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Factors Influencing the Effect of E-commerce Development in Chinese Rural SMEs

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Abstract

The purpose of this study is to explore the factors influencing the development of e-commerce in rural SMEs in China. In addition, it uses SPSS and AMOS for data analysis to determine the effect of rural infrastructure development, overall rural environment, logistics system, e-commerce service system, and agricultural products factors on the effect of e-commerce development of rural SMEs. The scope of this paper focuses on Chinese rural SMEs, and due to the lack of sufficient financial support, the Chinese rural SMEs in this study are mainly concentrated in Guangdong Province, China, and rural SMEs in Guangdong Province are used as the research point. This paper consists of three parts. First, five research hypotheses of this paper are proposed based on extensive literature: rural infrastructure construction has a positive contribution to the development effect of rural e-commerce, the overall environment has a positive contribution to the development effect of rural e-commerce, the logistics system has a positive contribution to the development effect of rural e-commerce, the e-commerce service system has a positive contribution to the development effect of rural e-commerce, and the factor of agricultural products has a positive contribution to the development effect of rural e-commerce. The effect of agricultural products on rural e-commerce development is positively promoted. Secondly, the proposed research hypotheses are verified by distributing online questionnaires and offline questionnaires for surveys, and the findings of the study on the effect of e-commerce development on SMEs in rural areas of China are discussed on the basis of the results of the empirical analysis. Finally, based on the results of the study, some theoretical and practical management suggestions for rural SMEs, academics, and policymakers are proposed, and the outlook for future research is presented.

Keywords: Infrastructure development, Logistics system, E-commerce service system, Agricultural factors, Rural E-commerce Development Effect

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Introduction

With the implementation of the rural revitalization strategy under the new development pattern, rural e-commerce will also usher in a broader space for development. Based on the foundation of domestic and foreign e-commerce related research, foreign scholars' research on e-commerce, especially e-commerce in rural areas, is mainly derived from the practice of e-commerce. Based on this, foreign e-commerce research has gradually developed aspects such as the role, mode and advantages of e-

commerce for agricultural products. Domestic scholars have numerous research directions, rich research contents and three-dimensional overall structure. Based on this, domestic e-commerce research has gradually formed on the impact of rural e-commerce on rural areas, rural e-commerce development model, rural e-commerce development problems, rural e-commerce development countermeasures and rural e-commerce development trend. However, whether foreign scholars or domestic scholars, most scholars' research stays at the qualitative level, with relatively little quantitative level, or even just simple descriptive statistical analysis (Wu, Pengfei, 2022).

Current research on the development of rural e-commerce is mostly based on qualitative analysis and systematic discourse, and lacks quantitative analysis (Lei Lei, Li Chaoan, Lei Chunyan.2022). In this paper, on the basis of combing the existing research literature on agricultural products e-commerce, the effect of e-commerce development is taken as the research object, and after combining the actual situation of agricultural products e-commerce development and local conditions, the relevant influencing factors are selected from the internal and external environment related to the influence of agricultural products e-commerce, and this study combines the questionnaire survey results and the actual situation of rural China, according to the relevant small and medium-sized enterprises This study combines the results of the questionnaire survey and the actual situation in rural China, analyzes these influencing factors through empirical evidence, and proposes e-commerce development strategies suitable for Chinese rural SMEs, which will be more helpful for local governments to promote the development of e-commerce for agricultural products, and also help to enrich the theoretical research on e-commerce development of Chinese rural SMEs.

Literature Review and Hypothesis Development

Infrastructure Development and Rural E-commerce Development

Agricultural infrastructure construction generally includes: Farmland water conservancy construction and agricultural product distribution Construction of key facilities, commodity grain and cotton production base, timber forests Production base and Protective forest construction, and Agricultural education scientific research, and technology extension and meteorological infrastructure, etc. Building rural infrastructure reduces total production costs, including production, transportation, storage, marketing, risk, and decision-making costs, thereby increasing the economic efficiency of rural economic activities.

The development of rural e-commerce is a major opportunity to narrow the "digital gap" between urban and rural areas, backward regions and advanced regions. (Liao, 2021) pointed out that live streaming through cell phones or computers has become the trendsetter in the new development stage of rural e-commerce, which is important in forming a live streaming industry chain, promoting employment and entrepreneurship in rural areas, and promoting the transformation of rural industries and upgrading of Taobao villages. (Wei, Chao & Yang, 2021) pointed out that although the Internet has reached almost all corners of rural areas, the computer usage rate of rural residents is still at a low level due to the weak network infrastructure in rural areas and the failure of hardware facilities to keep up, and most farmers are limited to using cell phones to access the Internet. E-commerce function cannot be realized by the cell phone alone as an information tool.

Jinfeng, (2019) points out that the advantages of Internet big data are obvious in the process of rural e-commerce development. Promoted by the development of science and technology, big data technology is widely used, and through the analysis of massive data information can grasp the fluctuating characteristics of agricultural production regions and consumption regions, realize the optimal adjustment of production, etc., help farmers' groups scientifically obtain agricultural production indicators, ensure that farmers have a greater say in the agricultural market, reduce the adverse effects of market price fluctuations on farmers, and realize the maximum benefit for farmers protection. (Ruping, 2023) points out that although China attaches great importance to the construction of networks and other infrastructure in rural areas and invests a lot of human, financial and material resources, the rural logistics system has been greatly improved than before, but compared with urban areas, the gap in the construction of network infrastructure and the development of logistics support services in rural areas is still large.

