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Retraction

Retracted: Application of a Fuzzy Information Analysis and Evaluation Method in the Development of Regional Rural e-Commerce

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] L. Wang, "Application of a Fuzzy Information Analysis and Evaluation Method in the Development of Regional Rural e-Commerce," *Advances in Multimedia*, vol. 2022, Article ID 4744099, 10 pages, 2022.

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Research Article

Application of a Fuzzy Information Analysis and Evaluation Method in the Development of Regional Rural e-Commerce

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As a new form of e-commerce, digital industry will become a tool to enhance regional competitiveness and win the allocation of resources, and its advanced degree is the standard to measure economic strength. In the process of development, countries and regions need to master their development status, so a set of digital industry evaluation index system is necessary to help various fields monitor the development status of e-commerce industry, aiming at providing more targeted services. Therefore, the establishment of regional digital industry progress index is conducive to evaluating and improving the development level of e-commerce. Because of the unbalanced development among different regions and the diversity and fuzziness of evaluation indexes, how to evaluate the development degree of cross-border electronic commerce in a region has become the main problem at present. In this paper, the evaluation index of regional promotion degree in cross-border electronic commerce is constructed, and on this basis, the intuitionistic fuzzy multiattribute group decision-making method based on induction is used to evaluate the promotion degree of regional cross-border electronic commerce. By analyzing the actual situation of cross-border Internet e-commerce comprehensive evaluation cases in various regions of Zhejiang Province, it is proved that this method is really effective. In view of this, this paper constructs an integrated multiangle monitoring index system of regional digital industry progress index, puts forward a subjective and objective method based on the principle of the minimum distance between the evaluated object and the ideal point, and combines the regional digital industry progress index with the comprehensive index method. The measurement model is used to measure the progress of digital industry in this region from June 2019 to June 2020, as an empirical object. The empirical results will show that this road is easy, and at the same time, we can fully grasp the progress of digital technology in a region.

1. Introduction

The digital industry will become the engine of China, and its contribution to the "Troika" will become increasingly prominent [1]. Online shopping is the new force of consumption growth, social e-commerce is the new hot spot of investment and entrepreneurship, and the digital industry will become the new power of this rise [2]. China is in the leading position in the world in the development of digital technology. In recent years, the trading volume ranks first in the world [3]. In 2017, the global online retail sales reached USD 2.3 trillion, with a growth rate of 24.8%, and the online retail sales in China reached USD 1.1 trillion (7.18 trillion yuan) [4].

In the late 1990s, some or other countries will explore digital measurement, for example, OECD and APEC. A digital network has been established in the EU [5]. These organizations created the system. The UK has experienced numerical development calculations [6].

In addition, foreign consulting organizations have also carried out measurement research on the progress of digital industry. Carney publishes Global Retail e-commerce Index every two years, and Nielsen publishes Global Digital Industry Progress Report every year [7]. Foreign scholars also began to evaluate the development of e-commerce earlier [8]. Drigo et al. analyzed the level of digital e-commerce in Singapore and emphasized the positive role of the government in establishing e-commerce infrastructure [9]. Luo

et al. investigated and analyzed e-commerce in nine underdeveloped countries with infrastructure problems [10]. A new interval type 2 fuzzy TOPSIS method is established to solve the problem of large-scale group decision-making, and the social network analysis community detection method is used to reduce the social relationship between large-scale decision-makers. These two kinds of fuzzy sets and the complexity of language variables are used to deal with uncertainty.

The research on measuring the progress of domestic digital industry started late but developed rapidly. China's government and market institutions have successively carried out research in this area [11]. Many domestic scholars have gradually studied e-commerce measurement [12], summarized the advantages and disadvantages of each measurement method, and provided theoretical and theoretical reference for China's e-commerce measurement [13]. Based on Alibaba's county-level digital industry progress index, the spatial distribution characteristics of county-level digital industry development was expounded by using ESDA and standard elliptic analysis method, and the significant influence of retail industry on e-commerce was pointed out by using multiple linear regression method. Business development plays a very important role. Through the study of the existing literature, it can be found that foreign countries mainly focus on theoretical research, aiming at providing theoretical topics for reference [14]. However, these theories and systems are not applicable to every country and field. Sometimes, there is lack of practice. Digital industry research is only a branch field in China, and there is little research on the actual progress of development indicators. CII will be used in this study, but the progress of ECI is slow [15].

