

# Value Contribution of Rural E-commerce Development: Model Constructing and Empirical Testing

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## Abstract

*In the field of rural e-commerce, based on literature review, the paper constructs a four-dimensional value contribution model of rural e-commerce to economic, social, cultural, and ecological development. The value contribution scale for rural e-commerce development is designed to collect experts' opinions, then the measurement items are modified, and a questionnaire survey is conducted with farmers participating in rural e-commerce activities as the respondents. With AMOS software, a first-order structural equation model and a higher-order structural equation model are used to analyse the confirmatory factors of the rural e-commerce value contribution model, and to test the convergence and discriminative validity of the model and other important attributes. It can be concluded from the test results that the four value dimensions of the model show relatively high reliability and validity, which also suggest that the use of this model is highly rational in identifying the value contribution of the development of rural e-commerce, and has successfully developed the value contribution system of rural e-commerce as a formal theory. At the same time, according to the factor loading and the contribution rate of each principal component measured at the overall level, the weight of the principal components and indices of the overall dimension are achieved. Among the four value contribution dimensions, economic value shares the largest contribution brought by rural e-commerce development and ecological value shares the smallest. Therefore, these results and weights gained from this research will be used to determine the priority of the value contribution of rural e-commerce development, and will be taken into consideration in developing rural e-commerce.*

**Keywords:** Rural e-commerce, value contribution, model

## I. Introduction

With the widespread use of the Internet, especially the development of e-commerce in rural areas, channels for rural resources entering external markets have been broadened to a larger extent, allowing farmers to participate in more market activities, share information and encourage effective communication, which promote the sale of agricultural products. The use of internet and e-commerce plays new role in many aspects, namely rural industrial development, farmers' income increase, farmers' ability to get rid of poverty, farmers' better quality of life, entrepreneurship and employment. That is, the development of rural e-commerce contributes value to rural economic, social, cultural and ecological development: WaiShiang Cheah, Azman Bujang Masli and Edwin Mit [1] modeled the factors influencing the sustainability of e-commerce in rural communities, and the verification model showed positive results. Galloway L and Mochrie R [2] showed through a lot of evidence that information and communication technology (ICT) is the driving force of rural economic growth. The development of rural e-commerce has facilitated rural economic and social development, and promoted the integration of village culture [3]. E-commerce rebuilds the social and cultural environment in China's rural areas, facilitating cultural integration [4]. Liu Lili et al. [5] believed that e-commerce promotes agricultural green development and ecological environmental protection; Yingnan Zhang et al. [6] also proved that e-commerce has promoted the development of rural industries towards ecological integration. It can be concluded that the researches on the value contribution to

the development of rural e-commerce have mostly focused on the analysis of a single aspect or a single module, and has not yet presented a complete value theory system structure, which is in a fragmented state.

As rural e-commerce has just emerged and been developing in the past few years, theoretical research on rural e-commerce and its value contribution are still in the exploratory stage. At present, the value contribution of rural e-commerce has yet neither generated a formal unified concept nor relevant empirical measurement tools, and empirical research on its composition theory requires new scales.

This research aims to build a rural e-commerce value contribution theoretical system based on the literature review of rural e-commerce value contribution. Through research data and AMOS software, a first-order structural equation model and a higher-order structural equation model will be used to conduct confirmatory factor analysis on the value contribution model, testing the model's convergence and discriminative validity and other important attributes, and then forms a complete rural e-commerce value contribution theory system.

The structure of this research is as follows: Part 2 introduces the relevant literature review, the economic, social, cultural, and ecological value of rural e-commerce development extracted from previous studies and verified by preliminary case studies; Part 3 builds a rural e-commerce value contribution model based on literature review; Part 4 expounds the research methods of this research; Part 5 features variable measurement and data collection; Part 6 identifies the structural validity and reliability of the model based on the survey data. According to the factor loading and the contribution rate of each principal component calculated according to the previous sections, Part 7 obtains the weight of the overall dimensional principal components and their indices; finally, the results are discussed in Part 8.

## II. Literature Review

This paper selects the literature related to the development of rural e-commerce, classifies and counts the value contribution items in the literature, and extracts the indicators of the value contribution of the rural e-commerce development. The literature review is specifically carried out from four aspects: economy, society, culture and ecology.

