacking uniqueness. They remain on the surface, lacking creativity and individuality, unable to meet consumer demand, and unable to provide consumers with good satisfaction[39]. As proposed by Li Dongjin and others, today's society has a strong demand for individuals to have a good understanding and sense of belonging. Individuals are gathered together to resist the unknown, establish a stable and effective assembly, thus maximizing individual value[38]. As today's society increasingly emphasizes collective interests and the pursuit of a harmonious atmosphere, designers' decisions may rely more on the support of the collective rather than the selection of designers themselves[40].

The significantly positive impact of attitude behavior shows that designers have expressed a positive active participation attitude towards rural creative product innovation, but compared with other influencing factors, attitude behavior is not the most explanatory factor. This is because the development of rural creative products is still in its initial stage, designers lack the mastery of reflecting regional characteristics in cultural themes and elements, and they are unable to form a carrier representing local cultural development characteristics. This is also the main reason for the current serious homogenization of rural creative products[41]. Most designers themselves lack emotional resonance with rural cultures because emotional resonance is based on understanding. This is why many regional cultures cannot be directly copied and applied. There is a correlation between various cultural elements, forming a cultural system[42]. Only by truly understanding and integrating into rural culture can distinctive and creative cultural products be created. This study also confirms Fang Xiaofeng's theory of "attitude"[19], and further improves theoretical research related to factors influencing designer innovation.

VI. Conclusion

Based on the above research conclusions and discussions, when promoting designers to assist in rural revitalization, the government can start from two aspects: guiding designers to enhance their own capabilities and resources, and external policy support.

1. Reduce the risk in the innovation process of designers. The research found that designers have strong intentions to participate in rural areas. If the risks are reduced better, it can better encourage designers to participate in and innovate in rural creations. Through corresponding incentive policies, the government can effectively enhance the enthusiasm of designers to participate in rural creations, and reduce the cost of designers participating in design, help designers disperse risk involved in design, and reasonably control design costs, which can effectively help designers in rural product innovation. At the same time, reducing the government, village committees, market, and enterprise's intervention and management of design behavior, and maintaining reasonable incentives for external factors, can ensure rural market order and better play the role of design in the field of rural cooperation creation.
2. The related tools and methods of rural creative design need to be improved, which can help designers better enhance their behavior control capabilities, and thereby improve the designers' innovation capabilities and resource utilization efficiency in the rural environment. Designers need to realize the importance of villagers in rural design scenarios. In the communication and investigation of rural culture with villagers, corresponding design tools can help the designers faster adapt to the design needs of rural scenarios, reasonably reduce the communication costs between designers and rural areas, and enhance the comprehensive design and innovation capabilities of rural creative designers under rural scenarios.
3. Help designers better understand rural culture, better understand the subjective norms in rural areas, increase the sense of identification with rural culture in design, and make it easier for designers to gain more understanding and support in rural creative activities. Assist designers in gradually conforming to rural culture and rural systems and playing more villagers' subjective intentions, and let villagers join and improve the design, considering the sustainability of rural local culture, villagers' needs, and products.

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Value Evaluation of Comprehensive Development of Woodblock New Year Prints Based on FAHP

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Abstract : *Woodcut New Year pictures are the artistic creation of Chinese folks, bearing regional cultures in different areas and forming a variety of artistic forms. But nowadays, under the environment of the collision of regional culture and economic market, its expansion faces dilemma of development. On the one hand, there is a gap between folk art and modern aesthetics. On the other hand, it faces the choice between traditional craftsmanship and modern technology. In such a complex environment, how to determine the development point of woodcut New Year pictures is the most important. Based on the previous research on woodcut New Year pictures in various places, the article constructs a comprehensive development value evaluation index system. Taking three places - Taohuawu, Yangjiabu and Fengxiang as examples, the paper evaluates the woodcut New Year pictures by using fuzzy analytic hierarchy process, expecting to pertinently put forward a new perspective and method for the development of woodblock New Year pictures.*

I. The Current Status and Development Difficulty of Woodblock New Year Prints

1.1 Development of woodblock New Year pictures

Woodblock New Year Prints are an essential art variety in folk art. Most of their productions originate from folklore, historical stories, and folklore activities. Hence, they perform social production, aesthetic appeal, and concepts in various phases. The early Woodcut New Year Prints were principally adopted to expel evil spirits. During the development procedure, they slowly arose the functions of decoration and beautification and brought the blessing concept of people. In the Tang and Song Dynasties, because of the southward variation of the economic center, the transformation of ideology, and the progress of production technology, there were innovations in the form and theme of Woodblock New Year Prints. While it evolved into the Ming and Qing Dynasties, the creation of Woodblock New Year Prints in several places continuously made the center of the industry, and the marketing range scattered across the whole country and had a deep-felt influence. When the period of the Republic of China, under the impact of offset New Year Prints and lithographic methods, the juvenile painting creation center slowly diminished, but the annual output of Woodblock New Year Prints started by Hebei Wuqiang can still reach 32 million. After discovering the reason, firstly, Wuqiang's New Year Prints zealously acquired latest techniques and joined them into their production system. Secondly, to correspond with the requirements of the people, catch the news and current events, and generate innovative themes. Nowadays, Woodblock New Year Prints are also encountering development difficulties.

Apart from the previous dilemmas, how to build up its platform under burdensome protection policies, combining tradition with contemporary, and improving the heritage as resources are worthier of study.

