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## Study on evolution simulation of social and cultural tourism system under different management mode in heilongjiang province

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### ABSTRACT

Heilongjiang Province as a major tourism resource in China, its tourism development has made great achievements. At the same time, it is faced up with challenges and threats. Therefore, Heilongjiang provincial government has put forward the construction strategy of tourism province, which means to realize the strategic span from rich tourism resources province to tourism industry strong province, promote the great-leap-forward development of social tourism of Heilongjiang Province. Especially under the background of the current world financial crisis, Heilongjiang tourism development problems in the future are more worthy of in-depth discussion.

### KEYWORDS

Heilongjiang province; Management mode; Social and cultural tourism system.



## INTRODUCTION

Heilongjiang is rich in tourism resources, but the tourism industry development is not mature enough, there are many realistic development problems. From the point of space structure, there exists the problem of unbalanced development of regional tourism. The development pattern with Zhangjiajie as leader and Changsha as the center has been basically formed. The tourism development in central Hunan, Shonan and Dongting lake area is weak. Though these areas are with big resources potential, there still lacks development efforts and publicity. The visibility of tourism scenic spots has yet to be increased. In terms of the industrial structure, among the six elements of tourism, entertainment, shopping and other departments are relatively in a weak position. The grade of the entertainment product is not ideal due to the lack of development. The proportion of tourist shopping is in the low level for a long time. Tourism enterprise overall strength is not ideal with the obvious "weak poor" phenomenon. The tourism product is with single structure and still focuses on sightseeing tour products featuring natural landscape and cultural landscape. Holiday leisure products, exhibition tourism and business travel is with a strikingly low proportion. Entry tourism market proportion is small and the high-end market development does not reach the designated position. As well, individual market proportion is low. Domestic tourism market exists some defects. Tourism is a multi-factor and multi-level comprehensive system involved in many departments. Both from the space structure and industrial structure view, as long as there is a weak link, Buckets effect will appear. Hence, the overall competitiveness of tourism industry and comprehensive benefit would be severely affected.

In the reality context of coexistence of opportunities and challenges, Heilongjiang social tourism development still has a long way to go. In order to promote industry overall strength and realize the great-leap-forward development from a big province in tourism resources to tourism strong province, we must grasp the Heilongjiang social tourism development evolution; weigh its tourism development direction in the future systematically.

## SOCIAL TOURISM SYSTEM OPERATION MECHANISM ANALYSIS

### Conditions and motivation of tourism system evolution

#### Openness

In the dissipative structure theory, Prigogine put forward that total entropy change  $ds$  in the system can be divided into two parts. One is  $d_e s$ , which connects the exchange between the system and the outside world and is called entropy. Another is  $d_i s$ , which is caused by irreversible process within system, known as the entropy production<sup>[1]</sup>. Then, there is an equation as follows:

$$ds = d_e s + d_i s$$

This equation describes the fact that open system entropy changes over time for two reasons. Entropy flows could be positive or negative, depending on the environment. Entropy production is always positive (exception is thermodynamic equilibrium state, it goes to zero). For an isolated system,  $d_e s = 0$ ; total entropy change in the system  $ds = d_i s \geq 0$ . The system tends to entropy production and finally reaches the biggest state of entropy, which is also the most chaotic state of the system<sup>[2]</sup>. For open systems,  $d_e s \neq 0$ , the total entropy change symbols cannot be determined. As long as  $-d_e s > d_i s$ , that is to say, as long as the negative entropy flow from the outside world is greater than the system internal spontaneous entropy production, symbols of the change of the total entropy is negative. System is in the ordering process. Entropy flows could be positive or negative and it gives new dynamic properties to the system, suggesting that openness is the premise of system evolution. The first condition of the formation and evolution of the tourism system is the openness of the system, which is mainly manifested in two aspects:

(1) Openness of the internal tourism system. There exists within each subsystem a wide range of material, energy and information exchange, each subsystem respectively including all related industries, departments and other factors. There exists a complex correlation between the elements. Through interaction and flow and exchange of each of the elements of the system, the industrial system as a whole is constructed to ensure system normal operation.

