Evaluation of Digital Rural Development from the Perspective of Rural Revitalization – Take Zhejiang Province as an Example

Songyan Zhang* and Simin Wu

School of Economics and Management, Zhejiang University of Science and Technology, Hangzhou 310023, Zhejiang, People's Republic of China
E-mail: syzh201@163.com; suerte91@163.com
**Correspondence Author*

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Abstract

The construction of the digital village is a combination of the concept of digital economy and the strategy of rural revitalization, which requires a correct understanding and scientific evaluation. Taking Zhejiang Province as the research object, based on the actual situation and the connotation of digital villages, a digital village indicator system was constructed from the two dimensions of digital village development capacity and development effectiveness, and the relative entropy TOPSIS method was used to analyze the digital villages in Zhejiang Province from 2016 to 2019. Compare and evaluate the development level. The results show that the development of digital villages in Zhejiang Province has achieved remarkable results, and the development level of digital villages has been improved year by year. Among them, the index scores of industry digitalization, governance digitalization, service digitalization, digital life, agricultural production, farmers' prosperity,

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and rural prosperity have achieved stable or rapid growth. The close value of TOPSIS is increasing year by year. Finally, it puts forward countermeasures and suggestions to promote the development of digital villages across the country.

Keywords: Rural revitalization, digital village, index system, entropy method, TOPSIS method.

1 Introduction

In 2016, the concept of "digital economy" at the G20 summit came into being in my country. The digital economy is defined as "using digital knowledge and information as key production factors, modern information networks as important carriers, and effective information and communication technologies. Modern network technologies provide the essential infrastructure for information and communication systems in the hospital today. So far as we know, information networks are artificial, with perhaps the best-known example being the World Wide Web. Use a series of economic activities as an important driving force for efficiency improvement and economic structure optimization" [1]. In 2018, the "Opinions of the Central Committee of the Communist Party of China and the State Council on the Implementation of the Rural Revitalization Strategy" [2] first proposed the development of a "digital village" strategy. Digital Village will have a one-stop service solution for the village area citizens, providing them with quality services like telemedicine, financial services, internet connectivity, and other Government-to-Citizen (G2C) and Business-to-Consumers (B2C) services which are easily accessible at an affordable price around. The opinions stated that the core productivity of digital technology should be fully utilized and the Internet, cloud computing and big data New digital technologies such as the Internet of Things, 5G, and artificial intelligence have been widely used in agricultural and rural areas. In this context, the development of digital villages accompanied in new opportunities. Although we increasingly view this as conducting business through marketplaces based on the internet and the World Wide Web, the term "digital economy" refers to an economy built on digital computer technology. A digital economy enables firms to cut out an aspect of the retail chain and send personalized goods directly from factories or warehouses to people's goods, rather than through shops.

The development of digital villages, by integrating the concept of digital economy and the strategy of rural revitalization, promotes agricultural

upgrading, rural progress, and farmer development [3], and finally realizes rural revitalization. Since my country's research on digital villages is in its infancy, there is little research on the construction and measurement of digital village index systems. The more cutting-edge research is on the construction of digital economy and rural revitalization index systems. Therefore, in the existing development environment such as the digital economy and rural revitalization, this article aims to clarify the connotation of digital villages and construct an evaluation index system that can measure the development level of digital villages, so as to consider the development status and development of digital villages in Zhejiang Province. Effectiveness. Zhejiang province has a wealth of tourist resources, making it one of China's most developed tourism regions. Many tourism resources, on the other hand, are being depleted or damaged as a result of haphazard development and usage. Rural revitalization is a way of positively transforming rural areas for present and future generations, as described in this signature chapter co-authored with UNDP. The digital economy refers to a broad range of economic activities that use digitized information and knowledge as key factors of production.

2 Literature Review

With the continuous advancement of the concept of the digital economy, related research has become more and more in-depth. In the measurement of the digital economy, the China Academy of Information and Communications Technology released the "White Paper on China's Digital Economy Development (2017)" and proposed including macroeconomics, basic capabilities, basic industries, and integrated applications. Four levels of digital economy indicator system. Wang Ruyi [4] established an indicator system of 5 first-level indicators and 19 second-level indicators from the five aspects of digital infrastructure, core industries, personal applications, social applications, and government applications. Liu Jun et al. [5] defined the connotation of the digital economy from the perspective of informatization, constructed 3 first-level indicators, including information development, Internet development, and digital transaction development, and 14 second-level indicators, and measured China's provinces from 2015 to 2018 The level of economic development. Zhao Tao, Zhang Zhi, etc. [6] comprehensively evaluated the comprehensive development level of the digital economy from two aspects: Internet development and digital financial inclusiveness. Digital financial inclusion entails using cost-effective digital means to reach currently financially excluded and underserved populations with a range of formal financial

services tailored to their needs, delivered responsibly at a cost that is both affordable to customers and sustainable for providers.