1.2 Development Difficulties of Woodblock New Year Prints

Under the background of the information age, production technologies in the design, printing, and communication industries have appeared iteratively. Woodblock New Year Prints, which to some extent still require to rely on handicrafts, slowly diminish. Linked with the diversification of contemporary lifestyles and diversified aesthetic tastes, Woodcut New Year Prints can no longer satisfy the aesthetic requirements of modern people and thus have progressively turned into the art products, which need to be preserved. For the industry of Woodblock New Year Prints, as an art form arising from the masses, it is out of connection with social production and differs from the mainstream aesthetics. It already lacks source and challenging to survive. Under the declining status quo, the government put forward protection and development policies in this regard. Thus, mobilize each level of society to engage in it, the academic community proclaims learning from foreign experience, from various viewpoints to investigate the protection and development mode, to offer a theoretical foundation for practice.

Currently, the research on Woodblock New Year Prints in the academic community is comparatively complete, so it is of considerable importance to how to present particular development techniques for Woodblock New Year Prints. Furthermore, it is favorable to the mixture of academic theory and resource development, supporting the industry of Woodblock New Year Prints to dispose of resources that cannot be developed. Meanwhile, the FAHP analysis approach is one of the more generally applied techniques in the field of resource development. Moreover, it comprehensively adopts qualitative analysis and quantitative analysis techniques. Via a fuzzy comprehensive evaluation, decision-makers can correctly seize the complete degree of the objective. Particularly, in the range of tourism resource development, the use of this approach has been pretty mature, presenting theoretical assistance and administration for tourism development in several regions. By contrast, as a cultural resource that also belongs to the class of resource development, the application of this method is still uncommon, and the development research in the range of Woodblock New Year Prints is nearly empty. Also, the estimation of the development of cultural resources, for example, Woodblock New Year Prints is itself a comparatively complex decision-making issue. Most scholars consider and advance strategic planning from a qualitative aspect. Given this, the research strives to create a scientific evaluation index system from the viewpoint of producers, merchandises themselves and purchase groups based on such analysis, beginning with resource development. Next, through the blend of qualitative and quantitative analysis, clarify the development value determinants at every degree, and investigate the inner logical connection between the higher value determinants. Later, via fuzzy analytic hierarchy method to estimate the pros and cons of the overall development value of regional Woodblock New Year Prints. Thus, it figures out the source difficulties in the development of Woodblock New Year Prints in contemporary circumstances and offers new research perspectives and research concepts for further relevant research.

II. The Construction of the Evaluation Index System of the Comprehensive Development Value of Woodblock New Year Prints

2.1 Analysis of Development Elements

2.1.1 Factors of traditional value in the comprehensive development

From the viewpoint of the producer, as an ancestral craftsman, how to bring forward the conventional value of Woodblock New Year Print is the core. First of all, from the prospect of development, the invention of paper-making in the Eastern Han Dynasty supported the growth of Woodblock New Year Prints. Next, with the maturity of block printing in the Northern Song Dynasty, the popularization of paper allowed mass production of Woodblock New Year Prints. Hence, it comprised multiple historical elements in the development procedure, and to some extent revealed the situation of material production at various times. Second of all, in the procedure of composing Woodblock New Year Prints, the generators have to satisfy the psychological needs of the buying group, no matter in the selection of themes or the form of expression. Besides, it demands that Woodblock New Year Prints require to grasp the cultural causes of various domains, so it has extraordinary cultural value in the content. Eventually, the method is the solution to producing Woodblock New Year Prints. The general development of Woodblock New Year Prints has essentially experienced the transition from hand-painting to engraving and printing plates. Nevertheless, in the procedure of constant optimization in diverse fields, this collection of production processes has produced its individual production approaches. It can be understood that the technical methods in distinct areas are a concentrated expression of regional culture. Above all, this report considers that the convent value of Woodblock New Year Prints is principally shown in three perspectives: historical development, cultural heritage, and methods.

2.1.2 Factors of self-value in the comprehensive development:

From the prospect of the Woodblock New Year Prints, we require to discover the constituent components that can have high development value in the current circumstances. At this moment, the academic investigation of Woodblock New Year Prints usually begins from the three perspectives of composition, form and color. This article adopts previous studies from former scholars, and consider the value factor of Woodblock New Year Prints is made of these three. Firstly, as folk art, Woodblock New Year Prints are art on paper, and they are known from the aspect of graphic design. For the screen size, the investigation of the composition form is the essential section. Meantime, the Woodblock New Year Prints are not complete images. Most of the texts in it are intimately associated with the picture, so the association between language and images is also a significant component. In various areas, the features in the Woodblock New Year Prints are also complex. The corresponding topic and the same type have diverse shapes, and the matching costumes and accessories are also different. Also, because of the variations in the theory of color setting in different regions, separately region has its own experience in color matching and color layout. The formulas invented in several areas are also very complex. Under this situation, the diversity of Woodblock New Year Prints in the market is further improved. In conclusion, the investigation of the composition level in this report largely causes from the three viewpoints of the image size, composition form, and language association. The study of the modelling degree largely originates from the appearance of modelling and the matching of clothes. Thus, the study of the color degree principally begins from the color layout and color matching.

