

Innovation of Transformation Development Path of Application-oriented Colleges Based on Self-organization Theory*

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Abstract—The transformation of application-oriented colleges can be regarded as a behavior that an institution promotes its own educational thought, teaching orientation, teacher development, professional setting, curriculum development and other factors in to order. With the deepening of higher education reform, the market's demand for talents tends to be diversified. Under this background, many local integrated colleges have been transformed into application-oriented colleges. However, the transition from a comprehensive institution to an applied institution is not the end of institutional transformation. In response to the increasingly deepening social economy and industrial structure reform, application-oriented colleges as a complete self-organizing system, based on self-organization theory, continue to actively adapt to the call for regional economic development and national policies, and continue to promote their own transformation to improve the ability to serve the economic development of the region.

Keywords—*self-organization theory; application-oriented colleges; transformation development*

I. INTRODUCTION

According to the self-organization theory, in an open environment, everything is exchanging energy with the outside world and continually absorbing external order parameters to form a new evolution of organic structure and function. With the reform and development of society, application-oriented colleges are constantly facing new problems and challenges. Only by continuously and actively adapting to social needs can they maintain life vitality and development vitality. Therefore, exploring the transitional development path of application-oriented colleges based on self-organization theory is conducive to clarifying the transformation law of application-oriented colleges, strengthening the self-organization power of application-oriented colleges, and realizing the benign development of application-oriented colleges.

II. SELF-ORGANIZATION THEORY

The self-organizing system is a system that can

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spontaneously exchange information and energy with the outside world, and gradually evolve from disorder to low-level order to advanced order, thereby forming a complete structure and obtaining comprehensive functions. In an open environment, any system that is in a non-equilibrium state will be subject to huge fluctuations due to the collision and then form a new and advanced system.

First, openness is a prerequisite for self-organization. A system must be in an open environment in order to react with the outside world. The theory holds that the increase of system entropy is mainly composed of two parts: the entropy generated automatically inside the system and the entropy flow of the outside. Assuming that the entropy of the system is positive, only in an open environment and constantly exchanging substance and energy with the outside world, can he spread the positive entropy and introduce negative entropy from the outside, so that the entropy of the whole system can be continuously decreased and forms an ordered system.

Second, staying away from equilibrium is a necessary condition for the formation of an ordered structure of a self-organizing system. Not all open systems can form self-organization, and there is another necessary condition for the formation of self-organization, that is, in a state of being far from equilibrium. The reason is that a system in equilibrium does not spread and attract entropy with the outside world even in an open environment. Staying away from equilibrium is not only a necessary condition for the formation of a self-organizing system, but it also keeps the system alive.

Third, nonlinear interactions are intrinsic conditions. Regardless of whether a system is in an open environment and is in a non-equilibrium state, the root cause of self-organization is that there must be nonlinear interactions within the system. Nonlinear interactions are concepts that are diametrically opposed to linear interactions. Linear interaction refers to the relatively simple interaction between variables in the system, which can be described by theory or data model. The typical linear interaction system is the organization system. Such systems are easily described because of their simple relationship. The nonlinear interaction means that the role of inter-system variables is extremely complicated and cannot be described. Typical systems with nonlinear interactions include

social systems and thinking systems. The internal relationships of these systems are rich and cannot be perfectly predicted by simple description stacking. The nonlinear interaction between system elements makes it possible for the system to produce multiple evolution, each of which may exhibit significant self-organizing features.

Fourth, fluctuations are a direct cause of self-organization. Fluctuation is a random variable. Generally speaking, people's body temperature and heart rate are subject to change at any time. The thermometer or heart rate meter measures the average value. Therefore, as long as the accuracy of the instrument is high enough, it is possible to test the physical quantity that fluctuates with time. Traditional thermodynamics treat fluctuations as noise and interference. From a fixed point of view, fluctuations are the deviation of the system from equilibrium; from a development perspective, fluctuations are the differences that the system produces during evolution. Since staying away from the equilibrium state is a necessary condition for the self-organization of the system, fluctuations can promote the system away from the equilibrium state, so the fluctuation can be seen as a switch of the self-organizing system.

Open, non-equilibrium states, nonlinear interactions, and fluctuations are conditions for the self-organizing system, which are closely connected and constantly interact. Any complex system in an open environment and in a non-equilibrium state, if there is a nonlinear interaction, when a certain internal parameter change reaches a critical value, the system will abruptly change by the fluctuation, gradually changing the original disorder state to an ordered state, and the structure is complete and full-featured. The application-oriented colleges undoubtedly have all the self-organizing features and are typical self-organizing systems. Therefore, the application-oriented colleges in the social system should follow the law of self-organizing system and realize the smooth evolution from disorder to low-level order to advanced order, so as to maximize the social value of application-oriented higher education.