In terms of economic value contribution, Khanal A and Mishra A [7] believed that small farms benefit from the use of the Internet. Compared with their peers, the annual agricultural cash income of agricultural households using the Internet has increased by approximately US\$9,500-12,400. Simple Jain and Anuprita Purohit [8] studied the utilization of e-Choupal by rural residents in four regions in Sri Lanka, namely Nagar, Kota, Balatpur and Chitolga. The results clearly show that e-Choupal has helped rural people obtain higher profits from crops in increasing agricultural production, adopting improved technologies, selling agricultural products and obtaining agricultural inputs in time. Alan Lukose [9] believed that farmers' adoption of e-commerce can help expand product coverage and increase turnover. Zhang Haibin and Zhang Guoqing [10] believed that an outstanding feature of e-commerce is that it can evaluate agricultural products online, which has an effect on the consumption behavior of other consumers and drives merchants to pay attention to product quality.

In terms of social value contribution, the main focus of research is on the role of rural e-commerce in improving the status of disadvantaged groups, employment and entrepreneurship, convenience of life, communication methods, and comprehensive quality improvement. Jo Rhodes [11] and Farhadi Fariba [12] maintained that rural e-commerce has the potentials to improve women's economic welfare, especially rural women's social status. Georgiadou K, Baros W, Kekkeris G [13] believed that e-commerce provides non-formal education and community empowerment for socially disadvantaged groups living in rural, remote and isolated areas. Amirhossein Alibaygi, Mehdi Karamidehkordi and Mehrdad Pouya [14] proved that the development of information and communication technology (ICT) in rural communities has effectively prevented the rural outflow. Pushpa B [15]

believed that information and communication technologies (ICT) have enabled people to migrate from cities to rural areas, bringing employment opportunities to many people. Sapna A, Narula and Sabhyata Arora [16] found that farmers use village-level Internet sites for online ticket booking, online bill payment, and property information registration, bringing convenience to farmers' lives. Adamides et al. [17] believed that ICT can encourage communication among farmers and increase their participation and exchanges of skills and knowledge.

In terms of cultural value contribution, Krishan K. Boora [18] believed that rural e-commerce effectively promotes rural cultural activities. Zoltán Zakota [19] argued that e-commerce developing in areas such as agriculture or rural tourism will help strengthen the rural business atmosphere. Colom Gorgues and Antonio [20] held that the use of information and communication technologies (ICT) can help strengthen cultural, artistic, architectural and historical heritage to achieve a new geographical balance in the development of rural areas.

In terms of ecological value contribution, Jalali A A, Okhovvat M R, Okhovvat M [21] recognized that implementing e-commerce practices in rural areas is also an applicable and durable solution to the rural environment. Vajda-Mlinacek, Ljiljana, GradiBnik, et al. [22] studied e-commerce based on the promotion and sales of eco-tourism services. The results confirmed that the Internet is a good way to promote ecological destinations.

### III. Construction of Value Contribution Model of Rural E-commerce

This research defines the value contribution of rural e-commerce based on previous researches and four sub-dimensions, namely economy, society, culture and ecology constructed on value dimension of the value contribution of the development of rural e-commerce as in the process of participating in e-commerce, farmers boost the economic, social, cultural and ecological performances in rural areas altogether with multiple visible results. The value contribution model proposed in this research recognizes the value of rural e-commerce from three levels, namely the overall level, the dimension level and the measurement items. The dimension layer mainly reflects the value of 4 aspects, namely economy, society, culture and ecology. On top of these four dimensional factors, there is an overall factor, namely the value of rural e-commerce. The value contribution model of rural e-commerce is shown in Table 1.

**Table 1. Value contribution model of rural e-commerce**

Overarching dimension	Measuring dimension	Variable
Rural E-commerce (REC)		Household income EV1
		Production mode EV2
		Product sales EV3
		Product brand EV4
	Economic value (EV)	Market sensitivity EV5
		Industrial service EV6
		Organization scale EV7
		Cost of sales EV8
		Infrastructure SV1
		Way of life SV2
		Social status SV3

Overarching dimension	Measuring dimension	Variable
	Social value (SV)	Returnee SV4
		Non-native personnel SV5
		Consumption capacity SV6
		Comprehensive quality SV7
		Way of communication SV8
		Rural civilization CV1
	Cultural value (CV)	Business atmosphere CV2
		Cultural fusion CV3
		Environmental awareness EcV1
	Ecological value (EcV)	Ecological product EcV2
		Ecological industry EcV3

The value model contains a total of 22 measuring variables, of which the economic value dimension contains 8 variables, the social value dimension 8 variables, cultural value and ecological value both 3 variables, respectively, the name of the variable and its meaning is explained in Table 2.