Yanhong, (2008) points out that backward infrastructure construction is a distinctive feature of most of China's rural areas, such as many villages do not have smooth roads, farmlands do not have machine paths, water conservancy facilities are outdated, and basic education and medical conditions are backward, which have a serious impact on farmers' production and life, and the lack of their own functions restricts the rapid development of rural economy. Mo, (2022) argues that with the policies related to the rural revitalization strategy, the infrastructure in rural areas has been greatly improved, and these infrastructures are mainly in the main roads. While the infrastructure of rural bifurcation roads still needs to be improved, and it is difficult for vehicles to drive, which makes logistics and distribution more difficult. Pan and Shijie (2020) analyzed the influence of informationization level and transportation infrastructure on the efficiency of modern commerce and circulation, and found that both information level and transportation infrastructure significantly improved the efficiency of modern commerce and circulation, and the promotion effect showed a decreasing trend from east to west. (Yang & Zhang, 2021) pointed out that in recent years, China has paid more and more attention to the construction of rural roads and rural communication facilities, and the level of rural traffic conditions and communication networks has improved significantly, which has brought a greater impact on the development of rural e-commerce, indicating that the construction of commerce infrastructure has a positive effect on promoting the development of rural e-commerce.

In summary, there are many studies on the effect of rural infrastructure construction on rural e-commerce development, mainly in terms of rural computer equipment, rural network facilities construction, rural road conditions, the geographical environment in which rural areas are located, and rural electricity supply. In this paper, based on the above scholars' views, the following hypotheses are proposed:

H1: Rural infrastructure development has a positive contribution to the effect of rural e-commerce development

Overall Rural Environment and Rural E-commerce Development

The grassroots government should play its role well by introducing more supportive policies, increasing the investment of special financial funds, broadening the channels for social capital to enter the rural Internet sector, and developing more encouraging initiatives around social capital especially for enterprises, including tax incentives and project approval (Ruping, 2023). Accelerate the construction of grassroots rural 5G network facilities to ensure a more prominent role for rural network infrastructure protection. Give full consideration to rural reality, increase the construction of supporting transportation infrastructure, and improve road traffic access. Accelerate the strategic shift of large logistics companies to the urban-rural interface and establish more large-scale logistics and distribution centers in rural areas.

Yi, Famin, Sun, Yucheng, and Cai, Yi (2021) explored the promotion effect of government promotion of rural e-commerce development and systematically examined the impact of the "comprehensive demonstration of e-commerce in rural areas" policy using the double multiplicative difference method. It was found that the implementation of the "comprehensive demonstration of e-commerce in rural areas" policy effectively promoted the development of rural e-commerce and poverty alleviation among poor groups.

Public policies are not always effective, i.e., there is the phenomenon of so-called "policy failure" (Liu, Peng et al., 2018). There is a structural imbalance in the application of rural e-commerce policy tools at this stage, and some policy tools have unscientific and non-synergistic applications, and policy supporting measures The implementation of rural e-commerce policies is subject to constraints and influences such as the laws of rural e-commerce itself, rural e-commerce participants and the regional economic and social development environment where rural e-commerce is located, whether the government policies supporting the development of agricultural e-commerce are effective and whether all policies introduced by the government can promote the development of agricultural e-commerce (Zhaoyang, 2018), local governments should consider how to create conditions, improve capacity, stimulate engines and support e-commerce development when implementing the central rural e-commerce policy (Liang Qiang et al., 2016).

Yang Mei (2022) points out that infrastructure construction is a fundamental condition for the effective development of rural e-commerce and a basic manifestation of whether the government's public service function is effectively performed. The rural areas themselves are not sufficiently developed and have a large capital gap to afford infrastructure construction, so they can only rely on financial funds to support perfection. Local governments urgently need to innovate working mechanisms, strengthen policy orientation and increase support. The "Several Opinions on Increasing Reform and Innovation to Accelerate the Construction of Agricultural Modernization" promulgated in February 2015 points out that the reform of the rural financial system should make comprehensive use of fiscal taxation, monetary and credit, financial supervision and other policy measures to promote financial resources to continue to "three rural "The policy indicates that the rural areas are in the process of developing e-commerce. The policy indicates that rural areas can apply for loan support in the process of developing e-commerce.

Based on the above scholars' views, this paper summarizes that the main contents of studies related to the overall rural environment and the effect of rural e-commerce development include government policies, government's cultivation and improvement of rural e-commerce market, villagers' awareness of rural e-commerce, humanistic environment (concepts, beliefs, etc.), villagers' literacy, government's financial support of rural e-commerce, etc. The following hypotheses are proposed:

H2: The overall environment has a positive contribution to the effect of rural e-commerce development

Logistics System and Rural E-commerce Development

Wang Yun & Song Shanmei. (2020) proposed that the promotion of new infrastructure construction brings new opportunities for the development of rural e-commerce logistics: the "new infrastructure" of rural logistics industry promotes the generation of new momentum in rural economy, the "new infrastructure" of e-commerce logistics promotes the continued sinking of intelligent supply chain to the countryside, and the vertical diversification of rural e-commerce logistics.

Through a study of rural shared logistics model, Zhao Guanghua (2018) points out that the common distribution form of rural regional shared logistics can effectively open up the "last mile" of rural distribution to promote the coordinated development of rural e-commerce and rural logistics. The logistics network not only promotes national commodity transactions, but also completes the supply chain of agricultural products. Remote rural areas developing e-commerce need to reach strategic agreements with fixed transportation companies, and try to select courier companies with wide transportation range and remote areas to solve the problem of "last mile", so as to provide consumers with better home delivery services (Liu, Yuguang, 2023). The selection of efficient logistics channels can speed up the supply chain continuity and make a smooth service chain for the production and sale of agricultural and sideline products.