2.1.3 Factors of market value in the comprehensive development

From a market prospect, for Woodblock New Year Prints, the decision of buyer is important. In most circumstances, the purchase behavior is because of the buyer's request. Earlier praying for blessings and exorcism required media to raise the appearance of the New Year Prints. In the following customs of life and social production, Woodblock New Year Prints used the platform as spiritual subsistence and daily necessities. Meantime, Woodblock New Year Prints are the outcome of the mixture of people's material and spiritual demands. In the current epoch, the change in the perspective of life makes it challenging for Woodblock New Year Prints to appear in daily life as daily necessities. Accordingly, the request on the material level is steadily fading. And compared with the ancestral spiritual core of Woodblock New Year Prints, the artistic beauty connected to it is in line with people's pursuit of diversified beauty in this period. However, on the whole, material requirements, spiritual needs, and artistic demands are not ternary. Just set the Woodblock New Year Prints into the modern context, it has not been able to meet the needs of life, and achieve the contemporary mainstream aesthetic while conveying the classical culture. The study of the value of the market is according to the previous three points. Firstly, the Woodblock New Year Prints are known as daily necessities. The living conditions define the specifications of the Woodblock New Year Prints. The ancient Woodblock New Year Prints have emerged various genre specifications for the living circumstances of diverse places. There are more stove paintings, window, Kangtou paintings in the northern, likewise, there are more tribute notes, screen width, horizontal wrap, strip screen in the southern. Notwithstanding, the modern family living conditions has turned into a unified commercial apartment, appearing in a decrease in the material requirement for Woodblock New Year Prints. Consequently, the range of using Woodblock New Year Prints is one of the critical features that influence market value. Secondly, the Woodblock New Year Prints are considered as works of art, depending on the production activities of the public, showing multiple viewpoints of life customs, ideas, etc. Additionally, there are numerous expressions of art with a pleasant flavor. It is in range with the aesthetic taste of the older people, so the solution to how to satisfy the aesthetic requirements of the market today. Ultimately, owing to the cultural variations of distinct sources, most of the Woodblock New Year Prints are modified to regional circumstances, and the range of communication is different because of the difference in recognition of Woodblock New Year Prints in distinct areas. Also, in the procedure of historical development, its scope of communication is improving. Under the current trading market, Woodblock New Year Prints as products should be measured for their market value, and their impact should be considered. The range of transmission can view as their measurement standard.

2.2 Set Up Index System

According to the earlier analysis, a value evaluation index system for the comprehensive development of Woodblock New Year Prints was launched, as presented in Table (1)

Table (1) Index system for comprehensive development value evaluation of Woodblock New Year Prints

Target layer U	Standardized criterion layers Uk	Specific indicators
Evaluation of the value of the comprehensive development of Woodblock New Year Prints	Traditional value	Technique and technology
		Historical heritage
		Folk custom concept
	Self value	Image scale
		Diagram relation
		Composition form
		Modeling look
		Outfit matching
		Color layout
		Color matching
	Market value	Range of application
		Scope of communication
		Modern aesthetics

III. Model construction of comprehensive development value evaluation of Woodblock New Year Prints

3.1 Establishment of index system weight

3.1.1 Construct a judgment matrix:

Based on the installed comprehensive value evaluation index system, it is separated into U, Ui and Uij from top to bottom. Beginning from the Ui layer, the judgment matrix B = (bij) n × n is formed by consulting specialists to compare each other. Among them, bij depicts the relevant meaning of bi to bj for B. The assignment standard utilizes Saaty's 1-9 ratio scale approach (see Table 2).

Table (2) 1-9 ratio scale approach

Scale	Meaning
1	Bi and Bj are equally important
3	Bi is slightly more important than Bj
5	Bi is significantly more important than Bj
7	Bi is more important than Bj
9	Bi is more important than Bj
Reciprocal	Bji = Bij
2,4,6,8	The importance is somewhere between the above bases

3.1.2 Measure the index weight value

1. Measure the product Pi of the i-th row component of the judgment matrix.

$$P_i = \prod_{j=1}^{n} b_{ij}$$

2. Measure Pi's nth root Dni.

$$\mathrm{Dn}_i = \sqrt[n]{P_i}$$

3. Weight estimation. Normalize the vector Dni, and receive the weight value.

$$W_i = {Dn_i}/{\sum_{i=1}^{n} Dn_i}$$

4. Consistency test. The consistency index CI of the judgment matrix, where λ Max is the biggest eigenvalue of the judgment matrix.

$$CI = \frac{\lambda max - \mathrm{n}}{n-1}$$

5. Random consistency ratio calculation

$$\mathrm{CR} = \frac{CI}{RI}$$

If CR <0.1, the judgment matrix is supposed to have satisfactory consistency, otherwise the judgment matrix must be modified. In the formula, RI is the average random consistency index, which can be seen by Table (3).

Table (3) RI average random consistency index

Matrix order	1	2	3	4	5		6	7	8	9	10	11
RI	0	0	0.52	0.89	1.12		1.26	1.36	1.41	1.46	1.49	1.52

3.2 Construct a fuzzy matrix of FAHP

3.2.1 Determine the index set of the main factor layer as

Uk = {U1,U2,…,Uk}: define the index set of the sub-factor layer Uki = {Uk1,Uk2,…,Ukn}

3.2.2 Define the comment set as

where vj (j = 1,2, ..., m) means the comments from each degree. In this article, m = 5 is picked. For the evaluation of the comprehensive development value of Woodblock New Year Prints, the comment level is 1. Good (v1); 2. Better (v2); 3. Fair (v3); 4. Poor (v4); 5. Poor (v5); Thus, the review set of the rating set built by the evaluation is V = {v1, v2, v3, v4, v5}.

3.2.3 Build a fuzzy judgment matrix

Where rkij (i = 1,2, ..., n; j = 1,2,3,4,5; k = 1,2,3) depicts the i-th sub-factor index Uki in the k-th principal determinant for the j-th level. The degree of affiliation of reviews vj is the ratio of sub-evaluation determinants Uki to obtain reviews of vj (j = 1,2,3,4,5). The value of rkij can be defined as below, statistically sort out the expert evaluation outcomes, and arrange vi1 v1 reviews, vi2 v2 reviews, ..., vi5 v5 reviews for the indicator Uki.