The development of digital villages relies on the continuous extension of the concept of digital economy to agricultural and rural areas, so that digital technology can be promoted and used in rural areas. The ultimate goal of digital village development is to realize rural revitalization. Therefore, rural revitalization is closely related to digital villages, and relevant evaluation research can provide important reference for digital village evaluation. In the research on the index system of rural revitalization, Zhang Ting [7], Mao Jinhuang [8], Yi Xiaoyan [9], Li Tan [10] and others are based on industrial prosperity, effective governance, ecological livability, rural civilization and life. The five major wealthy rural revitalization strategic objectives are the first-level indicators, and different second-level indicators are set up to form a distinctive rural revitalization evaluation system. Guo Xiangyu and Hu Yue [11] used Xi Jinping's important expositions on the work of "agriculture, rural areas and farmers" and implementation of rural revitalization strategies, as well as relevant policy documents of the Party and the state as guidance and basis, to construct rural economic construction and industrial prosperity, and rural ecological civilization construction. 6 first-level indicators, including environmental beautification and livability, rural cultural construction and rural civilization, rural political construction and governance effectiveness, rural social construction and farmers' affluent level, limited agricultural and rural development and urban-rural integration, and other 6 first-level indicators, and selected There are 21 second-level indicators and 55 third-level indicators. Agriculture plays an important part in rural development, especially due to land use, in countries where the sector is of less economic significance.

In view of the above analysis, scholars have conducted more explorations on the digital economy and rural revitalization. Since the development of digital villages in my country is in its infancy, there are relatively few studies on the construction of the digital village indicator system. Zhang Hong [12] and others constructed a digital rural development readiness evaluation index system including 5 primary indicators and 29 secondary indicators of macro environment, infrastructure, information environment, government environment and application environment; Cui Kai [13], etc. Focusing on the digitization of industries and the digital economy of the digital industry, a rural digital economy indicator system covering 4 primary indicators and 16 secondary indicators including digital environment, digital investment, digital benefits and digital services has been constructed. The

Villages" Digitally Connected and every rural citizen digital literate. CSC Center will act as a one-stop channel to digitally connect the entire population of the Village.

The development of digital villages is inseparable from the integration and application of digital economy concepts and rural revitalization strategies. The evaluation of digital villages should not only consider the current status and future trends of the application of digital technology in various fields of agriculture and rural areas, but also show them in the context of rural revitalization strategies. The development of digital villages has achieved results in promoting agricultural upgrading, farmers' prosperity, and rural prosperity. Based on existing research, this paper fully combines the concept of digital economy and rural revitalization strategy, attempts to construct an indicator system from the two dimensions of digital rural development capacity and development effectiveness, and conducts an empirical evaluation and analysis of the development level of digital villages in Zhejiang Province to further verify The scientific validity of the evaluation index system. The five forms of rural development in new urban regions are: ecological leisure, traditional farming, balanced development, industrial-and-agricultural mixed type, and industrial promotion type.

3 Digital Village Evaluation Index Design

3.1 The Connotation of Digital Village

The "Digital Rural Development Strategy Outline" (hereinafter referred to as the "Outline") issued by the State Council in May 2019 to the No. 1 Central Document in 2020 will again focus on agriculture, rural areas and digital countryside. Digital agriculture refers to tools that digitally collect, store, analyze, and share electronic data and information along the agricultural value chain. The document states: "Building agricultural and rural areas based on existing resources The big data center accelerates the application of modern information technologies such as the Internet of Things, big data, blockchain, artificial intelligence, the fifth-generation mobile communication network, and smart weather in the agricultural field, and launches the national digital village pilot" [14]. Digital villages are frequently named, and the importance of developing digital villages is self-evident.