III. THE PROBLEMS FACED BY THE TRANSFORMATION AND DEVELOPMENT OF APPLICATION-ORIENTED COLLEGES

A. *Transformation and Development Are in Equilibrium*

Theory of dissipative structure believes that non-equilibrium is the root of the system to achieve advanced order. Non-equilibrium means that the system is in a state of being far from equilibrium. The entropy value of the system represents the order of the system. The larger the entropy value, the more disordered the system, the smaller the entropy value, and the more orderly the system. When the system is far from equilibrium, the entropy is large and the system is out of order. Therefore, only when the system is in a non-equilibrium state, the system can move from disordered to low-order order, and then from low-level order to advanced order, that is, the non-equilibrium state is a necessary condition for the system to form an ordered structure. In a state of equilibrium or near equilibrium, the system can always maintain a stable or relatively stable state. Small fluctuations cannot break this state, and the system has no possibility of forming a new

system. When the system is in a non-equilibrium state, its internal structure is very unstable at this time. As long as the external interference is caused, the system may be mutated into a new stable state, forming a system with complete structure and full function. If the application-oriented colleges are in a relatively stable equilibrium state, then this state will continue for a long time, and the fluctuation of any variable will not form a huge fluctuation. At this time, it is difficult for the application-oriented colleges to transform and upgrade.

Influenced by traditional ideas, our society has pursued stability and balance since ancient times and has not realized the importance of change and innovation. Excessive pursuit of balance and stability affects all aspects of human life. The transformation and upgrading of colleges and universities is a typical example of the impact of balance and stability. The college leaders lack of thinking advanced with the times, the practical ability of the faculty cannot adapt to the needs of social development, and the content of teaching and curriculum are unchanged, all of these lead to insufficient response to the national call and missed opportunities for transformation and upgrading. For college leaders, maintaining the existing management model can highlight their achievements; for teachers, maintaining the original teaching model and teaching content can make the teaching smoothly completed. In this state, transformation and development will be impossible to talk about.

B. *There Is No Macro Fluctuation Between the Variables*

Fluctuation is a complex, accidental process in which one or more variables in a system deviate from the average or the original state. In an open environment, colleges and universities will be in a relatively stable state for a certain period of time. However, in order to meet the needs of society and their own sustainable development, the original equilibrium state is continuously broken through the nonlinear interaction between variables and reaches a new stable state due to a huge fluctuation. There are many variables that affect the transformation and upgrading of colleges and universities. They can be divided into two categories: endogenous variables and exogenous variables. Endogenous variables refer to institutional leadership and faculty; external variables refer to social needs, national policies, and science and technology innovation. These variables affect the transformation and development of institutions to varying degrees, and there are also nonlinear interactions between variables and mutual constraints.

Since each variable maintains a certain correlation, each variable will float freely within its range and will follow the other variables to produce corresponding changes. At this point, due to the synergy, the system will remain in balance overall. For application-oriented institution, a complex system, small fluctuations between variables do not have much impact on transformation. Once the fluctuation of a certain variable is strengthened, other variables will produce a positive response due to the nonlinear interaction, and a large fluctuation will be formed. However, as far as the current situation is concerned, the interaction between the variables affecting the transformation of institutions has not yet formed a huge

fluctuation, and the transformation and upgrading of application-oriented institutions will be hindered.

IV. TRANSFORMATION DEVELOPMENT PATH OF APPLICATION-ORIENTED COLLEGES BASED ON SELF-ORGANIZATION THEORY

In order to promote the successful completion of transformation of application-oriented colleges, it is also necessary to meet the self-organizing conditions for self-organizing transformation, that is, institutions should actively pursue transformation and upgrading according to social development, rather than passively transforming and upgrading under the intervention of government policies and mandatory measures.

A. *Realizing the Dynamic Development away from the Equilibrium State*

Prigogine believes that if a system is in a closed environment, its balance and stability is only a disorderly state of silence, and will not be sustainably developed. Only an open system that is in a non-equilibrium state can embark on a long-term development on the road of self-organization. In order to smoothly transform and upgrade, application-oriented colleges must maintain the spirit of self-reflection, self-questioning and independent innovation, so that they can move between equilibrium and non-equilibrium to achieve innovation and progress. For the application-oriented colleges, its tendency to be non-equilibrium is to break the balance between the original professional setting, the training mode, the faculty and the curriculum, and form the uncertainty and originality of the educational concept, professional settings and training mode.