#### IV. Research Methods

##### 4.1. Questionnaire

In order to obtain the first-hand data, the micro-data involved in this research was mainly collected by designing questionnaires for farmers and other relevant subjects, and conducting field surveys, *Questionnaire for Farmers' Participation in Rural E-commerce in Zhejiang Province*. The questionnaire survey used a combination of stratified sampling of cities and counties and random sampling of farmers, so the sample as a whole can represent the overall situation of Zhejiang Province. The survey of farmer households adopts the method of questionnaire, which is conducted by random households sampling. For farmer household survey, the questionnaire survey was completed by either surveyed farmer themselves or the inquiry of surveyors.

In this research, AMOS software was used, and a first-order structural equation model and a higher-order structural equation model were adopted to analyse the confirmatory factors of the value contribution model of rural e-commerce, and to test the convergence and discriminative validity of the model and other important attributes.

#### V. Variable measurement and data collection

##### 5.1. Variable measurement

The development of the scale in this research has gone through multiple stages. In the first stage, a large number of domestic and foreign rural e-commerce documents have been reviewed. To ensure the validity of the scale, comparatively developed measurement items from previous researches were adopted. Finally, 29 measurement items were formed. In the second stage, 2 rural e-commerce professors, 2 e-commerce professors, 3 IT professors, and 6 doctoral students of relative majors were invited to group discussions, revising and selecting the 29 measurement items that have been formed, and finally it was decided that 29 items were streamlined to 26 items. In the third stage, in July 2019, 50 rural e-commerce practitioners were pre-tested. Through on-site interviews and exchanges with the officials of relevant rural e-commerce departments, the questionnaire measurement items were

further improved and revised based on the actual operations of rural e-commerce. Finally, after the removal of 4 items and further improvement of item expressions, a questionnaire with 22 items was formed.

**Table 2. Variables of value contribution model of rural e-commerce and descriptions**

Measuring dimension	variable	Variables description
Economic value (EV)	EV1	Compared with before, household income has been increased
	EV2	Compared with before, production mode has changed
	EV3	Compared with before, product sales have been increased
	EV4	Compared with before, the popularity of products has increased
	EV5	Compared with before, the efficiency of arranging production based on market information feedback has been strengthened
	EV6	Compared with before, industrial technical services and training have been increased
	EV7	Compared with before, the rural cooperative economic organization has a larger scale
	EV8	Compared with before, the cost of sales has been reduced
Social value (SV)	SV1	Compared with before, rural infrastructure (roads, networks, etc.) has been further improved
	SV2	Compared with before, lifestyle has changed (in terms of convenience)
	SV3	Compared with before, family's social status has been improved
	SV4	Compared with before, there are more people returning to the village (migrant workers, college students, etc.)
	SV5	Compared with before, there are more people coming from outside the village
	SV6	Compared with before, your family's consumption power has increased
	SV7	Compared with before, your comprehensive qualities (literacy, communication skills, e-commerce knowledge and skills, etc.) have been significantly improved
	SV8	Compared with before, way of communication has been more convenient
Cultural value (CV)	CV1	Compared with the past, rural customs and civility (family harmony, cultural diversity, etc.) have improved
	CV2	Compared with before, the business atmosphere (more product display, sales related topics discussion, fair competition and increased awareness of win-win cooperation, etc.) has improved
	CV3	Compared with before, urban culture has been more integrated with other cultures
Ecological value (EcV)	EcV1	Compared with before, environmental protection awareness has increased (no littering, environmental protection, etc.)
	EcV2	Compared with before, the sales of ecological products (decreased use of fertilizers, pesticides, chemical agents, etc.)
	EcV3	Compared with before, the industries have been more environmentally friendly, light industries have been further developed, and sewage, exhaust gas, and waste emission has been reduced

It is used to measure the value contribution of rural e-commerce, and the questionnaire is designed based on the four measuring dimensions formed by the theoretical model. The measurement items are measured by Likert five-level scale, 1 means "strongly agree", 2 "relatively agree", 3 "agree", 4 "disagree", and 5 "strongly disagree".

## 5.2. Data collection and sample characterization

According to the level of economic development, per capita GDP and per capita income in 2018, 11 prefecture-level cities in Zhejiang Province are divided into three tiers: economically developed, economically moderate and economically underdeveloped. One prefecture-level city is selected from each tier, and three counties are selected from each prefecture-level city by the same method. Each prefecture-level city was issued with 405 questionnaires and each county 135 questionnaires. A total of 1215 questionnaires were issued and 1183 were recovered, thus the recovery rate is 97.36%, among all the questionnaires, 1111 are valid with an effective rate of 91.44%. At the same time, the questionnaire survey for farmers was conducted from July to October in 2019, and the survey time was relatively concentrated, so there was no response deviation in time. Table 3 provides a descriptive statistics of the collected data.