Lai Zhisheng (2022) proposed that in the process of development of rural e-commerce logistics, the degree of cooperation and correlation between the various links is relatively poor, without the formation of organic integration, the entire logistics system is not perfect. The small number of logistics service providers in rural areas and the disproportion between the quality of services provided and the price reduce the degree of consumption experience of rural online shopping (Yang, M., 2022). In order to better solve the distribution problems of local e-commerce, China must make efforts to build an intelligent logistics system, which, with the whole logistics infrastructure, can expand the circulation market and reduce the cost required for logistics and transportation during the promotion of agricultural products, and further promote the development of rural e-commerce (Kang, Bin, 2021).

In this paper, according to the views of the above scholars, we summarize that the research related to the effect of logistics system and rural e-commerce development mainly includes express points, optional express points, whether express service to the village, warehouse logistics construction, logistics cost and update speed of logistics information. The following hypotheses are proposed:

H3: Logistics system has a positive contribution to the development effect of rural e-commerce

E-commerce Service System and Rural E-commerce Development

Liu Ke (2020) conducted a comparative analysis of more than ten rural e-commerce development models at home and abroad, found the importance of rural e-commerce platform construction, and put forward important insights and suggestions such as base-building as the basis, playing the decisive role of the market, and playing the active role of the government and large e-commerce platform enterprises. Yan Zhiyun (2020) points out that the development and construction of rural e-commerce must be supported by a team of high-quality professionals, and the key to solving the problem of rural e-commerce talents is to do a good job of "introducing" and strengthening "training" of talents. Under the current situation, it is necessary to increase the education and training of the existing e-commerce staff in rural areas and make up for the "short board" as soon as possible. Although the historical task of building a moderately prosperous society has been completed, the development of rural areas still lags behind urban areas, and urban areas have more development opportunities to attract young people from rural areas to make a living in urban areas, resulting in fewer young people staying in rural areas, which is not conducive to the high-quality development and construction of rural e-commerce. Young people with insight and ideas are not very enthusiastic about returning to their hometowns to start their own businesses. The awareness and ability of the current e-commerce service station personnel in rural areas are not high (Zou Qin, 2020).

The "comprehensive demonstration of e-commerce into rural areas" policy guides e-commerce platforms to cooperate with local governments to jointly build county resource integration platforms; meanwhile, the government financially supports rural logistics, e-commerce talent training and e-commerce services to solve the problems of concepts, entrepreneurship training, atmosphere creation, agricultural product sales, and O2O rural consumption (Yang, Xu et al. 2017; Al-Shorman et al., 2021). The shortage of e-commerce talents is manifested in various development stages, technical fields and levels. Whether in operation and promotion, artwork design or data analysis, there are talent gaps in different positions and levels, especially the lack of high-end composite talents (Yang, 2022). To realize the healthy and sustainable development of rural e-commerce it is urgent to solve the problem of how to mobilize all parties' enthusiasm and increase the training and guidance of rural e-commerce talents.

Chang Xu (2020) pointed out that the organization of returning college students, returning migrant workers, rural women, people with disabilities, etc., will provide guidance and training on a series of knowledge and skills related to rural e-commerce, network employment and entrepreneurship, rural development path driven, so that local talents can be professionally trained. Create a high-quality e-commerce service team, expand the business of e-commerce service sites, and play the role of a grass-roots platform to serve the construction of new rural areas and promote rural revitalization.

Based on the above scholars' views, this paper summarizes that the studies related to the effect of e-commerce service system and rural e-commerce development mainly include e-commerce professional team, e-commerce personnel training work carried out by the government, localized e-commerce platform, and local e-commerce service station construction. The following hypotheses are proposed:

H4: E-commerce service system has a positive contribution to the effect of rural e-commerce development

Agricultural Product Properties and Rural E-commerce Development

Agricultural products have special natural properties and supply demand characteristics, which have very high requirements for temperature control and packaging in the whole process of logistics. When it comes to end distribution, different fresh products have even different packaging and distribution requirements. Haihong (2023) points out that due to the lack of a unified and efficient logistics system for agricultural products at this stage, the characteristics of agricultural e-commerce itself in the circulation process, especially fresh agricultural products, which require picking, packaging, transportation, storage, sorting and distribution, lead to the problem of high losses in the process of agricultural e-commerce still, which is one of the main reasons hindering the development

of agricultural e-commerce. Qiong (2021) believes that the cold chain logistics infrastructure in rural areas is relatively weak, the cold chain logistics management capacity is not high, and there is a lack of agricultural products cold chain logistics professionals. For perishable and breakable agricultural products, it is precisely the complete cold chain logistics that is needed to guarantee, especially for storage, packaging, circulation processing and distribution.

Xinyu (2023) proposed that in the branding of agricultural products, it is difficult to standardize the taste, shape, quality and packaging of agricultural products, which is not conducive to the differentiation of brands and competitors, which restricts the premium and value-added of agricultural brands and hinders the development of rural agriculture. Rural e-commerce shortens the distance between markets and rural areas, saving many intermediary fees and cost expenses for agricultural producers and enabling consumers to buy different types of agricultural products at lower prices. Ma (2022) suggests that the rise and development of rural e-commerce is due to the decline in logistics costs and the improvement of the cold chain system. Rural e-commerce reduces intermediate links and provides a large amount of market information, enabling farmers to face consumers directly without intermediaries earning the price difference and achieving a win-win situation for both producers and consumers. Xiaoli, (2022) points out that buyers and sellers of agricultural products can realize information docking based on the Internet, which further reduces the cost of both sides of agricultural products transactions and saves the cost of agricultural products circulation.