(2) Openness of the external tourism system. Tourism system is a subsystem of social economic system. It has a wide range of people, technology, knowledge, capital and other material flow, energy flow and information flow of communication with other external economic systems and the industrial sectors. Other economic systems or departments provide material, talent and technology support for tourism system. Tourism system, in turn, will promote the development of other industries and departments<sup>[3]</sup>.

**Non-equilibrium**

According to the distance away from balance, the system can be divided into three states: equilibrium, close to equilibrium, and far from equilibrium<sup>[4]</sup>. In equilibrium, the system elements are in a state of disorder random mixing. In close to equilibrium, the system entropy production offset with the outside world input, system remains unchanged. In far from equilibrium state, the system constantly carries out substance, energy, and information communication with the outside world, when the external entropy flow is greater than the internal entropy production, system will evolve into a new orderly state. Thus, Prigogine put forward the well known theory of “nonequilibrium is the source of orderliness”. As long as the system is in not far from equilibrium state, it will not develop into orderly development. Therefore, the unbalance of the system is the necessary condition of system self-organization evolution. The unbalance here refers to the diversity and differentiation between each parts of the system. The greater the difference between the system parts is, the farther the system is away from the equilibrium state<sup>[5]</sup>.

Suppose  $X = (x_1, \dots, x_n)$  is a set of state variables describing the tourism system movement, then general form describing the system dynamics equation is as follows:

$$\frac{dx}{dt} = f(t, \alpha, x)$$

In the equation, t is the time,  $\frac{dx}{dt}$  is derivative of state,  $\alpha$  is parameters affected or controlled by

$$\frac{dx}{dt} = f(\alpha, x)$$

the outside world. When f is irrelated to t, it is referred to as a autonomous system as

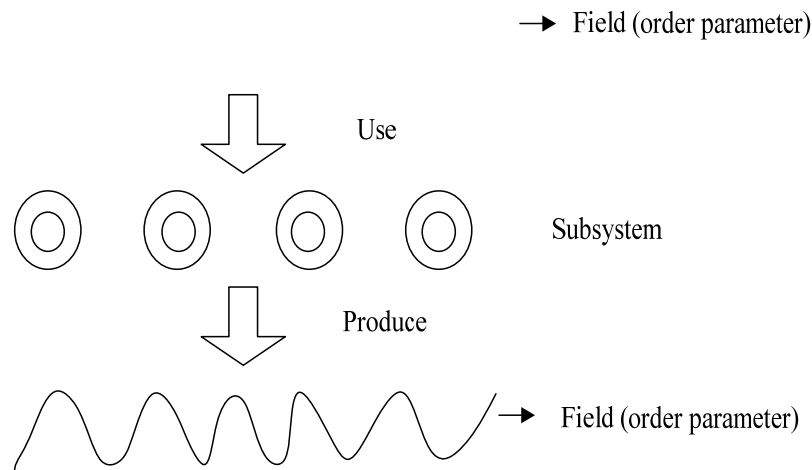
Without loss of generality, assume that  $X = 0$  is the only stable equilibrium state of the system when  $\alpha = 0$ , that is,  $f(0,0) = 0$  and  $X = 0$  is the stable point. It means when the control parameter is 0, namely the system and the outside world does not exist material, energy and information exchanges, system is in equilibrium and system state variables will not change<sup>[6]</sup>. When the external control leads to alpha changes, system makes material, energy and information exchanges with the outside world and is far from equilibrium. The steady state properties of  $X = 0$  may change. When there is a qualitative change, the system will evolve from old steady state to the new steady state<sup>[7]</sup>.