3.3 Estimation of the comprehensive evaluation

3.3.1 Measurement of the first level of the comprehensive evaluation

The fuzzy evaluation matrix Rk of the sub- factor layer index Uki belonging to various principal determinant layers is adopted to implement fuzzy operations to receive the level of membership of the principal determinant Rk for the j-th review vj.Integrating the membership level of the review set V of every principal determinant layer, the fuzzy comprehensive evaluation matrix R is received.

3.3.2 The second level operation of the comprehensive evaluation

The primary factor weight vector A = (a1,a2,a3), and then make a second comprehensive evaluation operation on R based on the fuzzy mathematical evaluation model to receive the membership vector of the objective layer index U for the comment set V

Normalize B to obtain B = (b1,b2,b3,b4,b5)

3.3.3 Evaluation outcomes

where b1,b2,b3,b4,b5 mean the level of membership of U for reviews v1,v2,v3,v4,v5. After negotiating with experts, established a weight value fj(j=1,2,3,4,5) for every level of reviews vj(j=1,2,3,4,5). It is adopted to show the consequence of the review at this level, and the weighted average of every element bj in B (marked as W) can be received as the last evaluation outcome.

W measures the final evaluation result. Thus, W is a weighted average, which depicts the last evaluation score of the comprehensive development value of woodblock New Year pictures in a particular region, the higher the score. It explains that the general performance of the Woodblock New Year Prints in this section on every evaluation symbol is better. Besides, the higher the value of the comprehensive development of Woodblock New Year Prints in the region.

IV. Case Study - Take the Tongzi Woodblock New Year Prints of Peach blossom Castle, Yangjiabu and Fengxiang as examples

According to the former calculation model and the particular evaluation steps, we selected the Tongzi Woodblock New Year Prints in Peach blossom Castle, Yangjiabu, and Fengxiang to estimate the overall value, and based on the outcomes of the model, and we executed reference estimations.

4.1 Measure the Index Weight

Through interviews with six experts who are involved in the New Year Prints industry or researching the field of New Year Prints, the 1-9 scale approach was adopted to compare the indicator layers at each level. Furthermore, based on the steps of the aforementioned analytic hierarchy process, reach the eigenvalue, weight and consistency test. The comprehensive weight of the first- level indicator U is A=(a1,a2,a3)=(0.5610， 0.2860， 0.1529); the comprehensive weight of the second-level evaluation indicator is A1=(0.2101,0.4573,0.3326)； A2=(0.0437,0.0596,0.3239,0.2837,0.1199,0.0645,0.1047); A3=(0.2890,0.1276,0.5835)

4.2 Construct a Fuzzy Relation Matrix

We requested ten industry experts, under the three determinants of traditional value, own value and market value for the Woodcut New Year Prints. Moreover, its second-level indicators are calculated individually, and probability statistics are performed to achieve a fuzzy comprehensive evaluation matrix, for instance, Table (4); Table (5); Table (6).

Table (4) the matrix of the fuzzy comprehensive evaluation of Yangjiabu

Standardized criterion layers Uk	Specific indicators	Membership matrix				
		Good	Better	General	Worst	Worse
Traditional value	Technique and technology	0.3	0.7	0	0	0
	Historical heritage	0.8	0.1	0.1	0	0
	Folk custom concept	0.6	0.2	0.1	0.1	0
Self value	Image scale	0.1	0.7	0.1	0.1	0
	Diagram relation	0.3	0.5	0.1	0.1	0
	Composition form	0.7	0.2	0.1	0	0
	Modeling look	0.6	0.2	0.1	0.1	0
	Outfit matching	0.6	0.3	0.1	0	0
	Color layout	0.4	0.3	0.2	0.1	0
	Color matching	0.6	0.2	0.1	0.1	0
Market value	Range of application	0.3	0.3	0.2	0.2	0
	Scope of communication	0.1	0.5	0.3	0.1	0
	Modern aesthetics	0.6	0	0.3	0.1	0

Table (5) Matrix of Fengxiang's fuzzy comprehensive evaluation

Standardized criterion layers Uk	Specific indicators	Membership matrix				
		Good	Better	General	Worst	Worse
Traditional value	Technique and technology	0.4	0.4	0.2	0	0
	Historical heritage	0.7	0.3	0	0	0
	Folk custom concept	0.3	0.5	0.2	0	0
Self value	Image scale	0.3	0.4	0.1	0.2	0
	Diagram relation	0.1	0.5	0.3	0.1	0
	Composition form	0.4	0.5	0.1	0	0
	Modeling look	0.4	0.3	0.2	0.1	0
	Outfit matching	0.3	0.7	0	0	0
	Color layout	0.2	0.3	0.5	0	0
	Color matching	0.4	0.5	0.1	0	0
Market value	Range of application	0.1	0.4	0.4	0.1	0
	Scope of communication	0.4	0.3	0.3	0	0
	Modern aesthetics	0.3	0.2	0.2	0.2	0.1

Table (6) Matrix of the fuzzy comprehensive evaluation of Peach Blossom Castle

Standardized criterion layers Uk	Specific indicators	Membership matrix				
		Good	Better	General	Worst	Worse
Traditional value	Technique and technology	0.4	0.4	0.2	0	0
	Historical heritage	0.7	0.3	0	0	0
	Folk custom concept	0.3	0.5	0.2	0	0
Self value	Image scale	0.3	0.4	0.1	0.2	0
	Diagram relation	0.1	0.5	0.3	0.1	0
	Composition form	0.4	0.5	0.1	0	0
	Modeling look	0.4	0.3	0.2	0.1	0
	Outfit matching	0.3	0.7	0	0	0
	Color layout	0.2	0.3	0.5	0	0
	Color matching	0.4	0.5	0.1	0	0
Market value	Range of application	0.1	0.4	0.4	0.1	0
	Scope of communication	0.4	0.3	0.3	0	0
	Modern aesthetics	0.3	0.2	0.2	0.2	0.1

4.3 Estimation of the fuzzy comprehensive evaluation

Based on the fuzzy evaluation matrix calculation process above, through two comprehensive evaluation operations, the weighted average of the three areas can be achieved individually.