However, it is difficult to guarantee the quality of the products because the transportation process will inevitably cause some damage to the fruits and the long-distance transportation has a greater impact on the freshness of the fruits. It is necessary to be able to guarantee the quality of the products in order to enhance the further sales of the agricultural products (Lin, Chen and Lai, 2022).

Based on the views of the above scholars, this paper summarizes that the research related to agricultural factors and rural e-commerce development effect mainly includes the characteristics of agricultural products, large-scale planting and breeding, packaging of agricultural products, branding of agricultural products, ways and means of information promotion of agricultural products, preferential prices of local agricultural products, and quality of local agricultural products. The following hypotheses are proposed:

H5: Agricultural factors have a positive contribution to the effect of rural e-commerce development

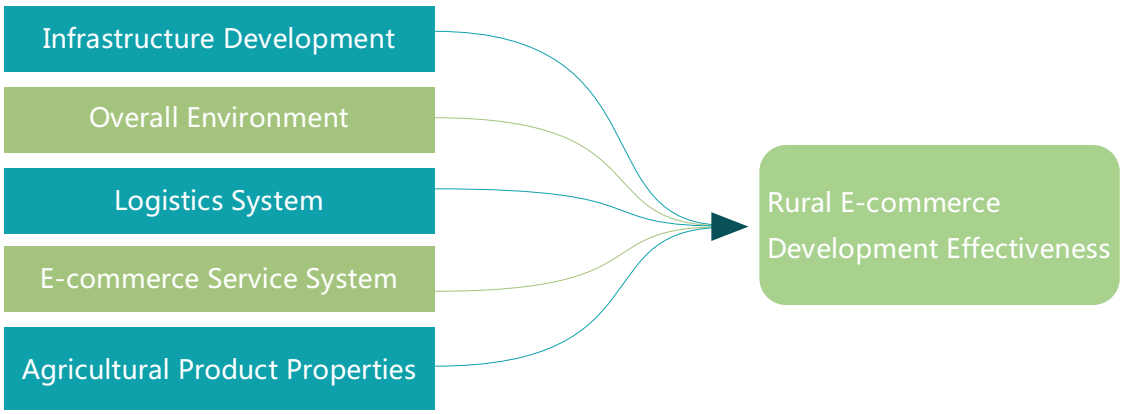

Figure 1: Proposed Research Framework

Research Methodology and Data Analysis

This paper explores the factors influencing the effectiveness of e-commerce development in rural SMEs in China, so the sample should be selected to have a high degree of involvement in e-commerce, relatively familiar with e-commerce online purchasing, and experience or practice in online purchasing.

Descriptive Analysis

The first step of the questionnaire analysis is to examine the distribution of the sample, i.e., the distribution of basic information about the people who participated in this research (Aldaihani & Ali, 2018). For example, the proportion of male to female, the proportion of different occupations, the proportion of different education levels, etc. After completing the collection of questionnaires, this paper preprocesses the basic data in the study and uses data analysis tools such as SPSS to conduct the next step of data analysis in order to explore the inner relationship behind the relevant data. In the basic information statistics of the respondents, the results of their descriptive detailed statistical analysis are shown in Table 1.

Table 1 Descriptive statistics of variables

Category		Number of people	Percentage (%)
Gender	Male	236	46.7
	Female	269	53.3
Age	18 years old and below	14	2.8
	19-29 years old	207	41.0
	30-39 years old	230	45.5
	40-49 years old	54	10.7
	Over 50 years old	0	0
Educational Background	High School and below	27	5.3
	University Specialists	106	21.0
	Undergraduate	343	67.9
	Graduate student and above	29	5.7
Average monthly income	Less than $2,500	58	11.5
	2500 RMB to less than 5000 RMB	135	26.7
	5000 yuan to 7500 yuan or less	126	25.0
	7,500 yuan to less than 10,000 yuan	145	28.7
	10000RMB and above	41	8.1
Frequency of Internet use per day	Less than 1 hour	32	6.3
	1 hour to 3 hours	169	33.5
	3 hours to 5 hours	226	44.8
	5 hours to 7 hours	63	12.5
	More than 7 hours	15	3.0
Number of online purchases per month	1 time	42	8.3
	2-5 times	258	51.1
	6-10 times	166	32.9
	More than 10 times	39	7.7

Reliability Analysis

In this paper, Cronbach's alpha (Cronbach's α) coefficient reliability test method is used. According to the relevant literature generally Cronbach's alpha value is greater than 0.7, which means that the reliability of the scale meets the requirements, its internal consistency is high and it has good reliability and can be further analyzed. If it is less than 0.7 then the questionnaire needs to be adjusted. The results of the reliability analysis of the current survey results are as follows:

Table 2 Overall reliability test for each dimensional question item

Item	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	117.16	481.553	.560	.947
Q2	117.13	475.942	.644	.946
Q3	117.02	480.964	.530	.947
Q4	117.09	476.593	.633	.946
Q5	117.14	479.546	.582	.947
Q6	117.32	469.054	.626	.946
Q7	117.17	465.480	.708	.946
Q8	117.16	468.918	.665	.946
Q9	117.21	469.468	.665	.946
Q10	117.17	472.491	.632	.946
Q11	117.31	473.457	.623	.946
Q12	117.09	472.538	.579	.947
Q13	117.03	469.969	.608	.947
Q14	116.99	471.823	.589	.947
Q15	116.88	475.272	.673	.946
Q16	116.83	478.533	.602	.947
Q17	116.98	474.958	.634	.946
Q18	116.93	476.934	.509	.947
Q19	116.96	475.247	.553	.947
Q20	116.91	474.507	.551	.947
Q21	116.99	473.006	.595	.947
Q22	117.04	477.352	.554	.947
Q23	116.84	479.981	.621	.947
Q24	117.02	471.938	.634	.946
Q25	116.99	482.833	.539	.947
Q26	117.21	475.065	.517	.947
Q27	117.07	477.091	.527	.947
Q28	116.94	477.300	.600	.947
Q29	116.94	478.944	.577	.947
Q30	117.01	480.020	.548	.947
Q31	116.93	474.054	.623	.946
Q32	117.03	469.600	.668	.946
Q33	116.82	503.238	.033	.950