With the process of rural digitalization, the development of digital villages is a combination of digital economy concepts and rural revitalization strategies. The digital economy continues to infiltrate the agricultural and

rural areas, through the support of technology, data, talents, capital and other elements to transform and upgrade the agricultural and rural areas, improve the level of digitalization of the agricultural and rural areas, and develop the digital countryside. Digital countryside is a concept with Chinese characteristics. It involves digital agriculture, digital governance, digital services and digital life in rural areas. The development of digital countryside is an important measure to achieve strong agriculture, rich farmers, and beautiful rural areas. The only way to revitalization.

Based on the above analysis, this article believes that the digital countryside is based on the Internet, cloud computing, big data, Internet of Things, 5G, artificial intelligence and other digital technologies, and inputs digital technology, data, talents, capital and other elements into rural industry, rural governance, Rural public services, residents' lives, and other fields, realize the digitalization of agriculture and rural areas, and ultimately serve the digital development form of rural revitalization.

3.2 Construction of Evaluation Index System for Digital Village

Following the basic principles of fully embodying the connotation of digital villages, systemicity and representativeness, operability and comparability, consulting a large number of data and statistical data, and combining the integration of digital economy concepts with rural revitalization strategies, this article constructs digital village evaluation indicators System (see Table 1). The top level of the index system is the target level digital village; the second level is the standard level, which contains two secondary indicators of digital village development capability and development effectiveness; the third is the sub-standard level, which includes the digitalization of industry, digitalization of governance, digitalization of services, and digitalization of life. There are 7 three-level indicators for agricultural production increase, farmer affluence, and rural prosperity; finally, there are 34 four-level indicators for the program level. Exploiting resources like land, water, and energy has long been a part of agricultural production. Increased output to feed a growing global population while saving resources for future generations has prompted a search for "sustainable" agricultural practices. The core of the indicator system is the setting of three-level indicators, the indicators are as follows:

(1) Main indicators of industrial digitization. Industrial digitalization mainly includes three aspects: First, select the total power of agricultural mechanization and the number of provincial-level modern agricultural parks to reflect the digital transformation of traditional agricultural

Table 1 Zhejiang digital village evaluation index system

First-level Index	Secondary Indicators	Three-level Indicators	Four-level Index	Indicator Attributes
Digital Village	Digital Village Development Ability	Industry Digitization	Total power of agricultural mechanization	+
			Provincial modern agricultural park	+
			Rural e-commerce sales	+
			Operating income of rural leisure tourism	+
			Agriculture-related loans	+
			Number of agricultural technicians	+
		Governance digital	Provincial-level democratic and rule-of-law villages	+
			Proportion of rural government information disclosed online	+
			People's sense of security rate	+
			Satisfaction rate of people working online	+
		Service digitization	Rural Culture Auditorium	+
			Population coverage rate of rural radio programs	+
			Number of public library management and cultural stations	+
			Number of village clinics	+
			Number of employees in culture, sports and entertainment industry	+

(*Continued*)

Table 1 Continued

First-level Index	Secondary Indicators	Three-level Indicators	Four-level Index	Indicator Attributes
		Digital life	Internet penetration rate	+
			Rural delivery route length (ten thousand kilometers)	+
			Telephone penetration rate	+
			Number of computers per 100 rural households	+
	Digital Village Development Effectiveness	Agricultural production	Total output value of agriculture, forestry, animal husbandry and fishery	+
			Total grain output	+
			Total output of aquatic products	+
			Total output of pork, beef and mutton	+
		Farmers are wealthy	Per capita disposable income of rural residents	+
			Per capita consumption expenditure of rural residents	+
			Engel coefficient of rural residents	−
			Per capita expenditure on transportation and communication of rural residents	+
			Per capita expenditure on education, culture and entertainment of rural residents	+
		Rural prosperity	Electricity consumption in rural areas	+

(*Continued*)

Table 1 Continued

First-level Index	Secondary Indicators	Three-level Indicators	Four-level Index	Indicator Attributes
			Number of express items	+
			Annual per capita minimum living security standard in rural areas	+
			Number of people with minimum living guarantee in rural areas	−
			Urban-rural income ratio	−
			Urban-rural consumption ratio	−

industries. Secondly, select rural e-commerce sales and rural leisure tourism business income to reflect the new digital industry generated under the "Internet + agriculture" model, that is, modern agriculture with unique rural characteristics, which plays an important role in broadening farmers' income-increasing channels. Modern agriculture is a developing approach to agricultural technologies and farming techniques that aid farmers in increasing efficiency while reducing natural resources such as water, land, and energy required to fulfil the world's food, fuel, and fibre demands. Finally, the digital upgrade of rural industries is inseparable from the support of financial and technical personnel. This article selects data related to agricultural loans and the number of agricultural technical personnel.