**Table 3. Descriptive statistics of the collected data**

Measuring dimensions	Variable	Mean value	Standard error	Skewness	Kurtosis
Economic value (EV)	EV1	3.748	0.66808	-0.104	-0.447
	EV2	3.720	0.66301	-0.233	-0.576
	EV3	3.713	0.65582	-0.149	-0.448
	EV4	3.626	0.65070	-0.300	-0.468
	EV5	3.563	0.74814	-0.002	-0.336
	EV6	3.230	0.90368	-0.192	-0.755
	EV7	3.251	0.9207	-0.100	-0.891
	EV8	3.365	0.87989	0.104	-0.728
Social value (SV)	SV1	3.798	0.71335	-0.121	-0.679
	SV2	3.943	0.69193	0.007	-0.700
	SV3	3.615	0.65699	-0.488	-0.572
	SV4	3.371	0.91001	-0.085	-0.811
	SV5	3.318	0.9496	-0.050	-0.865
	SV6	3.694	0.68966	-0.123	-0.429
	SV7	3.705	0.67993	-0.290	-0.632
	SV8	3.928	0.75590	0.106	-0.729
Culture value (CV)	CV1	3.573	0.63655	-0.448	-0.458
	CV2	3.533	0.68875	-0.288	-0.282
	CV3	3.515	0.71754	-0.585	-0.311
Ecological value (EcV)	EcV1	3.742	0.64714	-0.228	-0.598
	EcV2	3.718	0.64711	-0.189	-0.505
	EcV3	3.824	0.67968	0.078	0.049

In this research, the statistics of the items contained in the four dimensions show that the absolute value of Skewness of EV containing 8 items ranges between 0.002-0.300, the absolute value of Kurtosis between 0.336-0.755. In SV, the former containing 8 items is between 0.007-0.488, the latter between 0.429- 0.811. The two values in CV covering 3 items are between 0.288-0.585 and 0.282-0.458 respectively, 3 items in EcV between 0.078-0.228 and 0.049-0.598 respectively. The absolute values of Skewness and Kurtosis of the items contained in each dimension are all smaller than 3, indicating that the data meets the requirements of the normal distribution statistically.

## VI. Recognition model structure validity and reliability

The author consulted a large number of rural e-commerce and related literature, thus ensured that the questionnaire items could well reflect the four value contribution dimensions of rural e-commerce value. Two professors of rural commerce, two e-commerce professors, three IT professors and six doctoral students in related majors conducted group discussions to determine the measurement variables. Through pre-test and interviews with the surveyed farmers, the content validity of the questionnaire was ensured by logical analysis. SPSS24.0 was used to analyse the exploratory factor and reliability of the data.

### 6.1. Exploratory Factor Analysis

The objective of conducting exploratory factor analysis is to set up the structural validity of the scale or the questionnaire established [23]. The KMO value of the survey data and Bartlett's test is adopted to judge if the questionnaire is suitable for factor analysis. The KMO value is between 0 and 1. The prerequisite of conducting factor analysis on the scale is the KMO value of the scale data above 0.70 and the P value less than 0.05. Exploratory factor analysis adopts principal component analysis, extracting factors with eigenvalues larger than the value of 1, and orthogonal rotation is achieved with maximum variance method. Among common factors, the contribution rate of cumulative variance is expected to be higher than 60%, and each factor generally contains at least three items. Items with factor loading less than 0.50 and commonality less than 0.40 are deleted. In addition, items with factor loading greater than 0.45 in both common factors should also be deleted. According to the standards above, the value recognition model of rural e-commerce is analysed by EFA, and the results are shown in Table 4, Table 5 and Table 6.

**Table 4. KMO and Bartlett's test**

KMO sampling suitability		0.947
Bartlett's test	Approximate Chi-square	13831.806
	Degree of freedom	190
	Significance	0.000

From the table 4, it can be noted that the KMO value of the questionnaire items is 0.947, and the approximate Chi-square value is 13831.806,  $P < 0.001$ , which meet the standards and requirements of factor analysis in statistics.

**Table 5. Total statistics**

Measurement items	Mean value	variance	correlation	Alpha
EV1	50.2547	97.309	0.703	0.924
EV2	50.2268	98.703	0.598	0.926
EV3	50.2196	98.532	0.619	0.926
EV4	50.1332	98.916	0.593	0.926
EV5	50.0702	97.370	0.616	0.926
EV6	49.7363	94.692	0.655	0.925
EV7	49.7579	98.870	0.399	0.931
EV8	49.8713	94.779	0.669	0.925
SV1	50.3051	97.708	0.624	0.926
SV2	50.4500	98.013	0.622	0.926
SV3	50.1215	98.401	0.628	0.926

