

Research on the Application of Cloud Computing Technology in the Urban-Rural Integration Information Transmission of the Rural Revitalization Strategy in Laibin City

Weisong Wang^{a,b} and Wenjing Sun^{a,1}

^aGuangxi Science and Technology Normal University, China

^bXinjiang Normal University, China

Abstract. Implementing the strategy of rural revitalization is an inherent requirement for solving the plight of rural development and realizing the integrated development of urban and rural areas. With the help of cloud computing technology and game theory algorithms, the article constructs a resident-developer evolutionary game model, and explores the evolution of cooperation paths in the urban-rural integration information of the rural revitalization strategy. We applied this theory to the rural revitalization of Laibin City, Guangxi Province, and discovered the reasons for the imbalance and insufficient development of the urban and rural areas in the process of urban-rural integration in Laibin City. The article finally provides targeted policies for rural revitalization and urban-rural integration in Laibin City.

Keywords. Cloud computing; Laibin City; rural revitalization; urban-rural integration; game theory

1. Introduction

The rural revitalization strategy is to rethink, re-understand, and re-explore China's "three rural" issues for a long time, and to re-start, re-deploy, and re-advance China's "three rural" issues from the historical starting point of the new era. The rural revitalization strategy, together with the targeted poverty alleviation as one of the three tough battles, has become our party's major strategic arrangement and practical grasp on the "three rural" issues, and has become a systematic driving force for agricultural and rural modernization [1]. It is necessary to be good at integrating the original strategic deployment and policy measures related to "agriculture, rural areas and farmers", and further establish and improve relevant institutional mechanisms and policy systems so that they can continue to give full play to the new situation and

¹ Corresponding Author, Wenjing Sun, Guangxi Science and Technology Normal University, China; Email: 974635354@qq.com

This paper is the final achievement of the 2021 school level youth project of Guangxi Science & Technology Normal University: Research and practice of urban-rural integration based on rural revitalization strategy--Taking Laibin city as an example (No.: GXKS2021QN033).

requirements, cooperate with each other, and work together to promote rural revitalization.

2. The plight of rural development in the process of rapid urbanization

Since the reform and opening up, urbanization has been rapidly advancing in a large country like China in the dual sense of population and land area, and it has become a major event affecting the development process of China and the world. According to statistical data, from 1978 to 2017, the permanent population of China's urban residents increased from 172 million to 813 million, the urbanization rate of the permanent population increased from 17.92% to 58.52%, and the number of cities increased. It has more than doubled, and a number of core cities and urban agglomerations with global influence have emerged [2]. The rapid progress of urbanization has provided a space carrier for China's industrialization and agricultural labor transfer and employment, and has significantly changed China's economic and social structure and spatial development pattern. The rapid progress of urbanization has not only created impetus for the sustained and rapid growth of China's economy, but has also greatly increased the average urbanization level of developing countries, thus profoundly affecting the process of urbanization in the world. However, due to the influence of urban bias policies and other factors, in the rapid progress of urbanization since the reform and opening up, the system and mechanism of China's urban-rural integration development has not been effectively constructed, and rural development is facing many problems, especially the lagging of agricultural and rural modernization.

3. Game theory hypothesis and model of rural revitalization

3.1 Basic assumptions

Under the constraints of established resources and objectives, the development of rural tourism resources is led by the government, and the development of bidding is carried out through the form of investment promotion. In the development process, the developer, as the dominant player in the game, may cooperate with local residents in some form of development, or may conduct independent development due to the practical limitations of selfishness or bounded rationality [3]. In order to clarify the boundary of the problem, the following basic assumptions are made for the above-mentioned game subject:

Hypothesis 1: Assume that residents and developers are the two game players A and B respectively. If the residents adopt a cooperative development strategy with a probability of x , they choose a non-cooperative strategy with a probability of $1-x$; similarly, if the developer adopts a probability of y If you choose a cooperative development strategy, you can choose a non-cooperative strategy with a probability of $1-y$.