(2) Main indicators of governance digitization. Governance digitalization is the digital transformation of governance system and governance capabilities, which mainly includes three aspects. The principle of digital governance involves ensuring new digital initiatives are integrated within a company's existing IT rules, systems, and capabilities. The digital transformation uses digital technologies to create new or modify existing business processes, culture, and customer experiences to meet changing business and market requirements. First, we must use the "Internet + government affairs platform" to promote the online disclosure of party affairs, village affairs, and financial information, which will

help mobilize villagers' enthusiasm for participating in village public affairs. Secondly, relying on the national integrated online government service platform to accelerate the reform of "at most one run" and promote the process of realizing online services; finally, the application of digital technology to rural social security activities to improve the construction of rural public security is helpful to build a safe village. This paper selects relevant data on the proportion of rural government affairs information open online, the rate of public security, the number of villages under the rule of law at the provincial level, and the satisfaction rate of the people working online.

(3) Indicators of service digitization. Service digitization mainly includes the digital upgrade of public services such as health care, education, culture, and entertainment in rural areas. This paper selects five four-level indicators, among which the number of rural cultural auditoriums and the coverage of rural radio and television population are the direct manifestations of the digital upgrade of rural culture ; The number of public libraries and cultural stations reflects the process of rural education informatization; the number of grassroots medical technicians reflects the level of rural medical care; the number of employees in the culture, sports and entertainment industries reflects the strength of talent support for public services.

Industrial digital transformation provides companies with fully remote monitoring systems, so production can continue to function independently. A framework for creating responsibility, roles, and decision-making power for an organization's digital presence, which includes its websites, mobile sites, social channels, and any other Internet and Web-enabled goods and services, is known as digital governance. Digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business.

(4) The main indicators of digital life. The digitalization of life mainly includes three aspects. First, the Internet penetration rate is an important manifestation of the construction of digital infrastructure; secondly, the length of the rural delivery route reflects the convenience of rural e-commerce construction for the villagers; finally, the telephone penetration rate and rural 100%. The number of household computers reflects the use of digital equipment by rural residents.

(5) Main indicators of agricultural production increase. For the development of digital villages, in order to realize the digitalization of agricultural

and rural areas, we must first ensure sufficient food supply. In addition, with the improvement of people's living standards, they must also meet the people's needs for meat and aquatic products. This article selects the total output value of agriculture, forestry, animal husbandry and fishery, total grain output, total aquatic product output, and total output of pig, beef and mutton to reflect the level of agricultural production increase.

(6) Main indicators of farmers' wealth. Farmers' prosperity is not only the goal to be achieved by the digital village, but also the ultimate goal of the rural revitalization strategy. The wealth of farmers can reflect the improvement of rural residents' consumption level and quality of life in terms of income and consumption. The per capita disposable income of rural residents reflects the economic status of rural residents; the Engel coefficient of rural residents and the per capita consumption expenditure of rural residents reflect the rural residents' per capita disposable income. Residents' living standards; rural residents' per capita transportation and communication expenditures and rural residents' per capita expenditures on education, culture and entertainment reflect the consumption changes of rural residents in the construction of digital villages, and are a direct manifestation of rural residents' use of digital equipment for production and management, knowledge learning, and entertainment.

(7) Main indicators of rural prosperity. The overall performance of digital rural development is rural prosperity, which can be expressed in three aspects. First of all, the introduction of various digital technologies and the use of electronic equipment in the development of digital villages have increased the electricity consumption in villages; secondly, the number of rural express delivery is a direct manifestation of the effectiveness of rural e-commerce construction and development, which will help promote rural economic prosperity; Finally, the annual per capita minimum standard of living in rural areas, the number of people under minimum living allowance in rural areas, the ratio of urban-rural income and the ratio of urban-rural consumption intuitively show the level of urban-rural income and consumption, which is the goal of achieving urban-rural integration in the development of digital villages. A rural area, often known as the countryside, is a geographical area outside of towns and cities. Urban areas are made up of cities, towns, and suburbs. Urban regions often have a high population density, whereas rural areas have a low population density.