As seen from Table 3, all the influence factor variables satisfy the condition of Cronbach's $\alpha > 0.7$, and the overall reliability is 0.948, which indicates that the questionnaire of this paper to study the influence factors of e-commerce development of Chinese rural SMEs has good reliability. And from the detailed scale reliability analysis in Table 2, it can be seen that the Cronbach's α values of all the questions after the deletion of items are not higher than the original Cronbach's α value of 0.948, and the CITC values are all greater than 0.4, which indicates that the questionnaire is reasonably set up. Therefore, all 33 measures selected in this paper were retained.

Table 3 Reliability analysis

Variable Dimension	Cronbach's alpha coefficient	Number of projects
Infrastructure Development	0.913	5
Overall Environment	0.926	6
Logistics System	0.924	6
E-commerce service system	0.864	4
Agricultural Product Factors	0.933	7
The effect of rural e-commerce development	0.898	5
Scale as a whole	0.948	33

Exploratory Factor Analysis(EFA)

The first step of the validity test is to analyze the data using the principal component analysis method in factor analysis, and based on the KMO values and the results of the Bartlett's spherical test, it can be judged whether factor analysis can be performed. Generally, the significance level of Bartlett's sphericity test is less than 0.05, which can be used as a criterion for conducting factor analysis. The value of KMO should also be considered. If the KMO value is above 0.9, it indicates that it is very suitable for factor analysis; if the KMO value is between 0.7 and 0.9, it indicates that it is suitable for factor analysis; if the KMO value is between 0.6 and 0.7, it indicates that it is not very suitable for factor analysis; and if the KMO value is below 0.6, it is not suitable for factor analysis.

Table 4 KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.949
Bartlett's Test of Sphericity	Approx. Chi-Square	12796.386
	df	528
	Sig.	0.000

From the results of data analysis in Table 4, it can be seen that the KMO value is 0.949, which is greater than 0.8, which indicates from one side that the validity is good, very suitable for information extraction and suitable for factor analysis; and the significance level Sig of Bartlett's spherical test is 0.000, which is less than the standard value of significance level 0.05, and the approximate chi-square value is 12796.386, which proves that the results are significant and the test is valid. Therefore, the questionnaire is suitable for factor analysis and the validity of the questionnaire is good.

Table 5 Total variance explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.219	40.058	40.058	13.219	40.058	40.058	5.248	15.904	15.904
2	3.363	10.189	50.248	3.363	10.189	50.248	4.503	13.644	29.548
3	2.334	7.071	57.319	2.334	7.071	57.319	4.368	13.236	42.784
4	1.901	5.761	63.080	1.901	5.761	63.080	3.769	11.422	54.206
5	1.850	5.606	68.686	1.850	5.606	68.686	3.517	10.657	64.863
6	1.533	4.647	73.332	1.533	4.647	73.332	2.795	8.469	73.332
7	0.568	1.721	75.053						
8	0.561	1.701	76.755						
9	0.489	1.483	78.238						
10	0.479	1.451	79.689						
11	0.456	1.383	81.072						
12	0.443	1.343	82.415						
13	0.437	1.325	83.740						
14	0.410	1.241	84.981						
15	0.392	1.187	86.168						
16	0.370	1.120	87.288						
17	0.359	1.089	88.377						
18	0.342	1.036	89.413						
19	0.331	1.004	90.417						
20	0.318	0.963	91.380						
21	0.299	0.906	92.286						
22	0.294	0.891	93.177						
23	0.282	0.856	94.033						
24	0.269	0.814	94.847						
25	0.238	0.720	95.567						
26	0.230	0.696	96.263						
27	0.215	0.650	96.914						
28	0.196	0.594	97.507						
29	0.191	0.580	98.087						
30	0.168	0.509	98.596						
31	0.163	0.495	99.091						
32	0.159	0.480	99.572						
33	0.141	0.428	100.000						

Extraction Method: Principal Component Analysis.

In the factor analysis process, Principal Factor Analysis (PFA) was used to extract six common factors with eigenvalues greater than one, and it was found that the total variance explained by the six factors was 73.332%, which was greater than 60%, so the validity of the scale was considered good.

Table 6 Rotated Component Matrix[a]

	Component					
	1	2	3	4	5	6
Q24	0.865					
Q25	0.848					
Q22	0.827					
Q26	0.817					
Q23	0.797					
Q27	0.788					
Q28	0.744					
Q16		0.829				
Q14		0.799				
Q15		0.789				
Q17		0.779				
Q12		0.773				
Q13		0.770				
Q7			0.806			
Q10			0.785			
Q6			0.760			
Q9			0.755			
Q11			0.749			
Q8			0.740			
Q5				0.853		
Q4				0.799		
Q2				0.795		
Q3				0.756		
Q1				0.705		
Q29					0.810	
Q33					0.803	
Q30					0.791	
Q32					0.686	
Q31					0.676	
Q18						0.781
Q21						0.779
Q20						0.736
Q19						0.702

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

Factor rotation by maximum variance orthogonal rotation allowed all scale question options to be categorized into six categories of factors, with each measurement question item having a loading higher than 0.5 and no double factor loadings being high. And the measurement question items under each dimension were aggregated together according to the theoretical distribution, indicating that the questionnaire has good structural validity.