Hypothesis 2: In the process of cooperative development, assume that the total resources invested by residents and developers in the development of rural tourism resources are M_A and M_B respectively, and $M_A, M_B > 0$. In the cooperative

development, the income of the two game players has a certain relationship with their resource input [4]. Assuming that the income coefficient of the residents is k_A , the income coefficient of the developer is k_B , and $k_A, k_B > 0$, then the income of the two game players are K_A and K_B , $K_A = k_A * M_A, K_B = k_B * M_B$ respectively.

Hypothesis 3: In the process of cooperative development, assuming that the cooperation costs paid by the two game players are E_A and E_B respectively, and the cooperation cost coefficients of the two parties are λ_A and λ_B respectively, then the payment cost of the two parties is $E_A = \lambda_A * M_A, E_B = \lambda_B * M_B$.

Hypothesis 4: In the process of resource development, due to the asymmetry of information and the instability of cooperation, the risks of the two game players in the process of cooperation are affected by their returns. Assume that the risk coefficients of the two players in the process of cooperation are φ_A and respectively φ_B , the cooperative development risks of the two entities are respectively T_A and T_B , then $T_A = \varphi_A * K_A = \varphi_A * \lambda_A * M_A, T_B = \varphi_B * K_B = \varphi_B * \lambda_B * M_B$.

Hypothesis 5: Once the cooperating entities reach a cooperative agreement and start cooperative activities in the process of cooperation, the government will give certain subsidies. Assume that the subsidies given by the local government to residents and developers are Z_A and Z_B respectively.

Hypothesis 6: Assuming that the two parties in the cooperation have reached a certain cooperation contract during the development and operation process, if one of the two parties does not cooperate, a certain penalty will be imposed. The residents and the developer need to pay under the condition of non-cooperation The fine is S.

Hypothesis 7: Based on the actual situation, the government subsidies to both parties will be less than the size of the benefits they obtain in the process, that is, $Z_A < \lambda_A M_A, Z_B < \lambda_B M_B$.

3.2 Model construction

Based on the above assumptions and actual conditions, a resident-developer game evolution model is constructed. The specific initial payment matrix is shown in Table 1.

Table 1 Resident-developer initial evolutionary game payment matrix

Benefits of the selected strategy		Developer B	
		Cooperation	No cooperation (1-y)
Resident A	Cooperation x	Π_A^1, Π_B^1	Π_A^2, Π_B^2
	No cooperation (1-x)	Π_A^3, Π_B^3	Π_A^4, Π_B^4

In Table 1, $\Pi_A^1, \Pi_B^1, \Pi_A^2, \Pi_B^2, \Pi_A^3, \Pi_B^3, \Pi_A^4, \Pi_B^4$ is used to represent the income obtained by residents and developers under different strategic choices. The details are as follows. in:

$$\Pi_A^1 = \Pi_A + k_A M_A - \lambda_A M_A - \varphi_A \lambda_A M_A + Z_A \tag{1}$$

$$\Pi_B^1 = \Pi_B + k_B M_B - \lambda_B M_B - \varphi_B \lambda_B M_B + Z_B \tag{2}$$

$$\Pi_A^2 = \Pi_A - \lambda_A M_A + Z_A \tag{3}$$

$$\Pi_B^2 = \Pi_B - S \tag{4}$$

$$\Pi_A^3 = \Pi_A - S \tag{5}$$

$$\Pi_B^3 = \Pi_B - \lambda_B M_B + Z_B \tag{6}$$

$$\Pi_A^4 = \Pi_A \tag{7}$$

$$\Pi_B^4 = \Pi_B \tag{8}$$

3.3 Analysis on the evolution of the cooperative development path of residents-developer rural tourism resources

In the evolutionary game process, the players of the game continue to evolve and play, and eventually the two parties will choose a stable evolution strategy, namely the evolutionary stable strategy (ESS) as their final strategy to guide the two parties to further evolve [5]. The stability of the system can be judged by analyzing the determinants of the two-dimensional dynamic equations and the signs of the traces, as shown in Table 2.