4 Empirical Analysis

4.1 Overview of the Study Area and Data Sources

Zhejiang Province is located in the southeastern coastal area of China, bordering Fujian, Anhui, Jiangxi, Shanghai, and Jiangsu. It belongs to the Yangtze River Delta region and has good economic development. Zhejiang Province is not only a pioneer of reform and opening up, but also a microcosm of the development of my country's digital economy. In the context of the rural revitalization strategy, with the introduction of the "Digital Village Development Strategy Outline", Zhejiang Province actively promotes the construction of digital villages and strives to create a "Zhejiang model" for digital villages.

The evaluation index data mainly comes from the 2016–2019 Zhejiang Province Statistical Yearbook, National Economic and Social Development Bulletin, Government Work Report, Government Information Disclosure Annual Report, and Post Industry Development Statistical Bulletin, etc. Part of the data is calculated.

4.2 Research Methods

At present, in the selection of evaluation methods for agricultural and rural related indicators, there are more methods of analytic hierarchy process, Delphi method, entropy method, TOPSIS method or a combination of the above methods [12, 15–17]. The analytic hierarchy process is a method of subjective empowerment, which is subjective and arbitrary, and is easily affected by the limitations of expert experience and the willingness and preference of decision-makers. The Delphi method is a subjective weighting method that seeks the opinions of experts and uses letters to back up the evaluation. This method is highly subjective, and it is difficult to converge the conclusions in multi-person evaluations. Entropy method is an objective weighting method, which can use information entropy to scientifically calculate the weight of each indicator [18]. The TOPSIS method (distance method of superior and inferior solution) is a common comprehensive evaluation method within the group that can make full use of the original data information, and its results can accurately reflect the gap between the evaluation schemes [19]. The traditional TOPSIS method relies more on the subjective opinions of experts and is limited by expert experience. However, this article uses the relative entropy TOPSIS method [20] for objective empowerment and evaluation, which is more scientific and objective in evaluating digital villages. It reflects

the gap between the development level of the digital village and the ideal situation during the evaluation period. The Delphi method is used to arrive at a group opinion or decision by surveying a panel of experts. The entropy weight method (EWM) is a commonly used weighting method that measures value dispersion in decision-making. TOPSIS technique has been widely used to solve decision-making problems. This technique is based on the comparison between all the alternatives included in the issue.

4.2.1 Weight determination

(1) Use extreme value method to standardize data, the specific formula is:

Positive indicators:

$$X' = \frac{X_{ij} - \min(X_{1j}, X_{2j}, X_{3j}, X_{4j})}{\max(X_{1j}, X_{2j}, X_{3j}, X_{4j}) - \min(X_{1j}, X_{2j}, X_{3j}, X_{4j})}$$

Negative indicators:

$$X' = \frac{\max(X_{1j}, X_{2j}, X_{3j}, X_{4j}) - X_{ij}}{\max(X_{1j}, X_{2j}, X_{3j}, X_{4j}) - \min(X_{1j}, X_{2j}, X_{3j}, X_{4j})}$$

X_{ij} Indicates the index value of the jth index in the i-th year, $i = 1, 2, 3, 4$. Represents 2016, 2017, 2018, 2019 respectively; $j = 1, 2, \ldots, m$ (*m is the number of indicators in the system*).

(2) Calculate the proportion of the j-th index value in the i-th year P_{ij}:

$$P_{ij} = \frac{X'_{ij}}{\sum_{i=1}^{4} X'_{ij}}$$

(3) Calculate the information entropy of each indicator e_j:

$$e_j = \frac{\sum_{i=1}^{4} P_{ij} \ln(P_{ij})}{[-\ln(4)]}$$

(4) Calculate the weight of each indicator w_j:

$$w_j = \frac{1 - e_j}{\sum_{j=1}^{m}(1 - e_j)}$$

(5) Calculate the scores of each system in each year Z_i:

$$Z_i = \sum_{j=1}^{m} w_j \cdot X'_{ij}$$

4.2.2 Evaluation method

(1) Obtain the normalized matrix $\boldsymbol{V}$:

$$V = \{v_{ij}\} = \begin{Bmatrix} v_{11} & v_{12} & \cdots & v_{1m} \\ v_{21} & v_{22} & \cdots & v_{2m} \\ v_{31} & v_{32} & \cdots & v_{3m} \\ v_{41} & v_{42} & \cdots & v_{4m} \end{Bmatrix}, \text{其中 } v_{ij} = X' \times w_j$$