Tourism system has the typical non balance characteristics, which is reflected in regional structure and industrial structure imbalance. There are big differences in regional tourism industry development in our country. From tourism development speed and level, its difference is basically the same with that of urbanization and economic development regional difference. The eastern coastal zone is with high development speed and degree of development. Second comes to the central region and then the western region. From tourism resources endowment, the central and western regions are rich in tourism resources with significant characteristic while the eastern region is relatively scarce in

resources<sup>[8]</sup>. From industrial structure, there exist big differences of tourism development. The development of six industries of “eat, live, travel, tour, shopping and entertainment” is uneven. Take Heilongjiang as an example, among the six elements of tourism, entertainment and shopping departments are relatively in a weak position. Product structure is relatively single and transformation and upgrading of industrial structure is required<sup>[9]</sup>.

### Internal motivation of tourism system Order parameter and control process

Order parameter is a macro parameter which is used for describing macro overall effects of the collective motion of a large number of subsystems<sup>[10]</sup>. Any internal system exist such situation, in the course of action and under certain conditions; the subsystem will build a generalized "field" within its borders, which is called “order parameter”. It is produced in subsystem, and in turn acts on the subsystem. It is a global property which cannot be restored to subsystem features. On one hand, order parameters are the results of a lot of interaction between subsystems within the system due to the competition and synergy between subsystems. On the other hand, once the order parameters are formed, it can play the role of controlling or treating the subsystem and dominate the overall system evolution<sup>[11]</sup>.



**Figure 1 : Dynamic sketch of tourism system evolution**

System will generate a lot of variables in the process of movement and evolution, according to its change speed over time; it can be divided into two categories, slow and fast variables. According to Haken, when the external controlled variable reaches a tipping point, due to the different responses of damping coefficient of each subsystem to external influence, two modes can be divided as few slow variables and most fast variables. Slow variables play command, control and slaving role on fast variables, which is known as the slaving principle of synergetics. When the system arrived at or close to critical point, there will be the situation of a few slow variables dominates most fast variables. Such slow variables are actually the order parameters of the system and theory is dominant power for self-organization evolution of the system<sup>[12]</sup>.

Tourism system evolution process as well is controlled by order parameters. During the process, resources, economic, and social factors appear along with systems generation. They will not decay or die quickly by system internal fluctuation change; instead, they will grow with increase of the instability of the system. And the interaction between them generates the power to promote the evolution of tourism system, which can be regarded as sustainable development capacity of the tourism system evolution, i.e, the "field" for evolution of tourism system. Resources, economic, and social factors in the process of evolution gradually become major force to control system self-organization evolution process as well as the slow variable dominating system evolution.