Measurement items	Mean value	variance	correlation	Alpha
SV4	49.8776	93.410	0.727	0.923
SV5	49.8245	100.720	0.283	0.933
SV6	50.2007	97.966	0.628	0.926
SV7	50.2115	98.219	0.619	0.926
SV8	50.4347	96.464	0.672	0.925
CV1	50.0801	99.357	0.572	0.927
CV2	50.0396	98.233	0.609	0.926
CV3	50.0216	98.727	0.545	0.927
EcV1	50.2484	99.208	0.573	0.926
EcV2	50.2250	99.203	0.574	0.926
EcV3	50.3312	97.681	0.661	0.925

At last, after three orthogonal rotations, a stable and clear dimensional structure was obtained, and two questions, EV7(0.399) and SV5(0.283), with commonality less than 0.50 and factor load less than 0.6, were deleted, as shown in table 5. The results are shown in Table 6 below.

**Table 6. Exploratory factor analysis results**

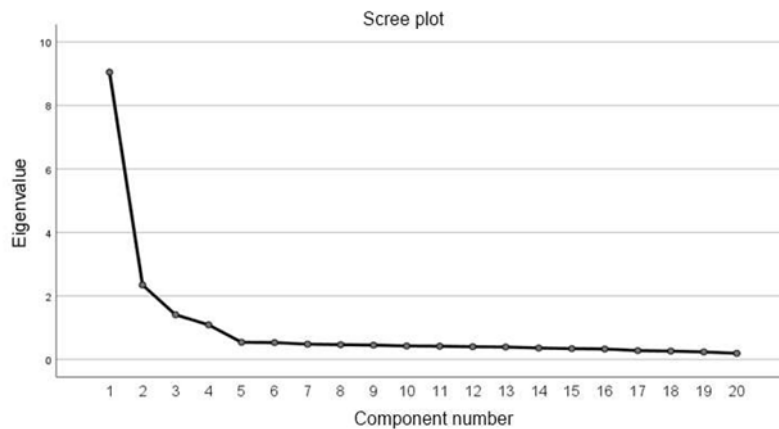
	component				commonality	Eigenvalue	Variance %	cumulative variance Contribution rate%
	1	2	3	4				
SV4	0.840				0.815			
SV8	0.824				0.760			
SV1	0.773				0.661	4.782	23.912	23.912
SV7	0.766				0.654			
SV6	0.759				0.648			
SV3	0.730				0.618			
SV2	0.674				0.568			
EV8		0.823			0.751			
EV2		0.776			0.651			
EV4		0.775			0.646			
EV5		0.755			0.643	4.634	23.169	47.080
EV1		0.746			0.690			
EV6		0.733			0.640			
EV3		0.712			0.595			
CV3			0.795		0.740			
CV2			0.774		0.754	2.269	11.345	58.426
CV1			0.773		0.736			
EcV2				0.782	0.754			
EcV1				0.777	0.742	2.210	11.049	69.475
EcV3				0.769	0.817			

From table 6, there are 4 common factors with eigenvalues greater than 1, which are 4.782, 4.634, 2.269 and 2.210 respectively, and the cumulative variance contribution rate of SV, EV, CV and EcV4 is 69.475, which meets the



statistical standard. It proves that the four common factors extracted in this research effectively interpret the 20 items of the questionnaire and realise the goal of dimension reduction. And the corresponding factor loading in the items included in each factor after rotation is greater than 0.60, indicating that these items can well fall into the corresponding contribution dimensions. In addition, the extraction rate of common factors for each topic is greater than 0.50, which indicates that the interpretation degree of extracted factors for each topic can reach more than 50%, so the extracted factors are suitable.

It can also be seen from the scree plot that the flattening of the chart starts from the fifth factor, so it is more appropriate to retain four factors, which also proves that the number of factors extracted by factor rotation is reasonable. As it is shown in figure1.



*Fig.1. scree plot*

## 6.2. Reliability test

**Table 7. Reliability analysis**

Dimension	Cronbach's Alpha	Number of items
EV	0.909	7
SV	0.918	7
CV	0.830	3
EcV	0.844	3
NXEV	0.935	20

From the reliability analysis results in table 7, the Cronbach's Alpha coefficient of the 20 items in the questionnaire is 0.935, and the four reliability coefficients of EV, SV, CV, and EcV are between 0.830-0.918. The reliability of the total questionnaire and the four dimensions of EV, SV, CV and EcV meet the statistical requirements. See Table 7.

## 6.3. Confirmatory analysis

Factor analysis is a common method to investigate the structural validity. In light of the results obtained from the exploratory factor analysis, this research preliminarily determined the questionnaire structure, and confirmatory factor analysis was adopted to evaluate the established questionnaire structure through data fitting indicators. The factor loading value in the model obtained by confirmatory factor analysis was used to calculate convergence and discrimination validity.