Table 2. The Stability Of The Jacobian Matrix At Each Equilibrium Point

Equilibrium points	Determinant symbol (Det. J)	The symbol of the trace (Tra. J)	Stability
P (0, 0)	+	-	ESS
Q (0, 1)	+	+	Unstable
M (1, 0)	+	+	Unstable
N (1, 1)	+	-	ESS

It can be seen from Table 2 that there is P (0, 0), N (1, 1) 2 stable points, Q (0, 1), M (1, 0) 2 unstable points, G (x, y) 1 saddle point. When the G (x, y) point moves in the interval [0,1], the two parties may choose the {cooperation, cooperation} strategy, or they may choose the {no cooperation, no cooperation} strategy, the specific G (x, y) point the equilibrium point at which it is stable is related to the specific parameter settings of the two parties.

The problem of characteristics plays a very important role in rural revitalization, which can be used to determine the evolution of elements in the system; The specific quantity of an element in the system; Its state can be predicted by some data; It tends to be in a stable state of growth or a state of decline and loss, so as to make timely adjustments to achieve the goal of revitalizing the countryside and achieve win-win results.

4. Evaluation of urban-rural integration in rural revitalization

4.1 The composition of the indicator system

This paper defines the urban-rural integration index system into three levels (as shown in Figure 1, the picture is quoted in Selecting Rural Development Paths Based on Village Multifunction: A Case of Jingjiang City, China): the first level is the target level, the second level is the internal subsystem, and the third level is the specific index. Therefore, the integrated development of urban and rural areas is the goal, the

internal subsystem corresponds to the first-level indicators, and the specific indicators under the internal subsystems correspond to the second-level indicators. The proportion reflects the structure and status of agriculture in the overall economic development. The secondary indicators corresponding to urban and rural ecological integration are the per capita green area of parks, the green coverage of built-up areas, and the innocuous disposal capacity of domestic waste [6]. These three indicators directly reflect the situation of urban and rural residents enjoying an ecologically livable living environment. The minimum living guarantee is a higher standard of public resources and public services that urban and rural residents should enjoy in the new era. Whether it can meet the higher level of living needs of urban and rural residents, and the provision of higher standards of public resources and public services directly reflects the level of urban and rural governance [7]. The secondary indicators corresponding to the integration of urban and rural factors are the proportion of fixed asset investment in the primary industry in total fixed asset investment, the ratio of average wages to average wages in the agricultural industry, the percentage of agricultural expenditures in total fiscal expenditures, and capital and human resources promote urban-rural integration. Important factors, fixed asset investment in the primary industry and agricultural expenditures can reflect the flow of capital to the countryside, and the average wage and average wage ratio of the agricultural industry can reflect whether human resources have an incentive to flow from the city to the countryside.

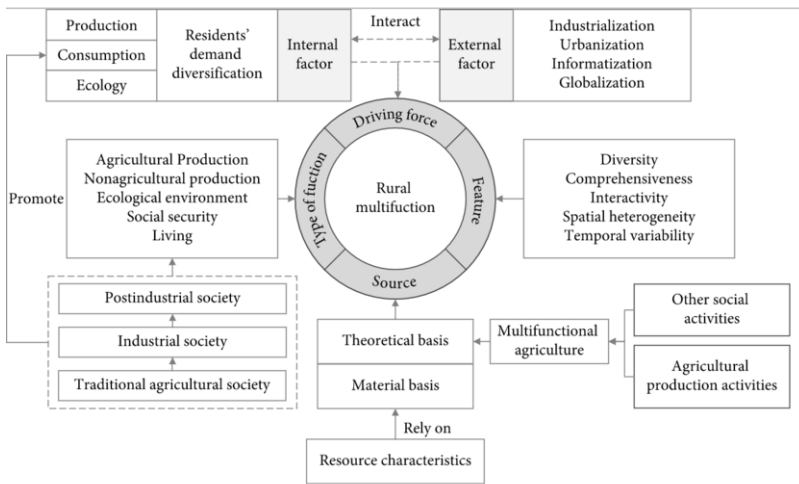


Figure 1 The evaluation index system of urban-rural integration in rural revitalization