Woodcut New Year Prints of Tongzi Yangjiabu Measurement of the first-level of the comprehensive evaluation

B1=A1*R1={0.6284,0.2593,0.0790,0.0333,0} B2=A2*R2={0.5798,0.2582,0.1065,0.0556,0} B3=A3*R3={0.4495,0.1505,0.2711,0.1289,0}

Calculation of the second level of the comprehensive evaluation

B=A*R={0.5871,0.2423,0.1162,0.0542,0}

Weighted average W=B*FT=0.11742963

Woodblock New Year Prints of Tongzi Fengxiang Measurement of the first-level of the comprehensive Evaluation

B1=A1*R1={0.5039,0.3875,0.1085,0,0}

B2=A2*R2={0.3528,0.4500,0.1541,0.0431,0}

B3=A3*R3={0.2550,0.2706,0.2706,0.1456,0.0583}

Calculation of the second level of the comprehensive evaluation

B=A*R={0.4226,0.3875,0.1463,0.0346,0.0089}

W=B*FT=0.08452995

Woodcut New Year Prints of T Tongzi Taohuawu Measurement of the first-level of the comprehensive evaluation

B1=A1*R1={0.5704,0.3420,0.0875,0,0}

B2=A2*R2={0.4900,0.3038,0.1736,0.0327,0}

B3=A3*R3={0.3294,0.2711,0.3577,0.0416,0}

Calculation of the second level of the comprehensive evaluation

B=A*R={0.5106,0.3202,0.1535,0.0157,0}

Weighted average

W=B*FT=0.10211565

V. Conclusion

There are several varieties of Woodblock New Year Prints and prominent regional features. Hence, the evaluation of the development value of Woodblock New Year Prints is a complex systematic program. This report sets the evaluation index of the comprehensive development value of Woodblock New Year Prints by investigating the influencing determinants of the comprehensive development of Woodblock New Year Prints and utilizes AHP to define the complete weight. Later, via FAHP to estimate the comprehensive development value of Woodblock Prints in various domains. In order to provide theoretical assistance for the development of such non- legacy Woodcut Prints by this evaluation model. Consequently, to provide some practical supervision in front of the sophisticated modern market, to better accomplish the promotion and regeneration of classical culture.

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Research on Innovation of Art Design Education Mode in Colleges and Universities

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Abstract: *With the rapid economic development of our country, our art design and other related undertakings are also developing rapidly, and the development of society also needs talents in art design, so the domestic colleges and universities in China have gradually developed their specialties in art design and so on. Cultivating high-quality and high-level artistic talents is a major task for our colleges and universities to meet the needs of social development. This paper analyzes the necessity and defects of art design education in colleges and universities, and also studies the new mode of art design education in colleges and universities in China.*

Keywords: *institutions of higher learning; art design; educational model*

With the development of China's reform and opening up, China's planned economy has become a market economy, and China's social economy has also achieved obvious results. With the guarantee of the material life of the people, we are faced with the problem of strengthening the spiritual construction of people in our country, that is, the demand for design and aesthetics. The rapid development of market economy leads to the demand for all kinds of talents, and the construction of people's spiritual civilization is the demand for talents. At present, many colleges and universities in our country have carried out the major of art design, but there are still many defects and shortcomings in the educational problems of the major, so strengthening the exploration of the new mode of art design education in colleges and universities is the subject that we should carry on all the time.

I. The present situation of Art Design in Colleges and Universities in China

Although at present, domestic colleges and universities have generally carried out art and design majors, but the good and bad are mixed, there are good development, but also some development is not good. Driven by interests, many colleges and universities carry out art design major without considering the educational problems of art design and the characteristics and professional advantages of their colleges and universities, which leads to the decline of the whole teaching quality and has no benefit to the cultivation of art and design talents.

II. Problems in Art Education in Colleges and Universities

With the demand of society for art and design talents, the enrollment of art majors in colleges and universities is more and more, which leads to various problems in art education in colleges and universities, which are summarized as follows.

2.1 Driven by interests

I all know very well that the tuition fees of domestic colleges and universities for art and design majors are very expensive, which has also led to a large number of colleges and universities for art design major enrollment began to increase, in order to increase income, did not consider whether the teachers are complete, set up art design major, also did not consider the basic cultural level of students, and the level of educational management in their own colleges and universities. This all affects the cultivation of art and design professionals.

2.2 Shortage of teachers

In the education of colleges and universities, the ability level of teachers is the premise to ensure the whole teaching quality. In the art design education of our country, the proportion of higher talents of teachers in colleges and universities is very few, and the unreasonable structure of teachers' knowledge leads to the teachers can not teach according to the needs of social development at present, the teaching mode is single, and they can not take the initiative to use knowledge to teach, which also leads to the learning ability of many students. Innovation is declining. Many teachers do not have practical experience in art design and are not well qualified for this teaching work.