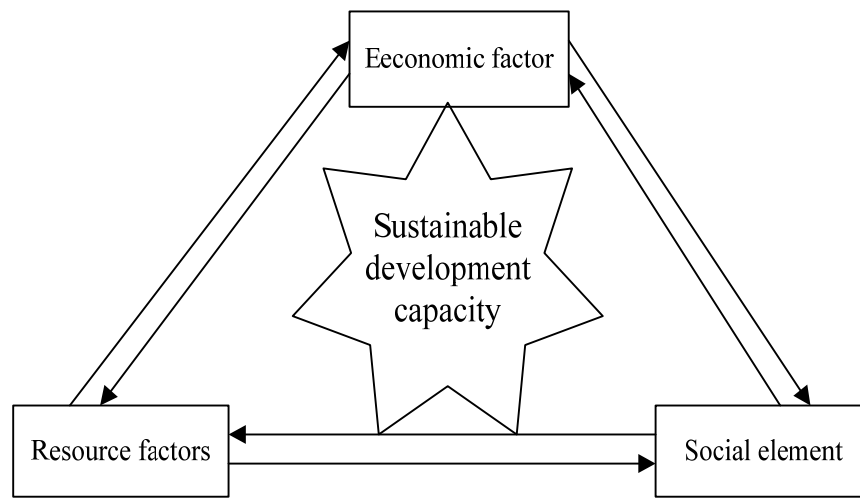


Figure 2 : Order parameter evolution sketch map

**TOURISM SYSTEM EVOLUTION PATH**

**Bifurcation and selection**

Catastrophe theory proved that only when control parameter change happens on the branch point will the system change from one steady state to another and mutations can occur. Bifurcation phenomenon is a common phenomenon in nonlinear dynamic systems. Generally, bifurcation exists in the survival evolution process of natural system and social system, the bifurcation and selection of mutation starts from system and environment or the changes of the two, that is, interaction between system and environment. Through the selection process, the system evolution occurs thus entered a new state. In the process of system evolution, change of control parameters can lead to many bifurcation of the system. The choice of bifurcation point as well can affect system evolution path.

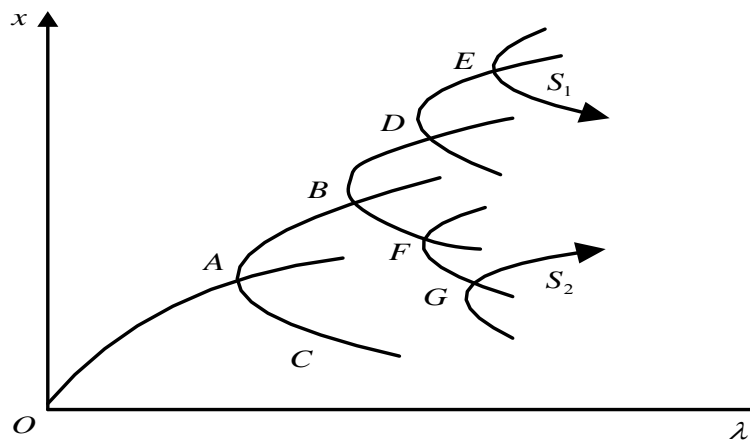


Figure 3 : Bifurcation evolution sketch map

Assume the tourism system is a 1 d system with only one control parameter, in the process of evolution, affected by controlled parameter  $\lambda$ , there presents several bifurcations. The stationary state set up after evolution is closely related to the previous bifurcation path.  $S_1$  represents status quo of tourism industry in China,  $S_2$  represents tourism status quo of a western country, A is the historical factor (social, economic and technical development after world war ii) which promotes the generation of

modern tourism. B, D, E, F and G represent respectively each historical factor which promotes tourism development. State  $S_1$  and  $S_2$  are evolved respectively based on  $A \rightarrow B \rightarrow D \rightarrow E \rightarrow S_1$  and  $A \rightarrow B \rightarrow F \rightarrow G \rightarrow S_2$  paths. Due to various historical factors, different characteristics of  $S_1$  and  $S_2$  is thus formed. Tourism system is actually a multidimensional system with multiple control parameters. Along with the increase in bifurcation points, bifurcation paths increase. Diversity of system evolution caused by bifurcation will as well become much more complicated.

### Gradual change and mutation

There are two types of evolution which are gradual change and mutation. Though it has been debated for a long time in the history of science on development mode of things, gradual change and mutation is unified in the real world. Emphasis on any one type is one-sided. Gradual change and mutation is a continuous, stable motion process. Using the cusp catastrophic model, it can be divided into three types. First, complete gradual change ( $a, a'$ ), the motion path displays gradual evolution characteristics. Second, nature mutation is ( $b, b'$ ). Evolution path through the critical point or critical areas, certain mutations of properties of the system has taken place. Third, kick mutation ( $c, c'$ ), system behavior characterized by a sudden jump of discontinuity.