Validation Factor Analysis

The convergence validity of the measurement model was examined by modeling it with AMOS 24.0, and the results are as follows.

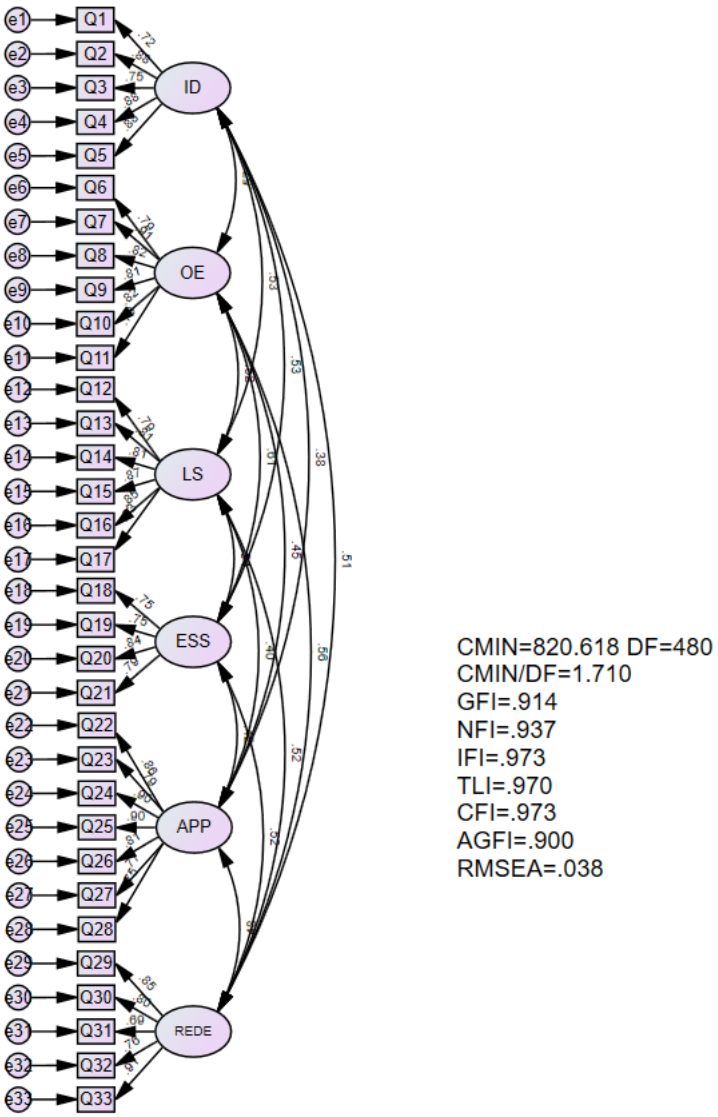

Figure 2 Measurement model modeling check

(ID: Infrastructure Development, OE:Overall Environment, LS:Logistics System, ESS:E-commerce Service System, APP:Agricultural Product Properties, REDE:Rural E-commerce Development Effectiveness)

Table 7 Fit test results

CMIN	DF	CMIN/DF	RMR	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
-	-	<3	<0.08	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	<0.08
820.618	480.000	1.710	0.040	0.914	0.900	0.937	0.931	0.973	0.970	0.973	0.038

According to the above table, the CMIN/df value is 1.71, which is less than 3; the RMSEA is 0.038 and the RMR is 0.04, which is less than the standard level of 0.08, indicating a good fit. the GFI, AGFI, NFI, IFI, CFI, and TLI are all greater than the standard of 0.9, and all the goodness-of-fit indicators meet the general criteria, indicating that the structural equation model established in this study is valid and the degree of fit with the recovered data is good.

Table 8 Convergent validity results

Variable	Item	STD. Estimate	CR	AVE
Infrastructure Development	Q1	0.724	0.915	0.684
	Q2	0.878		
	Q3	0.751		
	Q4	0.884		
	Q5	0.884		
Overall Environment	Q6	0.792	0.927	0.679
	Q7	0.905		
	Q8	0.821		
	Q9	0.810		
	Q10	0.823		
Logistics System	Q11	0.787	0.928	0.684
	Q12	0.793		
	Q13	0.807		
	Q14	0.814		
	Q15	0.867		
E-commerce Service System	Q16	0.851	0.865	0.615
	Q17	0.827		
	Q18	0.754		
	Q19	0.748		
	Q20	0.843		
Agricultural Product Properties	Q21	0.789	0.938	0.685
	Q22	0.857		
	Q23	0.792		
	Q24	0.903		
	Q25	0.897		
Rural e-commerce development effectiveness	Q26	0.808	0.901	0.647
	Q27	0.771		
	Q28	0.750		
	Q29	0.847		
	Q30	0.798		
	Q31	0.690		
	Q32	0.760		
	Q33	0.908		

As can be seen from the above table, the standardized factor loadings of each measure are greater than 0.6 or more, the compositional reliability (CR) is greater than 0.7, and the average variance extraction (AVE) is greater than 0.5, indicating that each variable has good convergent validity.