Rural e-commerce can effectively solve the economic problems faced by rural development. A successful Internet e-commerce platform can break through the bottleneck of the development of agricultural product consumption market, solve the fundamental contradiction of small output and large market in rural development, and let industrial products and industrial consumer goods flow to rural areas and at the same time let rural agricultural products flow to cities. On the one hand, it can increase farmers' agricultural income. With the increase of farmers' income, the vast countryside will also become a brand-new consumer market for industrial products and industrial consumer goods, which will complement each other and provide for what is needed, so that farmers' living standard and quality of life will be improved synchronously, along with the development of rural e-commerce. Therefore, this paper constructs a comprehensive, accurate, and operable evaluation index system for the development level of Internet e-commerce to measure the development level of regional e-commerce. At the same time, it innovates methods in the determination of index weights and the quantification of index dimensions, which fully embodies the scientific and reasonable statistical quantification measurement process and truly and effectively evaluates the development of regional Internet e-commerce according to the data of various dimensions.

2. The Latest Technology

2.1. Related Concepts. With the wide application of the Internet in daily life, Internet e-commerce has become a very familiar term for our modern ordinary residents, and e-commerce has become a popular choice for our daily shopping. Taobao, JD.COM, and other e-commerce websites developed rapidly in the past years. e-commerce has become a part of our daily life. e-commerce has long been inseparable from our present life, as shown in Figure 1 [16]. Among them, the east coast has the fastest growth, with the largest number of e-commerce trading companies and e-commerce sales. In contrast, e-commerce trading companies, e-commerce sales, and e-commerce purchases in Northwest China are the least. However, e-commerce purchases in the northern coastal areas account for the most. As soon as possible, its other two indicators are not as good as those of the east coast. The difference of these data is mainly due to the different levels of economic development in different regions and the unbalanced economic development in different regions.

Internet e-commerce refers to the use of Internet and network information technology to carry out various business activities in the form of network e-commerce. Specifically, it means that suppliers, customers, consumers, and managers of commodities (government, trade associations, etc.) communicate with each other through e-mail and instant chat tools, share all kinds of business information, and use electronic tools to manage and complete trading activities [17]. In a narrow sense, e-commerce refers to the business model of the trading party based on the Internet. Broadly speaking, e-commerce refers not only to the use of various electronic tools of computer network but also to the use of traditional communication tools such as telephone and fax to seek low-cost and quick ways [18].

In other words, the digital industry will damage the old and traditional industries. Because the application in the digital industry will reduce the cost, there is a market cost and a sales platform. The reduction of transaction cost can make online merchants sell at a lower price than the traditional market and sell the same products. By developing e-commerce, poverty-stricken areas can reduce the disadvantages caused by regional market differences, thus giving full play to their advantages in products, costs, and resources. The application of e-commerce gives manufacturers or suppliers the opportunity to contact consumers directly and get feedback information from consumers more quickly and effectively.

Rural e-commerce mainly focuses on a series of Internet electronic transactions and management activities such as agricultural products and processed products entering the city and consumer goods going to the countryside, including agricultural production and management, agricultural information services, online sales and electronic payment of agricultural products (consumer goods), logistics management, and customer relationship management [19], as shown in Figure 2.

It uses the Internet and information technology to improve the production, processing, and circulation of

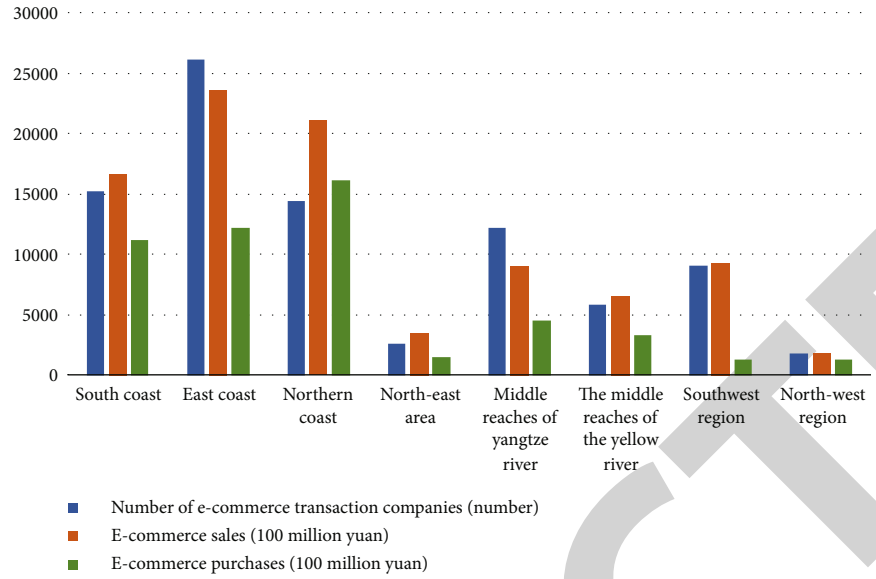

Figure 1: Regional e-commerce transactions.