2.3 Students' cultural quality is low

At present, the enrollment of art and design majors in colleges and universities in our country has low requirements for the comprehensive cultural quality of students. Many students do not understand art design, nor do they like this major, so they choose art design major, so as to complete their own college dream of parents, which also makes the art major in colleges and universities become a "shelter" for students with poor cultural classes. Due to the low cultural quality of students, not to mention the lack of artistic accomplishment, not to mention the love of art, which also leads to the lack of learning ability of many students majoring in art design, unable to cultivate their own artistic cultivation, lack of independent thinking ability and so on.

2.4 The students trained are not in line with the needs of the market

The routine training in colleges and universities leads to the popularization of art and design students who graduate from colleges and universities, there is no competitiveness in the market, and there is a great gap with designers and related designers, which also leads to the company spending resources to cultivate students here, what enterprises need is excellent talents who have the ability to innovate and can carry out their work immediately.

III. The necessity of Innovation in Art Design Education in Colleges and Universities

As mentioned above, there are many problems in the education of art design in our country, so the innovation and improvement of art design education in colleges and universities is to solve these problems, which is not only the need of education reform, but also the need of social development in our country.

IV. A New Model of Art Design Education in Colleges and Universities

4.1 Reform of enrollment system

Art design is a comprehensive subject. Students majoring in art need to have relevant cultural knowledge. The admission threshold of art design major in colleges and universities in our country is very low, and the cultural course level of many students is not enough. Therefore, the reform of enrollment system is mainly reflected in the need to improve the proportion of examinees' cultural course scores in the admission mechanism, and should also increase the investigation of students' design copywriting, design thinking, design practice and other related art and design majors, so as to facilitate the cultivation of subsequent schools. For candidates with low cultural scores, students can first strengthen basic learning and conduct professional examinations, which is also a good preparation for art design education.

4.2 Cultivate students’ innovative thinking

Innovation is the demand of social development and progress, and art design is gradually produced with the economic development and demand of our country. Cultivating students' innovative thinking and consciousness is the key point in education. China's art design education has also had 20 years of experience. We should not only absorb these years' experience and lessons, adopt foreign excellent design education ideas, but also achieve independent innovation. Art design innovation is the quality that excellent art and design talents must have.

4.3 Characteristic school running

Characteristic running a school is the method of talent training and the competitiveness of talent training. The pattern of art and design education in our country needs to be diversified and characteristic. Our country has a long civilization and history, and has a wide range of things. The art design education in colleges and universities should be carried out in combination with national conditions, national and local characteristics, and the characteristics of students. It should be innovative and characteristic, which can also strengthen the educational ideology in the practice of running a school.

4.4 Combine theory with practice

There is a serious disconnect between theory and practice in art design teaching in colleges and universities in our country. The art design teaching of pure art makes students have no practical experience. Therefore, in art design education, we should combine theory with practice, perceptual and rational. To create an open and creative teaching atmosphere, to make specific teaching planning and practical activities according to the actual situation of students, to carry out cooperation with enterprises in society, to carry out the work of building practical bases, to enable students to rely on the platform, to enhance students' practical ability of artistic design, to enrich their own experience, to cooperate closely between schools and enterprises, and to promote the training of excellent design talents with strong practicability. To meet the needs of society, the embodiment of their own student value.

4.5 Combined with national characteristics

The traditional culture of our country is extensive and profound, and the art design has the national characteristic culture, which will have more value and charm. The art design education in colleges and universities edifies the students of the traditional culture of the Chinese nation, trains the students' national consciousness, encourages the students to combine the style of national characteristics with their own works, designs the modern works with the connotation of the national culture, and brings the history and culture of the Chinese nation to a broader stage.

V. Conclusion

The construction of innovative and modern education model is to establish a perfect education system for the needs of our social development talents. It is imperative for the development of our country to strengthen the educational reform, especially the art design education in colleges and universities in our country, which plays an important role in the construction of spiritual civilization education in our country. In the face of the world in the era of knowledge economy, art and design education will have more space for development and a broader platform. The competition in society is the competition of talents. The reform of education can not only improve the competitiveness of students in society, but also strengthen the quality cultivation of students themselves. The art design education in colleges and universities should not only examine and improve the traditional education model, but also open up ideologically. It is the grand goal of art design education in our country to draw lessons from the experience of advanced art design education in foreign countries, to establish the art design education system with the characteristics of the Chinese nation, to train talents scientifically, to meet the needs of the market, and to have high efficiency and innovative comprehensive modern art design talents.

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Zheng Sitting: A Chinese Case of Cultural Tracing and Design Innovation for Sustainability

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I. Introduction

Today, human society is facing increasingly severe challenges of sustainable development, such as climate change, food security, health and other threats that are intensifying day by day. Sustainable design is not only limited to materials, products, processes and other physical or technological factors, but is also shifting to service systems, lifestyle, social innovations and those referring to behavioral changes to build a sustainable society (Manzini, 2015). Yet as of now the goal of sustainable development seems to be farther away than ever before. It's necessary to continue looking deep into the cultural perspective for sustainability since man's behaviour and lifestyle eventually depend on the culture they have. As the only existing ancient civilization among the four, China has a long history and a splendid culture. During most of the history of human civilization, it maintained a position as the central world empire with cultural, economic and military leadership. Those basic historical facts indicate that Chinese civilization contains the wisdom of sustainable development, and tracing the origin of Chinese culture may open a door towards a sustainable society (Gong, 2021).