4.2 Quantification of indicators

Indexes can be divided into single index and urban-rural analogy index. In the index system, the larger the value, the more advantageous it is a positive index, and the smaller the value, the more advantageous it is a reverse index. For single-type indicators, this paper uses the range standardization method to process the data dimensionless. The specific calculation formula is as follows:

$$M_{ab} = \frac{[M_b - \min(M_b)]}{[\max(M_b) - \min(M_b)]} \quad (9)$$

Among them, M_b represents the actual data of the b index, $max(M_b)$ represents the maximum value in the b index data, $min(M_b)$ represents the minimum value in the b index data, and M_{ab} represents the dimensionless data of the index.

4.3 Measurement and analysis of index data

This paper uses a comprehensive index to reflect the level of urban-rural integration, and comprehensively expresses the actual data of different dimensions of indicators after non-dimensional processing, and then obtains the urban-rural integration index. The urban-rural integration index is used as the comprehensive evaluation index value reflecting the evaluation of urban-rural integration. Weighting combines the information represented by all indicators into an index. The calculation formula of the urban-rural integration index dimensionless is as follows:

$$K = X_1Y_1 + X_2Y_2 + \dots + X_hY_h = \sum_m X_hY_h \tag{10}$$

Among them, K is the comprehensive index of coordinated urban and rural development, X_h is the value of the h index, and Y_h is the corresponding weight of index X_h .

5. Evaluation of Laibin City's Urban and Rural Revitalization Strategy

The data of the secondary indicators of urban-rural integration in Laibin City is non-dimensionally processed to obtain the standard value of each secondary indicator, and based on the weight of each secondary indicator, the urban-rural economic integration index, urban-rural ecological integration index, and urban-rural integration index of Bin City are calculated. The level of urban-rural integration in Laibin City is ranked according to the size of the index (see Table 3).

Table 3. Measurement of Bin City's urban-rural integration level under the background of rural revitalization

First level indicator	2018	2019	2020
Urban-rural economic integration	0.052	0.056	0.048
Urban and rural ecological integration	0.074	0.075	0.065
Urban and Rural Governance Integration	0.145	0.146	0.162
Integration of urban and rural living standards	0.102	0.102	0.103

6. Related suggestions

6.1 Strengthen public infrastructure services to achieve a balanced urban-rural integration

The construction of rural public services and the improvement of infrastructure are the basis for achieving balanced and coordinated development of urban and rural integration. Through new rural planning, unified planning and construction of rural areas will be carried out. Intensify the planning of the rural road transportation network system, accelerate the popularization and full coverage of information networks such as

telecommunication networks, broadcasting networks, and the Internet, improve rural public infrastructure services, and meet rural social and economic development and the daily needs of rural residents.

6.2 Promote the interactive and integrated development of urban and rural areas, and promote the upgrading of rural industries

To develop the villages, we must first ensure that farmers are prosperous. The government must take the initiative to act according to the weak links of the existing agriculture, adapt measures to local conditions, and actively guide farmers to upgrade their industries, increase the added value of agricultural production, and increase farmers' income. Establish agricultural science and technology parks, promote the use of science and technology in agricultural production, and establish agricultural industrial parks to formalize and industrialize agricultural products. Agricultural technicians must actively enter the fields to assist farmers in improving agricultural output and quality. Promote the large-scale operation of agriculture, improve production efficiency, and enhance the competitiveness and survivability of agricultural producers in the cruel market competition.