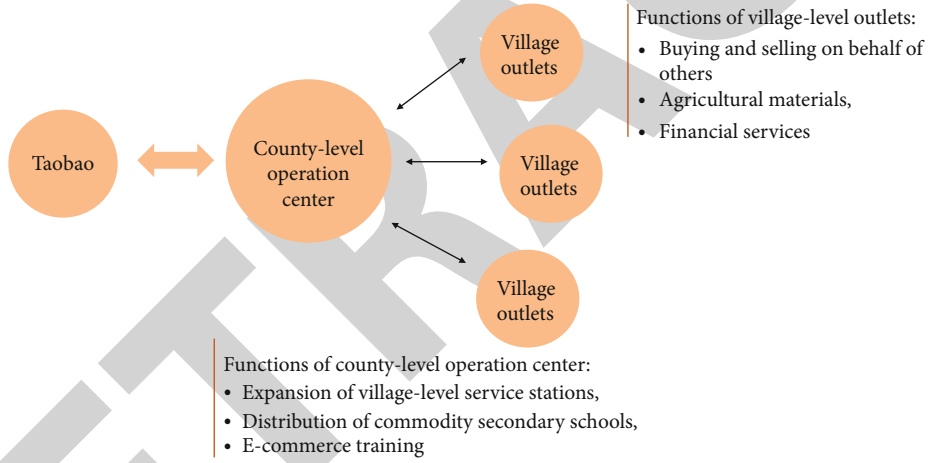

Figure 2: Schematic diagram of rural Taobao "County-to-Township Communication" service system.

agricultural products; improve business efficiency; benefit consumers and farmers; and finally improve the level of rural economic development. Rural e-commerce usually has three levels of meaning [20].

It mainly refers to farmers who sell various agricultural products on Taobao and other e-commerce platforms. The whole transaction process is completed in the remote network, and the transaction efficiency is very high. Service informatization refers to the close integration of agricultural production, processing, transportation, sales, product upgrading, and other trading processes with the Internet, so that farmers can get the latest information in time, thus improving their thinking level and gaining greater profits. Income mainly refers to the government's publicity and education to farmers and strengthening the construction of rural network infrastructure, so that agriculture can also conduct online transactions, thus improving farmers' living standards and rural economic vitality [21].

In terms of the popularization of rural facilities and websites, China's digital industry is booming in rural areas, its mode is changing to a higher level, and its transformation scale is also expanding. e-commerce giants are emphasizing the benefits of rural areas, especially in the "Internet Plus" wave driven by Alibaba and JD.COM. NetEase and Suning have made great efforts in rural e-commerce, and Alibaba's "One Thousand Households Plan" will also cover one-third of the top counties and one-sixth of the rural areas in the next few years, so as to promote rural offline service entities. In the next few years, the digital industry will occupy one-third of counties and one-sixth of rural areas.

The concept of "Taobao Village" is defined by Ali Research Institute, and it is the spatial form of e-commerce cluster. "Taobao Village" means that the digital industry will gather in the countryside with the help of Taobao's crutches [22]. On this basis, the scale and synergy of online business agglomeration have been formed. The identification criteria

of "Taobao Village" include the following: (1) trading place: the business place is located in the rural area with administrative village as the unit; (2) transaction scale: the annual transaction volume of e-commerce reaches more than 10 million yuan; (3) online business scale: there are 100 active shops in rural areas, or the number of active shops in Tobago reaches 10% of that in rural China [23].

According to the "2020 China Taobao Village Research Report" released by Ali Research Institute, the annual transaction volume of Taobao Village exceeds 1 trillion yuan. As of June 2020, there were 5,425 Taobao villages in China, which employed 8.28 million people. At present, there are 745 Taobao villages, with an annual turnover of over 100 million yuan, and there is a Taobao Village with a scale of 10 billion yuan, namely, Dayuan Village in Guangzhou. Among the "100 million Taobao villages," Zhejiang ranked first with 271, Guangdong ranked second with 234 million, and Jiangsu ranked third with 103. In 2020, the number of eligible Taobao villages increased by thousands, and the data showed that Taobao towns increased by more than 600.