(2) Calculate the positive and negative ideal solutions V^+, V^-:

$$V^+ = \left\{ \max v_{ij} \middle| \begin{matrix} j = 1, 2, 3, \ldots, m \\ i = 1, 2, 3, 4 \end{matrix} \right\} = \{v_1^+, v_2^+, \ldots, v_m^+\}$$

$$V^- = \left\{ \min v_{ij} \middle| \begin{matrix} j = 1, 2, 3, \ldots, m \\ i = 1, 2, 3, 4 \end{matrix} \right\} = \{v_1^-, v_2^-, \ldots, v_m^-\}$$

(3) Calculate the distance scale between the evaluation object and the positive and negative ideal solutions D^+, D^-:

$$D^+ = \sqrt{\sum_{j=1}^{m} (V_{ij} - V_j^+)^2}$$

$$D^- = \sqrt{\sum_{j=1}^{m} (V_{ij} - V_j^-)^2}$$

(4) Calculate the close value C_i:

$$C_i = \frac{D_i^-}{D_i^- + D_i^+}$$

C_i it is used to measure the degree of closeness between the evaluation object and the most common situation, that is, the degree of closeness between the development level of the digital village in Zhejiang Province from 2016 to 2019 and the ideal situation. C_i is between 0 and 1. The higher the value of C_i, it indicates that the digital village in that year better the development.

4.2.3 Calculation results

Using the entropy method to calculate the entropy value and weight of each indicator of the digital village in Zhejiang Province from 2016 to 2019, the results are shown in Table 2.

Table 2 The weights of indicators in the zhejiang digital village evaluation system

First-level Index	Secondary Indicators	Three-level Indicators	Four-level Index	Entropy e_j	Weights w_j
Digital Village	Digital Village Develop-ment Ability	Industry Digitization	Total power of agricultural mechanization	0.6688	0.0293
			Provincial modern agricultural park	0.4975	0.0445
			Rural e-commerce sales	0.6981	0.0267
			Operating income of rural leisure tourism	0.7492	0.0222
			Agriculture-related loans	0.6939	0.0271
			Number of agricultural technicians	0.3979	0.0533
		Governance digital	Provincial-level democratic and rule-of-law villages	0.7669	0.0206
			Proportion of rural government information disclosed online	0.5431	0.0405
			People's sense of security rate	0.6902	0.0274
			Satisfaction rate of people working online	0.7517	0.0220
		Service digitization	Rural Culture Auditorium	0.6633	0.0298
			Population coverage rate of rural radio programs	0.7932	0.0183

(*Continued*)

Calculate the scores of each indicator for each year based on the weights obtained by the entropy weight method, and perform TOPSIS based on

Table 2 Continued

First-level Index	Secondary Indicators	Three-level Indicators	Four-level Index	Entropy e_j	Weights w_j
			Number of public library management and cultural stations	0.5979	0.0356
			Number of village clinics	0.7038	0.0262
			Number of employees in culture, sports and entertainment industry	0.5131	0.0431
		Digital life	Internet penetration rate	0.7314	0.0238
			Rural delivery route length	0.5419	0.0406
			Telephone penetration rate	0.6716	0.0291
			Number of computers per 100 rural households	0.5930	0.0360
	Digital Village Development Effectiveness	Agricultural production	Total output value of agriculture, forestry, animal husbandry and fishery	0.6290	0.0329
			Total grain output	0.7574	0.0215
			Total output of aquatic products	0.7785	0.0196
			Total output of pork, beef and mutton	0.7543	0.0218
		Farmers are wealthy	Per capita disposable income of rural residents	0.7183	0.0249
			Per capita consumption expenditure of rural residents	0.6672	0.0295
			Engel coefficient of rural residents	0.7476	0.0223
			Per capita expenditure on transportation and communication of rural residents	0.6028	0.0352

(*Continued*)

Table 2 Continued

First-level Index	Secondary Indicators	Three-level Indicators	Four-level Index	Entropy e_j	Weights w_j
			Per capita expenditure on education, culture and entertainment of rural residents	0.4667	0.0472
		Rural prosperity	Electricity consumption in rural areas	0.7215	0.0247
			Number of express items	0.7035	0.0263
			Annual per capita minimum living security standard in rural areas	0.7715	0.0202
			Number of people with minimum living guarantee in rural areas	0.7706	0.0203
			Urban-rural income ratio	0.7184	0.0249
			Urban-rural consumption ratio	0.6322	0.0326