### 6.3.1. Analysis of confirmatory factors at dimension level

Confirmatory factor analysis has been carried out with the data from formal test, and the results are following:

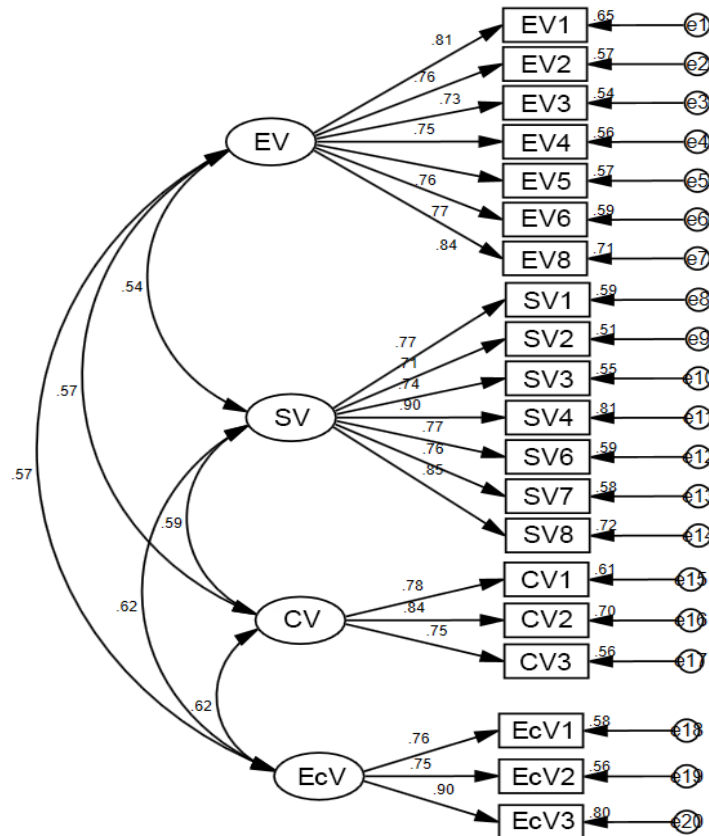


Fig.2. Confirmatory factor analysis structure

The fitting indexes at dimension level of confirmatory factor analysis are exhibited in Table 8.

Table 8. Fitting indexes of confirmatory factor analysis at dimension level

Indicator	Test statistic	Adaptation standard or critical value	Test result	Model adaptation
Absolute fit index	$\chi^2$		451.975	
	df		164	
	P	$\geq 0.05$	0.000	NO
	SRMR	$\leq 0.05$	0.014	YES
	RMSEA	$\leq 0.08$	0.040	YES
	GFI	$\geq 0.90$	0.961	YES
	AGFI	$\geq 0.90$	0.950	YES
Value-added fit index	NFI	$\geq 0.90$	0.968	YES
	RFI	$\geq 0.90$	0.962	YES
	IFI	$\geq 0.90$	0.979	YES
	TLI	$\geq 0.90$	0.976	YES
	CFI	$\geq 0.90$	0.979	YES
Reduced fit index	PGFI	$\geq 0.50$	0.750	YES
	PNFI	$\geq 0.50$	0.835	YES
	PCFI	$\geq 0.50$	0.845	YES
	$\chi^2/df$	$\leq 2.00$	2.756	YES

The fit index value of the model is obtained by confirmatory factor analysis. As the table above shows, from the overall situation of the fit index value, other fit index values have reached the evaluation standard of model fitting in statistics except P value, which shows that the structure of rural e-commerce value model has been verified and the questionnaire structure is accurate and effective.