2.2. Basic Theory. Location theory, also known as location theory, is about the spatial distribution of human activities and their spatial relations. Agricultural location theory was first put forward by German economist Du Fu, which marked the emergence of location theory [24]. Later, under the influence of Dunn's agricultural location theory, German geographer Weber put forward the industrial location theory. Generally speaking, location theory can be divided into enterprise (consumer) location, industrial location, and urban location. Location of merchants (consumers) mainly studies the optimal location of a single merchant or consumer, with the lowest cost of attention and transportation. Industrial location theory mainly studies industrial location. The urban location theory mainly studies where the central city develops and where the trade gathers, that is, the location of the city. Under the regional environment, e-commerce can meet the needs of rural labor market and rural life and effectively alleviate the possibility of building supermarkets or supermarkets in rural areas.

The concept of industrial cluster was put forward by Michael Porter, which refers to the gathering of a large number of affiliated enterprises in a region and the formation of super competitive advantage through specialized division of labor and cooperation [25].

The perfection of industrial cluster theory is inseparable from Porter's research. It is also influenced by the theories of many other scholars, such as Marshall, Weber, Coase, and Krugman, and other scholars who have made great contributions to the perfection of the industrial cluster theory. This paper studies the development form of rural e-commerce through the relevant theories of industrial clusters. The commercial characteristics of e-commerce determine that the industrial cluster of rural e-commerce is far more complex than traditional industries, with strong industrial relevance [26].

With the third-party e-commerce platform constantly launching strategic measures to promote the development of rural e-commerce, e-commerce is integrating into China's rural areas at an unprecedented speed, showing the characteristics of cluster development. The development of rural e-commerce industry cluster based on e-commerce platform is influenced by five factors in the evolution process: location advantage, leading enterprises, external economy, social network, and government behavior.

3. Methods

3.1. Analysis Method. This chapter constructs a regional digital industry progress index system from five aspects: regional economic development, regional informatization, transportation and logistics, rural economic development, and rural informatization [27]. Through quantitative analysis of provincial administrative regions in China, the differences of regional development degree are obtained, and then, the influencing factors and formation mechanism of regional e-commerce spatial layout are discussed [28].

Comprehensive evaluation methods mainly include principal component analysis, entropy method, fuzzy comprehensive evaluation method, and linear weighted analysis method [29]. Based on the practical economic significance and the interpretability of the measurement results, this paper selects fuzzy comprehensive analytic hierarchy process (AHP) combined with entropy weight method for measurement and analysis on the basis of traditional comprehensive evaluation methods. The whole process of measuring the advanced degree of regional e-commerce includes data collection and processing, dimensionless indicators, determination of indicator weights, and calculation of indicators at all levels and the total amount of indicators [30].

Entropy method is an objective weighting method, which determines the weights of indicators according to the information provided by the observed values of various indicators. In information theory, entropy is a measure of uncertainty.

Fuzzy comprehensive evaluation method is a comprehensive evaluation method based on fuzzy mathematics. According to the membership degree theory of fuzzy mathematics, comprehensive evaluation method transforms qualitative evaluation into quantitative evaluation; that is, fuzzy mathematics is used to comprehensively evaluate things or objects that are restricted by many factors.

Nuclear density analysis is one of the basic problems of probability statistics. It is used to solve the distribution density function of random variables from a given sample point set. The methods to solve this problem include parametric estimation and nonparametric estimation. Parameter estimation can be divided into parameter regression analysis and parameter discriminant analysis.

Analytic hierarchy process (AHP) can effectively concentrate experts' opinions and make the weight distribution conform to the theoretical basis and practical experience. The determined value may lack scientificity and objectivity. Entropy weight method can obtain objective weights based

on mined data, but the weights based on data alone are often inconsistent with actual experience. Therefore, the comprehensive weighting method is an ideal method, and its basic principle is as follows.