Table 3 Three-level indicator scores of zhejiang digital village evaluation system

Year	Industry Digitization	Governance Digital	Service Digitization	Digital Life	Agricultural Production	Farmers are Wealthy	Rural Prosperity
2016	0.0826	0.0405	0.0295	0.0203	0.0218	0.0305	0.0326
2017	0.0339	0.0467	0.0528	0.0558	0.0435	0.0570	0.0446
2018	0.0978	0.0511	0.0846	0.0500	0.0571	0.0701	0.0857
2019	0.1275	0.0701	0.1061	0.0964	0.0696	0.1237	0.1242

relative entropy based on the scores of each indicator in each year, obtain and evaluate the close value of the comprehensive situation of each year, see Tables 3 and 4. Every village will have a "Village Level Entrepreneur (VLE)" as the Common Services Center (CSC) operator. They will facilitate villagers to avail the services.

Table 4 Comprehensive scores and comprehensive close values of digital villages in zhejiang province

Year	Digital Village Development Ability Score	Digital Township Development Effectiveness Score	Digital Village Overall Level Score	TOPSIS Close Value
2016	0.1728	0.0848	0.2577	0.1965
2017	0.1893	0.1450	0.3343	0.2392
2018	0.2835	0.2128	0.4963	0.5268
2019	0.4001	0.3175	0.7176	0.8953

4.3 Analysis of Empirical Results

From the perspective of the determined indicator weights (Table 2), among the three-level indicators, the weight of industrial digitization is the highest (0.2032), indicating that it has the greatest effect on the evaluation of the development level of digital villages in Zhejiang Province; the smallest weight is the increase in agricultural production (0.0957). Its evaluation effect is the smallest; the weights of the remaining five three-level indicators are not too different, all around 0.15, indicating that the indicator system is more reasonable for evaluating digital villages.

Judging from the calculation results of the scores of digital villages in each year (Table 3), the development level of digital villages in Zhejiang Province has generally improved from 2016 to 2019. Among them, the industrial digitalization score showed a downward trend in 2017, mainly due to the poor performance of the number of agricultural technicians in 2017, but it gradually increased in 2018. This is because the Zhejiang Provincial Party Committee issued a strategy for implementing rural revitalization. The "Comprehensive Implementation of the Rural Revitalization Strategy and High-Level Promotion of Agricultural and Rural Modernization Action Plan" clearly states that it is necessary to accelerate the construction of pilot projects for agricultural and rural scientific and technological personnel to introduce and train a large number of talents to devote themselves to the cause of rural construction in Zhejiang Province; The steady growth trend is because at the end of 2016, Zhejiang Province for the first time proposed the "maximum run once" reform. Through digital technology, the innovative model of "one-window acceptance, integrated service, and one-time settlement" was realized to solve the difficulties and complicated tasks of the people. With the development of time, the score of service digitization has increased year by year. This is because Zhejiang Province has always adhered to the people-centered thinking, and through the use of digital technology to protect

and improve people's livelihood, let "Internet +" serve Gradually extend to the countryside to improve farmers' sense of gain; the score of digital life declined slightly in 2018, but the score in 2019 increased to 0.0964, which is a big improvement compared with the previous three years; the level of farmers' increase in production, the level of farmers' affluence, and rural areas Prosperity level scores have achieved annual growth. The ultimate goal of digital rural development is to achieve comprehensive agricultural upgrades, comprehensive rural progress, and comprehensive development of farmers. This also shows that the development of digital rural areas in Zhejiang Province is relatively good, but it is more effective than the other two development performance indicators. In other words, the level of agricultural production increase is poor. This is because with the acceleration of the urbanization process in Zhejiang Province, a large amount of arable land has been occupied, resulting in a decline in grain output. In addition, with the advancement of the construction of digital villages, rural farmhouses and leisure activities have emerged. New types of modern agriculture such as agriculture and ecological agriculture have caused changes in the agricultural structure, resulting in a decrease in the growth rate of traditional agricultural output. From the perspective of each year, the digitalization of industries was better in 2016, and the digitalization of services and life was poor; in 2017, the performance of each system was relatively even. The scores of farmers' wealth indicators are relatively good; in 2018, the digitalization of the industry developed rapidly, and the scores of other systems are all increasing steadily. This is due to the implementation of the rural revitalization strategy in 2018; the scores of all indicators in 2019 performed well, which is in line with the performance in 2019. The issuance and implementation of the Outline are inextricably linked.