6.3.2. Overall confirmatory factor analysis

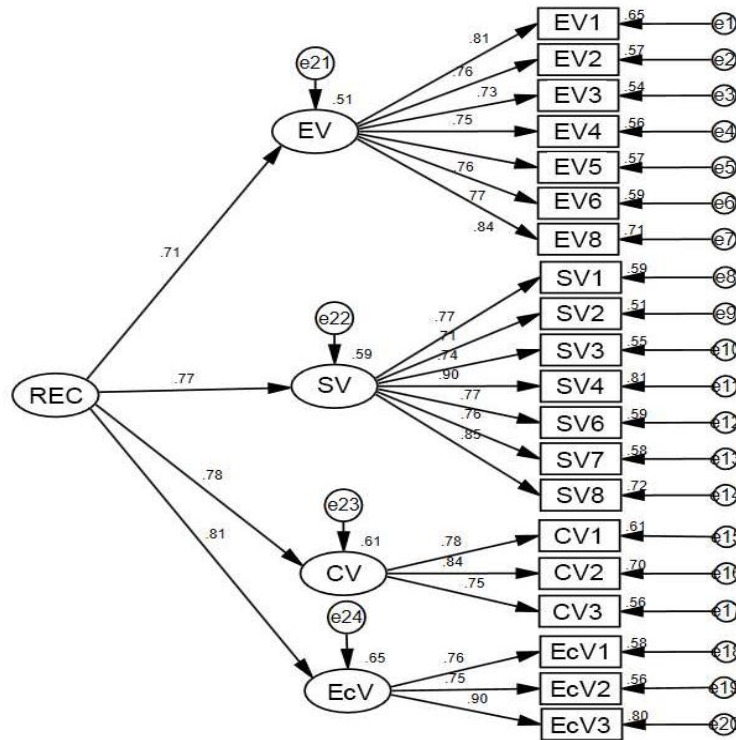


Fig.3. Overall confirmatory factor analysis of rural e-commerce value

After calculation, the overall layer factor model fit index is shown in Table 9. The fit index shows that the model matches well with the sample data.

Table 9. Overall confirmatory factor analysis fit indicators

Indicator	X <sup>2</sup>	df	X <sup>2</sup> /df	SRMR	GFI	AGFI
Acceptance standard			1-3	<0.05	>0.9	>0.9
Overall factor model	452.522	166	2.726	0.029	0.961	0.950
Match			YES	YES	YES	YES
Indicator	NFI	IFI	TLI	CFI	RMSEA	
Acceptance standard	>0.9	>0.9	>0.9	>0.9	<0.08	
Overall factor	0.968	0.979	0.976	0.979	0.039	

model						
Match	YES	YES	YES	YES	YES	

With confirmatory factor analysis, the fit indicators of the overall measurement model are obtained. From the statistical results, it can be concluded that all fitting indicators reach the ideal value. The structure of the model is verified, and the questionnaire structure is accurate and effective.

#### 6.4. Validity test

Through confirmatory factor analysis of the factor loading of each item in the corresponding dimension, the convergence validity and discrimination validity can be further calculated. The results are as follows.

**Table 10. Convergence validity**

	EcV	CV	SV	EV
EcV	0.774			
CV	0.625	0.789		
SV	0.622	0.595	0.790	
EV	0.573	0.566	0.543	0.806

In Table 10, the first value in each column is the square root of the four dimensions AVE of EcV, CV, SV, EV, which are 0.774, 0.789, 0.790, 0.806 respectively. The absolute values of the correlation coefficients between EcV and CV, SV, EV are respectively 0.625, 0.622, 0.573, the absolute value of the correlation coefficient between CV and SV, EV is 0.595, 0.566, and the absolute value of the correlation coefficient between SV and EV is 0.543. It can be concluded that the square roots of the AVE values of the four dimensions of EcV, CV, SV, and EV are all greater than the correlation coefficients of this dimension compared with other dimensions, indicating that the discrimination validity of these four dimensions has reached the statistical standard.

**Table 11 Parameter table of confirmatory factor analysis model at dimension level**

			Estimate	S.E.	C.R.	P	Factor loading	CR	AVE
EV	<---	REC	1.000				0.715	0.851	0.589
SV	<---	REC	1.087	0.066	16.559	***	0.766		
CV	<---	REC	1.003	0.061	16.438	***	0.780		
EcV	<---	REC	1.028	0.062	16.601	***	0.806		
EV1	<---	EV	1.000				0.808	0.913	0.599
EV2	<---	EV	0.929	0.034	27.607	***	0.757		
EV3	<---	EV	0.891	0.033	26.885	***	0.733		
EV4	<---	EV	0.906	0.033	27.422	***	0.751		
EV5	<---	EV	1.048	0.038	27.850	***	0.756		
EV6	<---	EV	1.283	0.045	28.417	***	0.767		
EV8	<---	EV	1.373	0.043	31.928	***	0.842		
SV1	<---	SV	1.000				0.768	0.920	0.622
SV2	<---	SV	0.900	0.036	24.731	***	0.712		