(1) Standardization of raw data

$$\tilde{X}_{ij} = \frac{X_{ij} - \bar{X}_j}{S_j} \tag{1}$$

When constructing the regional digital industry progress index, this paper follows the general principle of statistical index construction. First, calculate the basic classification index, and then, calculate the weighted average of the category and the total index. The subindex is calculated by Laplace index, and the aggregate index is calculated by weighted index. In the process of compiling, the evaluation index is selected according to the characteristics of e-commerce industry and regional market. The indicators compiled in this paper are monthly indicators, which can dynamically reflect the development of regional e-commerce.

$$\tilde{x}_{ij} = \frac{1}{n}\sum_{i=1}^{n} x_{ij}. \tag{2}$$

(2) Calculate the correlation coefficient matrix R, eigenvalue, and eigenvector

$$r_{ij} = \frac{1}{n-1}\sum_{k=1}^{n} \tilde{X}_{ki}\tilde{Y}_{kj} \tag{3}$$

(3) Calculate the contribution rate and cumulative contribution rate

$$e_i = \frac{\lambda_i}{\sum_{i=1}^{n}\lambda_i}, \quad \alpha = \frac{\sum_{j=1}^{m}\lambda_j}{\sum_{i=1}^{n}\lambda_i} \tag{4}$$

(4) Calculate the principal component score

Bring the normalized raw data into the formula, where q is the number of extracted principal components.

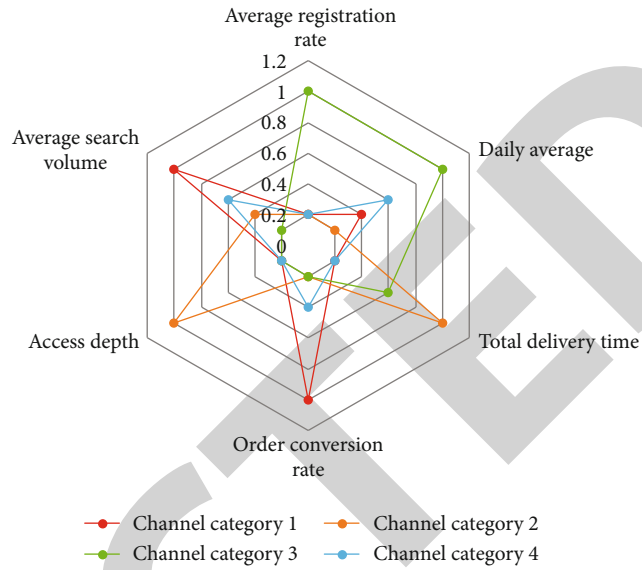

Figure 3: Comparison of salient features of each cluster category.

$$F_j = \sum_{k=1}^{n} u_{kj}\tilde{X}_k. \tag{5}$$

(5) Cluster analysis

According to the corresponding scores of each factor, cluster analysis is carried out in each province to evaluate the development degree of rural e-commerce. The salient feature pairs of each cluster category are shown in Figure 3. The salient feature pairs of each cluster category are shown in Figure 3. Channel category 3 has the highest average registration rate and daily average score, channel category 1 has the highest average search volume and order conversion rate, while channel category 2 has the highest access depth and total delivery time. However, channel category 4 has low scores in all areas, but it is also the most balanced.

3.2. Index Selection. This paper analyzes the related factors affecting the development of regional e-commerce and then, based on the enlightenment of several typical digital industry promotion indicators at present, from the perspective of regional economic development and regional informatization, constructs the evaluation index system of regional digital industry development used in this paper from five aspects: industrialization level, transportation and logistics level, informatization level, informatization level, and informatization level. Rural economic development level and rural informatization level include 18 secondary indicators, thus ensuring the reliability of the index system and the authenticity of the evaluation results (see Table 1).

In this paper, we use open test to classify query intentions. The evaluation parameters used in query classification are precision (P), recall rate (recall rate), and F value (calculated according to precision P and recall rate). These indicators were obtained through deliberation. For

Table 1: Index system of influencing factors of regional e-commerce development.

Primary index	Secondary index	Index interpretation	Number
Regional economic development level	Per capita GDP	Yuan	E1
	GDP growth rate	%	E2
	Industrial contribution rate	Industrial added value/regional GDP	E3
	Contribution rate of tertiary industry	Added value of tertiary industry/regional GDP	E4
Regional Informatization	Proportion of e-commerce transactions	e-commerce transaction volume/regional GDP	I1

Table 2: Whether the n queries belong to the division of navigation class.

	Divided into navigation classes	Classified as nonnavigation
It was originally a navigation class	A	B
Originally non navigation class	C	D

example, in a given query test set belonging to navigation class N, its output is processed using a classification algorithm, as shown in Table 2.

Then, the accuracy rate is $P = aa + c$, which means that the query is classified into navigation class by the classification algorithm, which is also the ratio of navigation class query to nonnavigation class query.