In the changes in the comprehensive scores of Zhejiang's digital villages in each year (Table 4), both the digital village development ability score and the digital village development effectiveness score have achieved year-on-year growth, indicating that the development of digital villages in Zhejiang Province has achieved remarkable results and the development level of digital villages has improved year by year. The closeness of TOPSIS in 2019 is 0.8953, which is the closest to the ideal point.

5 Conclusions and Recommendations

This research closely links the digital economy theory with the rural revitalization strategy. Based on the connotation of digital villages, it builds a

digital village construction level evaluation index system, which includes industrial digitalization, governance digitalization, service digitalization, and life digitalization, which show the development of digital villages. Capability indicators, as well as three indicators showing the effectiveness of digital village development, including agricultural production increase, farmers' affluence, and rural prosperity. Based on 2016–2019 data, the relative entropy TOPSIS method is used to compare the construction level of digital villages in Zhejiang Province from 2016 to 2019. The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) is a technique to evaluate the performance of alternatives through the similarity with the ideal solution. Through analysis, it can be seen that the various indicator values of the evaluation of the development level of digital villages in Zhejiang Province are relatively ideal. The development of digital villages has achieved agricultural production, farmers' prosperity, and rural prosperity, and has promoted the implementation of the rural revitalization strategy. This shows the current development measures for digital villages. Properly, the policy is effective.

The Department of Market and Information Technology of the Ministry of Agriculture and Rural Affairs and the Information Center of the Ministry of Agriculture and Rural Affairs jointly issued the "2020 National County Digital Agriculture and Rural Development Level Evaluation Report." The report shows that the overall level of digital agriculture and rural development in Zhejiang Province ranks first in the country, and the province's 84 agricultural participating counties (cities, districts) have exceeded the overall level of the country. Therefore, combined with the analysis of this article, the following suggestions are put forward for the construction and development of digital villages across the country.

(1) Consolidate the construction of rural digital infrastructure. Increase investment in the construction of rural network infrastructure and increase rural network coverage. Through the introduction of advanced network equipment, promote the construction of rural broadband communications, mobile Internet and digital television networks, increase the construction and upgrading of rural radio and television infrastructure, and realize the co-construction and sharing of digital infrastructure. In agriculture, promote the digital upgrade and transformation of agricultural machinery and equipment, increase the integration of digitalization into agricultural production activities, improve the supply of information terminals and services, and consolidate the construction of digital infrastructure.

(2) Strengthen the support of digital talents. With the support of policies, we will coordinate the roles of universities, enterprises, scientific research institutions and other parties to cultivate a group of digital talents in the agricultural and rural areas. Intensify the training of digital agriculture, by combining online and offline training, popularize the relevant knowledge of digital agriculture and rural construction and transformation, and improve the application level of digital technology by new-type professional farmers, cadres of agriculture, rural areas and business entities. In addition, it is necessary to create conditions for attracting technical talents to stay in the countryside, improve the reward policy for outstanding talents, and solve problems such as hollowing out of the countryside and brain drain.

(3) Accelerate the modernization and transformation of rural governance. The modernization of rural governance includes the digital construction of governance systems and governance capabilities. On the one hand, local governments should promptly disclose relevant government affairs information on government websites, WeChat public accounts, official Weibo and other platforms to increase the people's enthusiasm for participating in political life; "One-time" reform work, fully implement "no-face approval", build a comprehensive information platform for grassroots governance and a convenient service center for farmers, improve the convenience of farmers' work, and realize modernized governance in rural areas.

(4) Enhance digital inclusive services in rural areas. Use digital technology to sink urban public service resources to the countryside, and promote the equalization of urban and rural public services. Through the intelligent supply of rural public services, improve the process of rural public services, digitize and intelligentize the basic information and needs of various groups in rural areas, and provide rural residents with "Internet +" services such as medical care, education, assistance, and employment training, Realize rural digital services.

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Biographies

Songyan Zhang, female, graduated from Zhejiang Normal University with a Bachelor's degree in Math, graduated from Zhejiang University of Technology with a Master's degree in Information management. She is mainly engaged in the research of economic statistics. She published several articles indexed by SCI and EI journals.

Simin Wu, female, graduated from the Department of mathematics of Zaozhuang University in 2015 with a Bachelor's degree in finance.