This article presents a case of design for sustainability on the topic of tracing Chinese culture and design innovation at the DESIS Lab of Jiangnan University. The case focuses on a common behavior in ancient Chinese daily life, Zheng Sitting, which has completely disappeared in daily life today in China. Through cultural tracing, this article intends to explore its sustainable value, to find design opportunities in modern daily life, and puts forward design proposals that can build a bridge between the excellent traditional Chinese culture and sustainable contemporary lifestyles.

II. Zheng Sitting, sitting without chairs

Zheng Sitting, also called kneeling-sitting, a kind of sitting without chairs, is a normal way of sitting of the Ethnic Han people in ancient times in China. The Chinese word "Zheng" also means "normal", "correct" or "straight": in practice, Zheng Sitting means to kneel on the knees, legs flat on the ground, hips attached to heels, with the upper body straight and the hands laid regularly on the knees (Fig. 1, Fig. 2).

Fig. 1 Stage Photo of Nirvana in Fire, 2017

Such a sitting posture embodies dignity and concentration in communication, shows mutual respect, and is indicative of the Chinese ritual culture of self-cultivation and treatment of others. Furthermore, Zheng Sitting contains the aesthetic value of the Chinese. In ancient times, people emphasized a gentlemanly style for men and a dignified beauty for women. Because the clothes in ancient times were relatively broad, in the posture of Zheng Sit- ting, man displays the beauty of firmness and strength, and woman the beauty of grace and quiet.

Fig. 2 Jade artefacts from the Fuhao Tomb, Collection of the National Museum of China

Moreover, medical research indicates that Zheng Sitting has positive values in health as a physical and mental exercise, which enhances the circulation of the body, decreases the burden on the heart and relaxes the backbone and shoulders. It's particularly valuable for white-collar workers today, who have problems with cervical vertebrae and lumbar vertebrae in general. From the perspective of Chinese culture and the medical system, it's clear that Zheng Sitting is the most correct way of sitting and fits the principle of unity between nature and man. Therefore, it also represents the orthodoxy of Chinese culture.

III. Cultural Tracing of the Mat-Dwelling Lifestyle

Zheng Sitting is not an isolated daily behavior, but an element of the ancient Mat-dwelling culture and lifestyle. The Mat-dwelling culture refers to the lifestyle of ancient Chinese people whose household life included sitting and lying on the ground plane, which led to a different household space with different furnishings than those of today (Fig. 3).

Fig. 3 Portrait Brick of the Eastern Han Dynasty (AD 25-220). Collection of Sichuan Museum

In oracle bone inscriptions, we can find some characters that directly display the Zheng Sitting posture, such as “female” or “mother”, “eating”, “mat”, and “hosting” (Fig. 4).

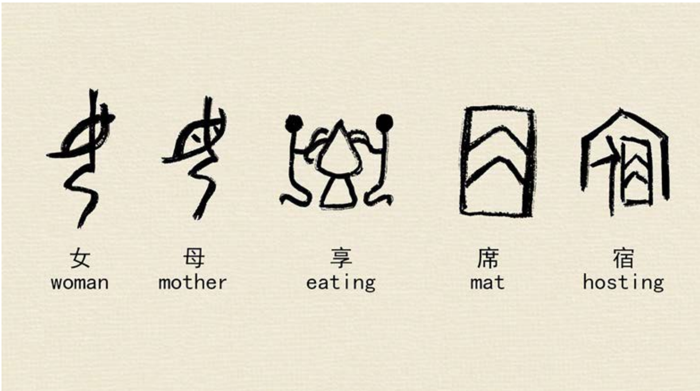

Fig. 3 The Forms and Meanings of Oracle: Woman, Mother, Eating, Mat, Hosting. Drawn by Author

In addition, the mat unearthed at the Hemudu Site in Yuyao, Zhejiang Province, can prove the existence of the Mat-Dwelling lifestyle in the last 7000 years (Fig. 5).

Fig. 5 Mat from Hemudu Site, Zhejiang Province. Photo: Xinhuanet

We don’t know when f the Mat-dwelling lifestyle originated, but historical evidence shows that Zheng Sitting and the Mat-dwelling culture were the main living cultures and life- styles of the ancient Chinese. Zhang Liang-gao studied Mat-dwelling culture through ancient documents and related archaeon-logical cultural relics. In his book Seven Comments of Chinese Architecture, he confirmed that the Mat-dwelling culture can be traced back to the Shang dynasty at least and lasted through the Han dynasty, when everyone used Zheng Sitting widely, both the nobility and the common people. China then entered a period of turmoil that lasted hundreds of years, including the disaster of the “invasion of northern nomads in the fifth century”, which largely destroyed the social and cultural ecology of China. After the Sui and Tang dynasties, the Mat-dwelling culture and Zheng Sitting gradually faded from common daily life, and have almost disappeared in modern society, completely replaced by the new sitting posture and lifestyle as we see today. Only a few ethnic minorities in remote areas, such as Dai and She, still retain the Zheng Sitting posture in their daily life. However, the Mat-dwelling culture had spread to Japan and Korea after the Tang dynasty. It has been well inherited and evolved into the Tatami, which has become a living and cultural characteristic of the Japanese people today.

Therefore, the disappearance of Zheng Sitting and the Mat-dwelling culture in the history of China was not because they no longer held any value, or couldn't follow the progress of society. Instead, it was the result of centuries-long periods of national catastrophes caused by invasions, and the corresponding cultural disasters, which finally transmitted to daily life. In other words, in Chinese history, the degradation and disappearance of the Mat-dwelling culture was a passive process rather than an active choice. We believe that retracing the traditional Mat-dwelling lifestyle and the value of Zheng Sitting will be conducive to the construction of sustainable behavior and lifestyle.