The recall rate is $R = aa + b$, which indicates the proportion of queries that originally belong to navigation category, navigation category, and original nonnavigation category that are classified into navigation category by the classification algorithm. The value of$f$is calculated from the precision$P$and the recall rate$R$.

$$F_\beta = \frac{\left(1+\beta^2\right)P * R}{\beta^2 * P + R}. \tag{6}$$

β is a parameter, and its general values are 0.5, 1.0, and 2.0. It can be seen from the formula that when the accuracy and recall rates are high, the F value is also high. The F value comprehensively considers the accuracy and recall rate, which can better reflect the comprehensive performance attributes of the classifier. However, precision, recall, and F value can only evaluate the parameters of one attribute.

The average macro precision is

$$\mathbf{P} = \frac{\sum_{i=1}^{m} P_i}{m}. \tag{7}$$

The average macro recall rate is

$$\mathbf{R} = \frac{\sum_{i=1}^{m} R_i}{m}. \tag{8}$$

The microaverage accuracy is

$$\mathbf{P} = \frac{\sum_{i=1}^{m} a_i}{\sum_{i=1}^{m} (a_i + c_i)}. \tag{9}$$

The microaverage recall is

$$\mathbf{R} = \frac{\sum_{i=1}^{m} a_i}{\sum_{i=1}^{m} (a_i + b_i)}. \tag{10}$$

When dealing with the dimensionless indicators, it is considered that the e-commerce industry has both positive indicators, such as those reflecting the growth of e-commerce, reverse indicators, and some intermediate indicators, such as those reflecting the structure of e-commerce. This paper deals with positive indicators, reverse indicators, and moderate indicators according to the following methods.

4. Result Analysis and Discussion

4.1. Regional Digital Industry Progress Index. Based on the principles of industrial economics, information economics, and statistics, this paper describes and analyzes e-commerce operation, e-commerce activities, e-commerce integrity, and e-commerce fields from five dimensions: e-commerce environment, e-commerce integrity, information technology, and information technology, according to the development characteristics and market situation of Internet e-commerce in Area A. Considering the availability and comprehensiveness of data, combined with relevant theories, this paper measures and selects the classification index of digital industry progress index in Area A from the following two aspects: first, measure Area A. The second is to measure the comprehensive development of regional e-commerce industry, which is mainly reflected in e-commerce, as shown in Table 3. Table 3 mainly explains the meaning of the indicators used in this paper, such as e-commerce environment index, which can reflect the development degree of e-economy inside and outside the region; e-commerce credibility index measures the credibility of e-commerce according to the performance of e-commerce in the region.

4.2. Empirical Analysis of Regional Digital Industry Progress Index. Through data collection, cleaning, integration, and analysis by market supervision bureau, commerce bureau, finance bureau, statistics bureau, and other departments and e-commerce platforms such as Alibaba and Taobao, the overall operation profile of the digital industry obtained

Table 3: Names and contents of digital industry progress index A subindex.

Index name	Index content
e-commerce environment index	The feasible indicators that reflect the internal and external environment of e-commerce development in Area A mainly include the external environment of investment, economy, trade, finance, logistics closely related to e-commerce, the support of local government to e-commerce, the environment of e-commerce infrastructure (including information flow), logistics costs and services closely related to e-commerce, and the internal business environment of enterprises themselves.
e-commerce credibility index	For the integrity of e-commerce business entities in Area A, the feasible indicators are mainly selected from three aspects: compliance, performance, and reputation.

Table 4: Changes of digital industry progress index.

Time	Total index	Environmental index	Integrity index	Activity index	Growth index	Contribution index
2015.10	112.45	105.50	102.82	116.10	126.84	110.04
2015.11	108.90	99.73	97.66	113.05	94.87	138.08
2015.12	109.29	110.69	99.76	95.87	116.65	127.00
2016.1	107.66	105.30	97.43	99.20	102.21	136.39
2016.2	85.69	88.48	101.04	59.65	71.14	114.97
2016.3	122.00	106.65	96.77	138.55	118.85	144.81
2016.4	109.58	103.02	91.93	106.57	100.67	146.52