6.3 Enhance the environmental protection awareness of rural residents and attach importance to ecological environmental protection

Building a beautiful countryside is the foundation for building a beautiful China, and a good living environment is a prerequisite for the sustainable development of people and society. Optimizing and improving the rural ecological environment is the top priority in realizing rural revitalization, and the ecological environment protection of the rural areas is regarded as the basis of urban ecology and national ecological construction. Only on the premise of perfecting rural ecological construction can we better carry out urban construction and coordinate the overall ecological situation of the country. The governance of the rural ecological environment must first enhance the environmental protection awareness of rural residents. The government is vigorously publicizing the importance of environmental protection to enhance the environmental responsibility of rural residents. Rural residents are the main body of the protection of the rural ecological environment, and their importance and sense of responsibility for ecological environmental protection directly affect the final results of the rural ecological environmental protection work. Actively publicize green agricultural production methods, focus on promoting green ecological industries, and focus on building ecological civilization demonstration areas for agricultural production. The government should strengthen the management and supervision of the rural ecological environment, increase rural environmental protection investment, promote the rural "toilet revolution", clean up rural domestic garbage, dredge rural rivers, treat rural sewage, and improve rural sanitation conditions.

6.4 Increase investment guarantee for rural revitalization and improve grassroots work construction

The grassroots cadres of the masses should take the lead and play an exemplary role, starting from themselves, actively studying the law, consciously abiding by the law, and actively using it. Actively exercise powers under the constraints of the law, seek

benefits for the broad masses of the people, exercise power in the sun, build a sunshine project to create a sunshine government, and ensure the majority of rural residents' right to know. Grassroots cadres must perform their functions in accordance with the law, use legal and reasonable law enforcement methods to enforce the law in a civilized and fair manner, and raise the awareness of the rule of law of administrative law enforcement personnel. Grassroots cadres must firmly grasp the work content and methods of administration according to law, raise their awareness of administration according to law, and increase their enthusiasm and initiative in ideological and political work. The government must strictly supervise the election activities of rural grassroots autonomous organizations, forbid underworld forces and religious forces to intervene in the election of grassroots cadres, and comprehensively build a sunshine project for grassroots work affairs. Establish and improve the public legal service system in the vast rural areas, implement a mechanism for active participation in legal services, and strengthen legal assistance to the grassroots. Create a special legal service team that effectively serves the people at the grassroots level, and provide the most true and effective legal aid to the people at the grassroots level when they need it, and effectively solve the people's legal problems.

7. Conclusion

In the context of the "rural revitalization strategy", this paper uses the game evolution theory to analyze the cooperative development behavior between residents and developers based on the unbalanced distribution of rural resource development benefits and unstable cooperation mechanisms. And use numerical simulation method to study the relevant factors that affect the strategic choice of the two parties.

References

- [1] Zhao Zao. Analysis of the logic and path of urban-rural integration development from the perspective of rural revitalization. *Learning Forum*, vol. 11, pp. 34-40, August 2020.
- [2] Ye Chao, Yu Jie. Toward the integration of urban and rural areas: the key and trend of research on the combination of new urbanization and rural revitalization. *Geographical Science*, vol. 40, pp. 35-41, April 2020.
- [3] Zeng Yang. Research on the path of vocational education serving urban-rural integration development under the strategy of rural revitalization. *Journal of National Academy of Educational Administration*, vol. 11, pp. 23-30, February 2019.
- [4] Zhang Yantao. Rural Revitalization and Rural Culture Reconstruction: A Review of "The Change and Development of Rural Culture in the Process of China's Urban-rural Integration". *China Agricultural Resources and Regional Planning*, vol. 273, pp. 97+176, September 2020.
- [5] Tian Peng. Research on the dynamic mechanism of new urbanization community construction under the background of rural revitalization—Based on the empirical investigation in northern Henan. *Study Forum*, vol. 11, pp. 73-80, January 2019.
- [6] Zhang Junyi, Su Weici, Wang Lachun, et al. Research on the path of urban-rural integration and development of rural revitalization in the Southwest Karst area. *Transactions of the Chinese Society of Agricultural Engineering*, vol. 35, pp. 8-19, February 2019.
- [7] Lu Lin, Ren Yisheng, Zhu Daocai, et al. The research framework and prospects of rural tourism guiding rural revitalization. *Geographical Research*, vol. 38, pp. 102-118, January 2019.