IV. Design Opportunities and Proposals

How can we rediscover the value of Zheng Sitting and promote the Mat-dwelling culture as a sustainable lifestyle today? This is a difficult design challenge. On the one hand, Zheng Sitting itself is a behavior, not a product. So, it cannot be restored as an artefact. On the other hand, Zheng Sitting has almost completely disappeared in history and been forgotten. Moreover, the cultural, social and spatial contexts of Zheng Sitting have almost completely changed as well. In other words, today people's living culture, household environment and lifestyle have undergone significant change since the Qin and Han dynasties. Under today's new conditions, the restoration and promotion of Zheng Sitting is lacking in a cultural, social and material basis. To answer the previous questions, we put forward four different design strategies:

1. Functional restoration strategy: in the cur- rent household environment, a series of furniture products are designed to restore a small Zheng Sitting space for reading, working and leisure. Home Series for Zheng Sitting is a design proposal based on this strategy (Fig. 6);

Fig. 6 Scenario of home furniture set for Chinese Zheng Sitting. ©Siqi Zhou

2. Features combination strategy: combining Zheng Sitting with other traditional life cultures, such as the tea culture, to create more comfortable conditions for its application. Tea Furniture Series for Zheng Sitting is a design proposal based on this strategy (Fig. 7);

Fig. 7 Scenario of a tea furniture set for Chinese Zheng Sitting. ©Junyang Liu

3. Scenario adaptation strategy: towards the modern office environment that is difficult to adjust systematically, a variable structure is adopted to allow people to freely switch between normal sitting and Zheng sitting. Office Chair for Zheng Sitting is a design proposal based on this strategy (Fig. 8);

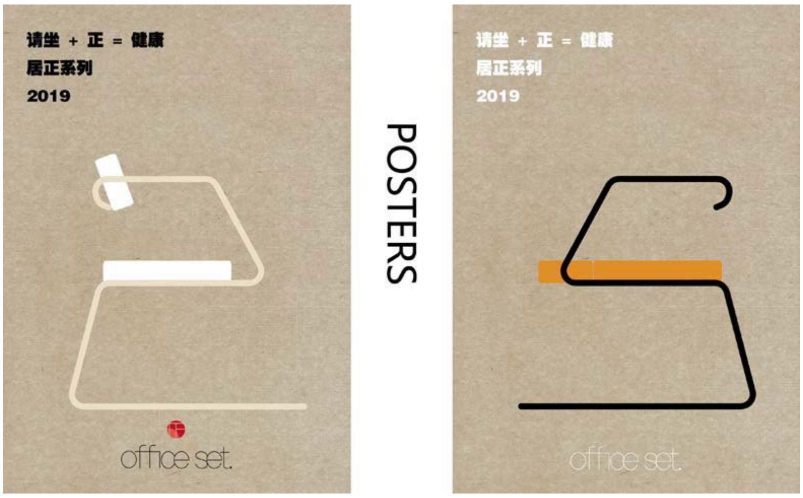

Fig. 8 Posters of an office chair for Chinese Zheng Sitting. ©Haoyuan Wang

4. Cultural promotion strategy: regarding Zheng Sitting as a cultural symbol or gaming element, and promoting it in public places through the method of entertainment.

Game Experience of Zheng Sitting is a design proposal based on this strategy (Fig. 9). Through the different design strategies laid out above, Zheng Sitting could partially return to different scenarios in households, social life, office, entertainment, etc., to achieve the value transformation of its traditional culture.

Fig. 9 Proposal of product of game experience on Zheng Sitting. ©Li Haolin and etc

V. Reflection

This is a concrete case of sustainable cultural tracing and design innovation. In researching this case by tracing the origin of Zheng Sitting and the Mat-dwelling culture, we find the superiority of this culture and life-style that has disappeared across history. In the perspective of Chinese culture, their dis- appearance and the change in daily life style are obviously a kind of cultural degradation instead of advancement. We are often confi- dent about the achievements of science and technologies, which dramatically change our lifestyle today compared to the past. At the same time, we are facing many challenges in terms of health and sustainability. The gap of the contradiction, I think is missing cultures which we lost in history. Hence, we need to be modest and understand that human his- tory does not always mean progress. Looking back on history and discovering excellent traditional cultures is a positive approach to avoid the continued degradation of human society.

It also indicates that we cannot look into an isolated product, behavior or event in history, but need a more holistic view, which requires cultural tracing to understand the origin and process of their evolution. How- ever, the cultural tracing and systematic cognition of traditional culture don’t mean we can fully recover and promote them. In a design innovation of lost traditional cultures such as the Mat-dwelling culture, it’s necessary to consider the current realistic environment and conditions, to define resilient design strategies, to find appropriate design opportunities, and to put forward innovative design proposals, so that excellent traditional culture can again play a valuable role in today’s society.

Therefore, sustainable design not only needs to face the current crisis and look forward to the future, but also needs to trace history and study ancient practices. After studying design for sustainability in the west for years, I came back to China and started to study traditional Chinese culture, especially pre- Qin Classics and archaeological finds. Now I fully recognize that ancient Chinese sages prepared a complete thought and culture of sustainability in terms of individuals, com- munities, nations or global society of human beings at the beginning of civilization. Unfortunately, we have almost forgotten most of them and have lost the ability to identify the value they hold. At least now it’s clear to me that rediscovering orthodox traditional cul- ture will open a great door towards a sustain- able society.

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