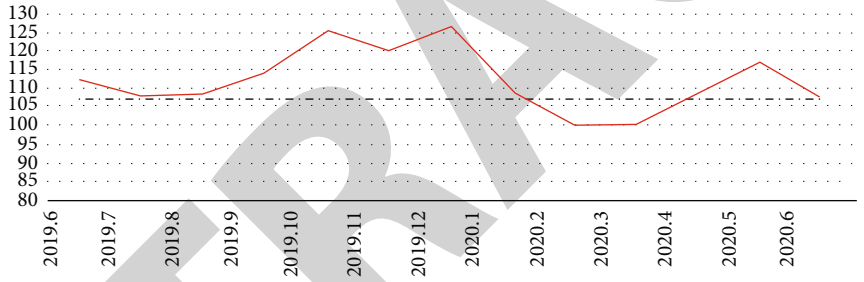

Figure 4: A trend of digital industry progress index.

the progress index and five secondary indexes of Area A from June 2019 to June 2020. See Table 4 for the overall development indicators and the overall operation of five secondary indicators. As shown in Table 4, the indicator was the lowest in February 2016; that is, the growth rate declined in February 2016.

The dynamic change of the overall promotion index of digital industry in District A reflects the monthly comprehensive promotion degree of e-commerce. As can be seen from Figure 4, from June 2019 to December 2019, it increased; from December 2019 to March 2020, there was a decline. The recession coincided with the most famous Great Depression. From June 2019 to June 2020, except for the period affected by the first COVID-19 epidemic, the deviation between the overall digital industry progress index of Area A and the historical average is relatively low; that is, the overall digital industry progress index of Area A fluctuates in the historical average and the overall trend is stable.

The change and interaction of each subindex can reflect the development of Internet e-commerce from different levels, as shown in Figure 5. As can be seen from Figure 5, the overall contribution index shows an upward trend, with only two special periods of decline, one in January 2019 and the other in March 2020. From November 2019 to April 2020, the activity index experienced a Waterloo-like decline. This shows that this indicator has suffered a heavy blow during this period. Integrity index and environmental index are relatively stable, with no obvious increase or decrease. The growth index generally shows a downward trend, reaching the lowest point in January 2019, and then rising. However, it was affected again in March 2020, causing it to decline again. From June 2019 to June 2020, the overall e-commerce contribution index fluctuates greatly and frequently, with the lowest point in February 2019; e-commerce environment index is between January and March 2020.

In November, 2015, due to the double effects of "Double Eleven," especially the drag of growth index, environmental index, and credibility index, the overall index dropped slightly to 108.90. However, driven by growth index and environmental index, the overall index rose to 109.29 in December, 2015.

4.3. Analysis Process. As the leading province of China's e-commerce development, A has many excellent Internet enterprises rooted and developed locally, creating a good

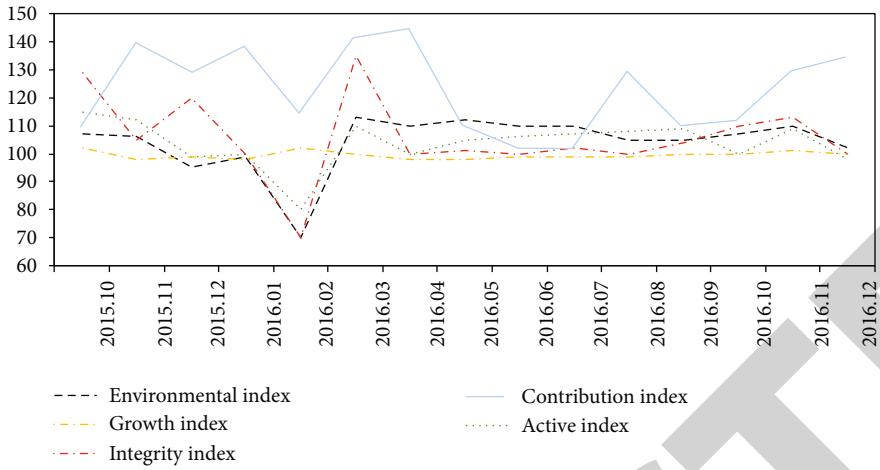

Figure 5: Time trend of digital industry progress subindex in A.

Table 5: Eigenvalue and contribution rate.