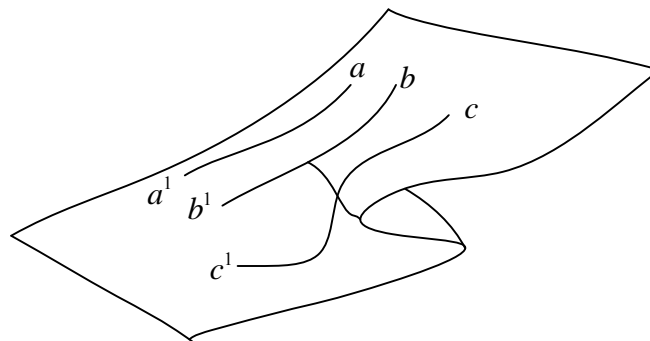


Figure 4 : System mutation evolution path diagram

According to Butler tourist destination life cycle theory, evolution of the tourism destination development can be divided into six stages of exploration stage, participation stage, development stage, consolidation stage, stagnation stage, recession and recovery stage. Its evolution process presents the characteristics of second type of system mutation. Exploration, participation and development stage present a gradual evolution process. In this process, there is an increase in number of tourists, enhancement of tourist reception ability. Service infrastructure is gradually perfected and quantity of employment is increased. The evolution of the tourism destination is mainly the change of the quantity rather than qualitative changes. When the number of tourists is further expanded and is close to tourist carrying capacity, tourism development speed slows down. Tourist visitors and environmental bearing capacity to some extent, is in a state of relative balance. The result of continued evolution is qualitative change of tourism destination system; number of tourists exceeds the environmental capacity and brings a series of negative effects to the destination. At this moment, system evolution enters the tipping point or critical areas and begins to mutate. After mutation point, the system will face two choices. First, negative impact continues and in a short period of time is difficult to restore. Tourism industry suffered severe blow and faced the decline. Second, through fundamental changes of tourist attractions attract tourists again. Expand the environmental bearing threshold by developing new tourism resources. Tourism destination is back to prosperity, entering a new cycle.

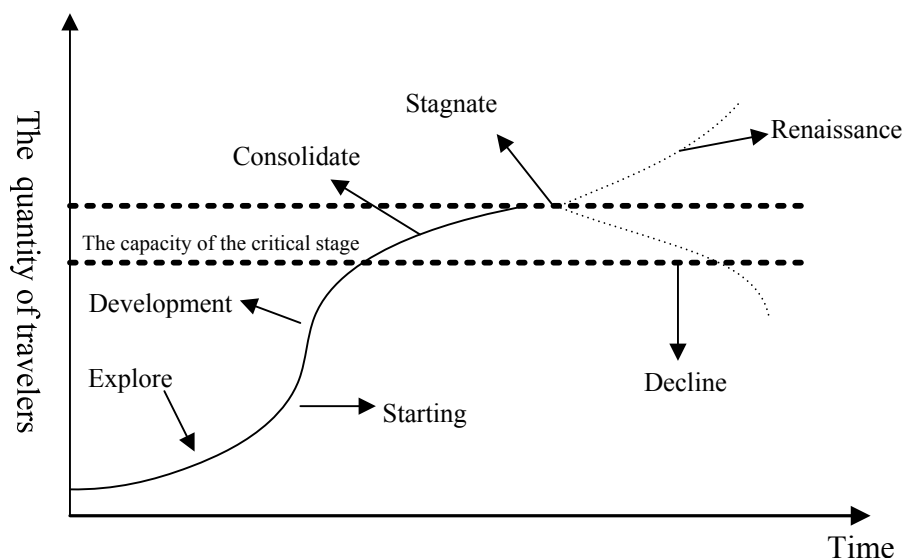


Figure 5 : Social tourism destination life cycle curve

## CONCLUSION

This paper from the perspective of system science, based on the self-organization theory, discussed the mechanism of evolution of tourism system. The self-organization characteristics and evolution of the tourism system are studied. On the basis of the use of a large number of statistical data, it applied factor analysis and grey correlation analysis method to carry out a comprehensive evaluation of tourism system evolution status of Heilongjiang province and draw the following important conclusions: Tourism system is a complex dynamic open system. Its evolution process has the characteristics of self-organization. Tourism is defined as a dynamic open system composed of demand system, supply system and supporting system with specific structure and function. In this paper, the author studies on tourism system, and takes tourism destination as the research object, defines the constituent elements of tourism system from the perspective of tourism function.

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