Structural Equation Modeling(SEM)

Based on the above analysis, the questionnaire of the factors influencing the development effect of e-commerce in rural SMEs in China passed the reliability and validity tests, from which it can be seen that the variables set in this study as well as the measurement questions have good reliability and validity. Therefore, structural equation modeling can be conducted on the model of factors influencing the development effect of e-commerce in rural SMEs in China. The hypotheses were tested by modeling the structural model with AMOS 24.0, and the results were as follows.

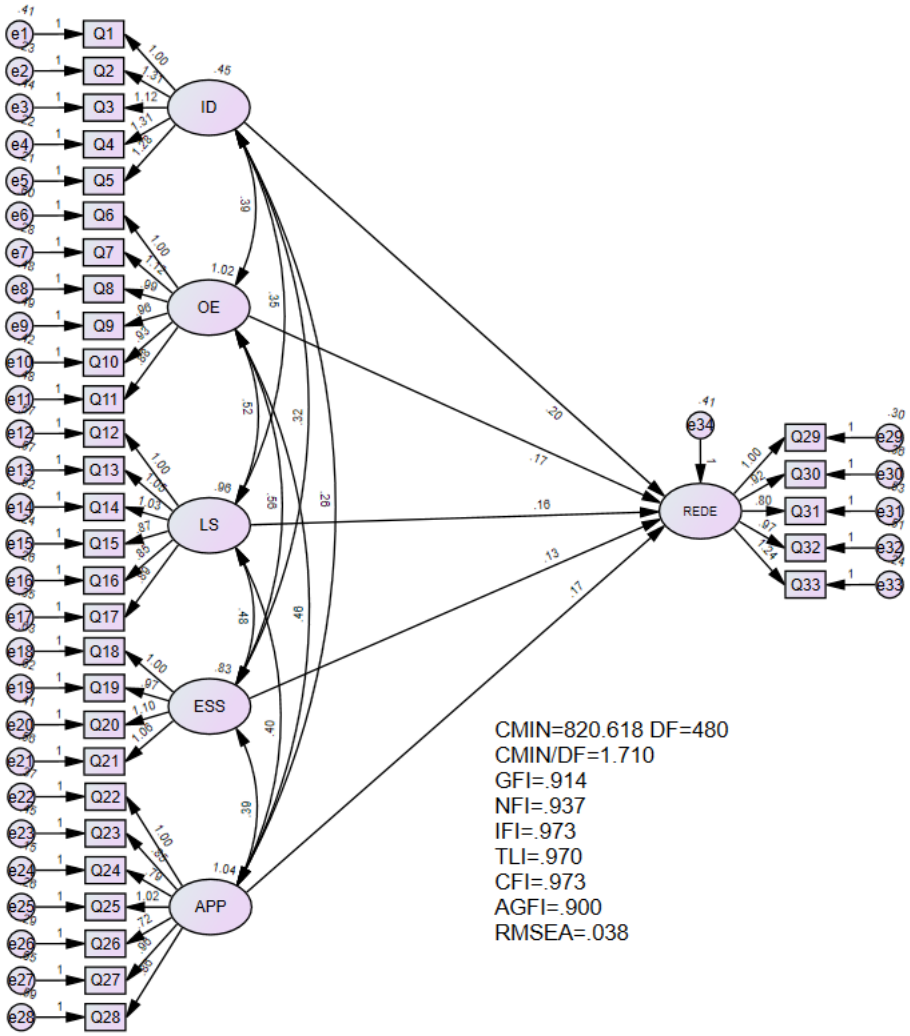

Figure 3 Structural equation model

Table 10 Fit test results

CMIN	DF	CMIN/DF	RMR	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
-	-	<3	<0.08	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	>0.9	<0.08
820.618	480.000	1.710	0.040	0.914	0.900	0.937	0.931	0.973	0.970	0.973	0.038

According to the above table, the CMIN/df value is 1.71, which is less than 3; the RMSEA is 0.038 and the RMR is 0.04, which is less than the standard level of 0.08, indicating a good fit. the GFI, AGFI, NFI, IFI, CFI, and TLI are all greater than the standard of 0.9, and all the goodness-of-fit indicators meet the general criteria, indicating that the structural equation model established in this study is valid and the degree of fit with the recovered data is good.

Table 11 Hypothesis testing results

Path			STD.Estimate	Estimate	S.E.	C.R.	P
REDE	<--	ID	0.153	0.198	0.066	2.989	0.003
REDE	<--	OE	0.203	0.175	0.048	3.660	***
REDE	<--	LS	0.179	0.158	0.045	3.536	***
REDE	<--	ESS	0.138	0.131	0.054	2.436	0.015
REDE	<--	APP	0.203	0.173	0.037	4.609	***

***, $p<0.001$

From the above table, we can see that Infrastructure Development ($\beta=0.153$, $p<0.05$), Overall Environment ($\beta=0.203$, $p<0.05$), Logistics System ($\beta=0.179$, $p<0.05$), E- commerce Service System ($\beta=0.138$, $p<0.05$), Agricultural Product Properties ($\beta=0.203$, $p<0.05$) on Rural E-commerce Development Effectiveness. All hypotheses are valid.

Results and Discussion

Through the research and understanding of the overall situation of e-commerce development of Chinese rural SMEs, and according to the process of data collection, questionnaire distribution and data analysis, the main influencing factors of e-commerce development effect of Chinese rural SMEs were obtained, and the results of the empirical research are in line with the research situation by combining the actual situation of relevant SMEs and professional cooperatives in rural areas. In general, the specific conclusions of this paper through field research and questionnaire research are as follows:

First, rural infrastructure development has a positive contribution to the development effect of rural e-commerce. With the changes and updates in the general environment of e-commerce, the immediate demand for product quality and fresh products is now increasing, and new requirements are being put forward for infrastructure construction. China's rural areas have basically achieved full Internet coverage, but the slow Internet speed and unstable signal in some rural areas cannot meet the needs of developing rural e-commerce, and the backwardness of rural infrastructure forms a big contradiction with the rapid development of rural e-commerce (Wei, 2017). There is a need to strengthen the construction of rural infrastructure.