Principal constituent	Initial eigenvalue			Extract the sum of square load		
	Sum of eigenvalues	Contribution rate (%)	Cumulative contribution rate (%)	Sum of eigenvalues	Contribution rate (%)	Cumulative contribution rate (%)
One	10.766	56.665	56.665	10.766	56.665	56.665
2	2.783	14.647	71.312	2.783	14.647	71.312
Three	1.622	8.538	79.850	1.622	8.538	79.850

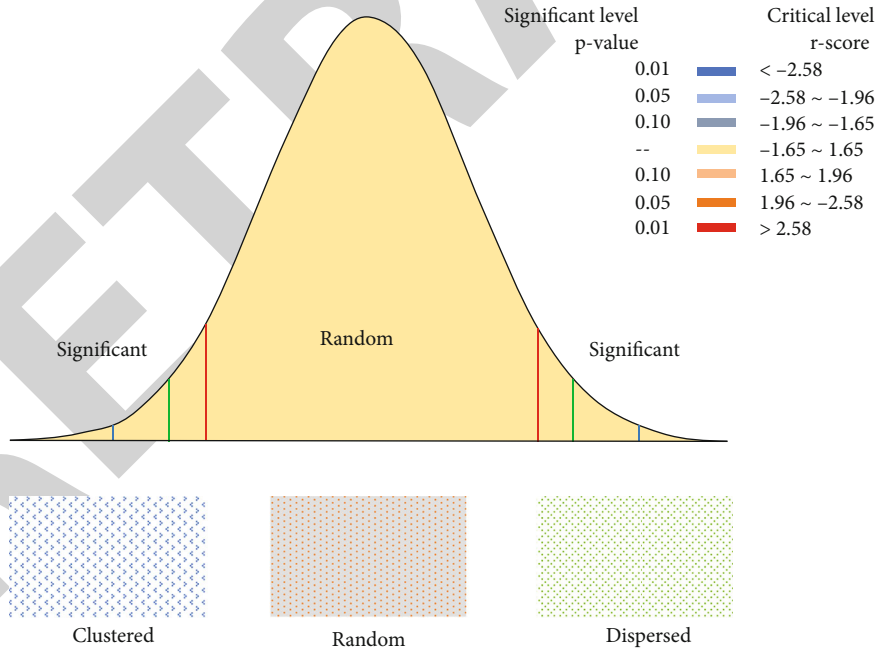

Figure 6: Spatial cluster diagram of nearest distance judgment.

environment for the development of e-commerce. In 2019, the retail sales of Area A totaled 19.73 billion yuan, up 18.4% year-on-year, second only to Guangdong Province and the whole country.

First, we use SPSS20. 0 software to calculate the correlation coefficient matrix between variables. The results are shown in Table 5.

The variance (information quantity) of the original variables occupied by each principal component is described in the table above. The first column is eigenvalue, the second column is contribution rate, and the third column is cumulative contribution rate. The greatest use of principal component analysis is to integrate multiple factors into the most representative ones. Table 5 shows that three common

factors are extracted from the principal components. The first factor can extract most components. The first factor is, for example, the sum of eigenvalues of the first principal component which is 10.766, the contribution rate is 0.4274, and the cumulative contribution rate is 0.4274. Other factors are similar. When the cumulative contribution rate reaches 75% and only a small part, the original information is lost. Therefore, here, we extract the first three factors for analysis, as shown in Figure 6.

From the national point of view, the spatial gradient pattern in which the number of Taobao villages decreases from the east coast to the west inland is still stable. Compared with 2020, the four-tier echelon pattern has been further strengthened, with the eastern coastal provinces with Zhejiang and Guangdong as the leader as the first echelon, the four central provinces (Henan, Anhui, Hubei, and Jiangxi) close to the eastern region as the second echelon, the six central and western provinces and cities (Shaanxi, Sichuan, Chongqing, Hunan, Guangxi, and Liaoning) as the third echelon, and other central and western provinces as the fourth echelon.

5. Conclusion

The development of cross-border electronic commerce is a complex system driven by major factors such as economy, politics, society, technology, and law. These factors are interrelated and influence each other. According to the new development trend of Internet e-commerce, this paper puts forward the evaluation system of Internet e-commerce development level, constructs the evaluation index system of Internet e-commerce development level, uses the concept of intuitionistic fuzzy set to solve the fuzziness and uncertainty of evaluation, and uses the multiattribute group decision-making method of intuitionistic fuzzy evaluation of cross-border electronic commerce's regional promotion degree. Considering the objective weight of indicators, it avoids the randomness of evaluation process. The main innovation is as follows: from the five dimensions of environment, honesty, activity, growth, and contribution, a five-dimensional evaluation model of the development level of Internet e-commerce is constructed, and the development of regional Internet e-commerce is comprehensively measured in this evaluation system. The development level of Internet commerce has gradually become an important indicator to measure the economic development level and quality of a country, city, and region, and it has also gradually become a key factor to measure the degree of modernization and the quality of life of residents in a region.

Data Availability

The labeled data set used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

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