			Estimate	S.E.	C.R.	P	Factor loading	CR	AVE
EV	<---	REC	1.000				0.715	0.851	0.589
SV	<---	REC	1.087	0.066	16.559	***	0.766		
CV	<---	REC	1.003	0.061	16.438	***	0.780		
EcV	<---	REC	1.028	0.062	16.601	***	0.806		
SV3	<---	SV	0.891	0.034	25.989	***	0.743		
SV4	<---	SV	1.496	0.045	32.897	***	0.901		
SV6	<---	SV	0.966	0.036	27.009	***	0.768		
SV7	<---	SV	0.948	0.035	27.037	***	0.764		
SV8	<---	SV	1.169	0.038	30.426	***	0.847	0.832	0.624
CV1	<---	CV	1.000				0.780		
CV2	<---	CV	1.160	0.044	26.471	***	0.836		
CV3	<---	CV	1.086	0.045	24.388	***	0.751	0.846	0.649
EcV1	<---	EcV	1.000				0.760		
EcV2	<---	EcV	0.988	0.040	24.813	***	0.751		
EcV3	<---	EcV	1.239	0.044	28.304	***	0.897		

From table 11, the CR values of EcV, CV, SV and EV are 0.913, 0.920, 0.832 and 0.846, which are all greater than 0.70, and the AVE values of EcV, CV, SV and EV are 0.599, 0.622, 0.624 and 0.649 respectively, all greater than 0.50, showing that the combined reliability and convergence validity of the four dimensions have reached the statistical standard.

As far as REC is concerned, the normalized factor loading of EcV, CV, SV and EV in REC are 0.806, 0.780, 0.766 and 0.715, respectively. Based on this, the CR value and AVE value of REC are 0.851 and 0.589, indicating that the combination reliability and convergence validity of REC also meet the statistical requirements.

### VII. Principal components of overall dimension and index weight

The results of confirmatory factor analysis at dimension level show that the coefficients between EV dimension and SV, CV and EcV are 0.54, 0.57 and 0.57 respectively, all less than 0.6; Coefficient between SV and CV is 0.59, less than 0.6; Coefficient between SV and EcV and between CV and EcV are all 0.62, which is similar to 0.6. Therefore, EV, SV, CV and EcV are related to but do not contain each other, and the four dimensions have good discrimination reliability.

According to the factor loading and each principal component's contribution rate, the weight of the overall dimension principal component and its index is obtained, as shown in Table 12. According to Table 12, the weights of EV, SV, CV and EcV are 0.344, 0.333, 0.163 and 0.159, respectively, indicating that the development of rural e-commerce has valuable contributions to farmers' economy, society, culture and ecology. Among these four value contributions, the development of rural e-commerce has the greatest contribution to economic value, followed by social value and culture See table 12 for index weights of each dimension layer.

**Table 12. Principal components of overall dimensions and index weights**

	Weight coefficient
EV	0.344
SV	0.333
CV	0.163
EcV	0.159
EV1	0.057
EV2	0.059
EV3	0.054
EV4	0.059
EV5	0.058
EV6	0.056
EV8	0.063
SV1	0.061
SV2	0.053
SV3	0.057
SV4	0.066
SV6	0.060
SV7	0.060
SV8	0.065
CV1	0.029
CV2	0.029
CV3	0.030
EcV1	0.028
EcV2	0.028
EcV3	0.028

### VIII. Results and discussions

The rural e-commerce value contribution model is a multi-dimensional structure. The value contribution model of rural e-commerce consists of four value dimensions: economy, society, culture and ecology, and the dimension of "economic value" includes seven indicators: household income, production mode, product sales, product brand, market sensitivity, industrial service and sales cost. The dimension of "social value" includes seven indicators: infrastructure, lifestyle, social status, returnees, spending power, comprehensive quality and communication methods. The dimension of "cultural value" includes three indicators: rural civilization, commercial atmosphere and cultural integration, while the dimension of "ecological value" includes three indicators: environmental awareness, ecological products and ecological industry, which is a multidimensional structural model.

Exploratory factor analysis shows that the Cronbach Alpha coefficient of 20 items in the total questionnaire is 0.935, and the reliability coefficients of EV, SV, CV and EcV are between 0.830 and 0.918, which indicates that the reliability of the total questionnaire and EV, SV, CV and EcV all meet the statistical requirements.

The results of confirmatory factor analysis at dimension level show that the coefficients between EV dimension and SV, CV and EcV are 0.54, 0.57 and 0.57, respectively, which are all less than 0.6; Coefficient between SV and CV is 0.59, less than 0.6; Coefficient between SV and EcV and between CV and EcV are all 0.62, which is similar to 0.6. Therefore, EV, SV, CV and EcV are related to each other but do not contain each other, and the four dimensions have good discrimination reliability.

Principal component analysis shows that rural e-commerce development has valuable contributions to farmers'

economy, society, culture and ecology. Among these four value contributions, rural e-commerce development has the greatest contribution to economic value, followed by social value and cultural value, while rural e-commerce development has the least contribution to ecological value.

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