Second, the overall rural environment has a positive contribution to the effect of rural e-commerce development. The results obtained from the questionnaire data analysis are consistent with those collected from the field research. The overall rural environment can be improved in terms of government policies, government cultivation and improvement of rural e-commerce market, villagers' awareness of rural e-commerce, humanistic environment (concepts, beliefs, etc.), villagers' literacy, and government financial support for rural e-commerce to promote the development effect of rural e-commerce.

Third, the logistics system has a positive promotion effect on the development effect of rural e-commerce. The development of the rural logistics system allows for a smoother sales path for the goods produced in rural areas (Xia, 2020). Villagers can not only trade locally, but also sell their products through the Internet and deliver them to consumers through the logistics route. The number of rural courier points, the types of couriers available, courier-to-village services, warehouse logistics construction, logistics cost savings, and the speed of updating logistics information can be used to improve the rural logistics system and promote the effectiveness of rural e-commerce development.

Fourth, the e-commerce service system has a positive promotion effect on the development effect of rural e-commerce. The development of rural e-commerce is inseparable from cultivating villagers' e-commerce awareness and professional e-commerce teams in the region, through building e-commerce industrial parks, carrying out related projects, introducing professional talents and cultivating local talents, etc. The construction of e-commerce service system is beneficial to the development of rural e-commerce, and the existence of professional e-commerce team can make the

development of rural e-commerce more standardized and systematic (Lan, Quan, Ziwei, Jiaqi, Xiangling, Wenjun, 2020). The rural e-commerce service system should be improved.

Fifth, the factor of agricultural products has a positive contribution to the development effect of rural e-commerce. In the e-commerce activities of rural SMEs, most of them revolve around the sales of agricultural products. The characteristics of the agricultural products themselves, whether they are planted and raised on a large scale, packaging, branding, publicity channels and the quality of agricultural products all have a certain influence on the sales of agricultural products. Establishing brand awareness of agricultural products, creating own brands, establishing large-scale and standardized planting bases and forming a complete chain of production, supply and marketing are the keys.

Management Recommendations

First, increase the construction of 5G networks, data centers, industrial Internet, Internet of Things and other new infrastructure in rural areas, and improve the construction of supporting infrastructure for rural e-commerce. At the same time, through the implementation of the policy of speed and fee reduction, we will reduce the cost of e-commerce network for agricultural products and expand the scale of Internet users in rural areas, thus promoting the development of rural e-commerce. Second, increase government policy support. Encourage and support innovation, carry out rural e-commerce innovation and entrepreneurship competitions and create strong rural e-commerce counties to promote e-commerce poverty alleviation. Increase credit and loan support for e-commerce start-up farmers, especially young farmers, and simplify the procedures for small short-term loans for rural online businesses. Eligible rural online businessmen can enjoy guaranteed loans and interest policies in accordance with the provisions of the business.

Third, strengthen the sharing and connection of rural logistics service networks and facilities, and accelerate the improvement of rural logistics systems in counties and villages. Reasonable planning of distribution routes, optimization of logistics distribution system, and improve distribution efficiency. Fourth, in the development of rural e-commerce, we should increase the investment in farmers' education and training, gradually improve farmers' education level, raise their awareness of the Internet and enhance their initiative to integrate into rural e-commerce. At the same time, for e-commerce talents among farmers, we can build training bases mainly in townships, play the supporting role of party schools and other carriers, train rich and diversified e-commerce skills, and ensure that e-commerce talents are more in place in Internet application. Fifth, accelerate the standardization and branding of rural e-commerce products. Give full consideration to the actual local situation, promote the innovative development of special agricultural products, play the leading role of the government, formulate unified standards for agricultural products, do a good job in qualifying agricultural products at the market level, deepen the cooperation with domestic giant e-commerce platforms and establish a special sales platform. At the same time, create local special products, so that rural revitalization contains more brand connotation, and improve the market influence and visibility of agricultural products.

Conclusion

This study explores some basic issues and inner laws of rural e-commerce in a more systematic way. Through literature collection and research, five factors that may affect the effectiveness of e-commerce development of rural SMEs in China are proposed, and the research hypotheses are verified through data analysis. Coordinating the resource allocation between supply and demand transactions of rural e-commerce is a basic guarantee for the healthy development of rural e-commerce and an important path to enhance the transformation of the agricultural industry. After empirical analysis, it is concluded that promoting the development effect of rural e-commerce can be done by strengthening the construction of rural infrastructure, improving the construction of the overall environment in which rural e-commerce is located, accelerating the improvement of rural logistics system, improving the rural e-commerce service system, and improving the factors of agricultural products themselves.

From a comprehensive point of view, the development of China's rural e-commerce is still in the exploration stage. The "three rural" issues are complex and changing, forcing all parties to constantly adjust the development mode and road of rural e-commerce. Only through continuous reflection and practice can China's rural e-commerce get better development. In addition, rural e-commerce is an ever-changing field of practice and a complex system, and the study of it is a new and open field that needs to be further deepened and expanded.

Research Limitations and Future Directions

The influencing factors on the development effect of e-commerce in Chinese rural SMEs can be further supplemented and improved. The thesis is based on the existing research base and the selection of indicators based on the research in rural areas, there are certain limitations, and there may be incomplete selection of indicators for the total impact factors.

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