1) *About institution leaders:* First of all, they must reform the concept of transformation. For application-oriented colleges, to achieve long-term sustainable and stable development, they must have sufficient foresight in value goals and school pursuits, and dare to seize opportunities and meet challenges. Every reform opportunity in application-oriented higher education is fleeting, and some institutions are comfortable with the status quo, have no long-term vision and values, and give up opportunities for transformation and upgrading. Institution leaders of application-oriented colleges should realize that transformation is the general trend, and transformation will not lower the original rankings and levels of colleges. Only by possessing the concept of innovation and transformation, and grasping the hard-won transformation opportunities can cultivate the excellent talents for social development and have an invincible position in many application-oriented universities.

Second, they must actively guide the change of the concept of teaching staff. In order to achieve transformation and development, application-oriented colleges and universities should actively guide faculty and staff to form teaching innovation ideas. They should establish relevant incentives or enforcement measures to encourage or force teachers to actively improve the teaching content and change the teaching methods. On the one hand, application-oriented colleges can carry out various lectures to encourage the transformation of

employees' teaching, carry out ideological mobilization, and listen to the suggestions of teachers and staff on the transformation, and the views on the transformation methods, so that employees realize that transformation and upgrading is the general trend, and it is closely related to their own interests. On the other hand, application-oriented colleges can organize teachers to learn and exchange experiences in successful transition universities abroad, or invite leaders and teachers from successful foreign universities to guide them in person, so that the road to transformation can be smoother.

Finally, they must play an active follow-up role in professional settings. First, the leader team of the application-oriented colleges should combine the transformation status and transformation goals of the institutions in the process of transformation and upgrading of the institutions, and actively discuss the educational concepts, professional settings and training models of the institutions, and defining all aspects of the transformation and upgrading of the institutions. Second, the application-oriented colleges can delegate some rights to the schools. For example, in the setting of vocational skills training courses and entrepreneurship training courses, the general courses are uniformly established by the colleges, but for highly professional courses, whether to open and how to open the course should be decided by schools. Third, application-oriented colleges should actively respond to the call of the state and put school-enterprise cooperation into practice. Application-oriented colleges should establish a cooperative training model with relevant enterprises according to their professional settings and curriculum models and set training plans according to the corresponding conditions and requirements of the contract. Fourth, application-oriented colleges must change the conditions for recruiting teachers in the past, and put the candidates' practical skills first, instead of paying too much attention to theoretical skills.

2) *About teachers:* Teachers are one of the core components of an application-oriented institution. The smooth transition of teachers is the key to the smooth transformation of institutions. Since the transformation and upgrading of the college is a comprehensive and systematic innovation process, if the application-oriented college leaders are regarded as the designers of transformation and upgrading, then the teachers are the concrete implementers and task undertakers of the transformation and upgrading of the institutions. Therefore, the main role of teachers must be played in the process of transformation and upgrading of colleges and universities.

First of all, teachers must take the initiative to change from a theoretical type to a "double skilled" type. Teachers should actively carry out social practice according to the requirements of the institutions and the needs of social development, improve their practical skills, and actively shift to the "double skilled." In terms of thinking, teachers should realize that teachers with only theoretical knowledge will be eliminated by society, so as to actively promote their practical skills; in action, teachers should cultivate students' innovative spirit and practical ability through the combination of theory and practice, continuously learn new knowledge, new skills and new educational methods, constantly practice and improve in teaching.

Secondly, realizing the transformation from valuing teaching content to cultivating ability. The main role of teachers is not to teach fixed knowledge and ideas, but to teach learning methods, to guide students to learn independently and to enhance students' hands-on practical ability. Because the theoretical teaching is relatively monotonous, in the long run, it will reduce the students' enthusiasm for learning, and the students who are trained will only talk in theory and be at a loss in practice. Therefore, ability teaching is more important than the teaching of pure theoretical knowledge.

Thirdly, the teaching model should turn to a diversified form. The traditional teaching mode is relatively simple, which makes it easy for students to have a burnout mentality and is slightly lacking in arousing students' interest in learning. Therefore, teachers should actively explore multi-level and diversified curriculum models. For example, under the premise of ensuring students fully grasp the theoretical knowledge, adopting various teaching modes such as corporate classrooms and online classrooms to enhance students' interest in learning and hands-on ability.

Finally, changing the traditional theoretical evaluation system. The traditional theoretical rating assessment system pays too much attention to the mastery of students' theoretical knowledge. Therefore, it is necessary to follow the needs of the transformation and upgrading of colleges and universities, and establish a new evaluation system, not only paying attention to the mastery of students' theoretical knowledge, but also paying attention to students' innovative ability and practical ability. In addition, apart from the written assessment method, skill-based assessment methods should be added to supervise and train students' practical skills.

B. Promoting the Formation of Huge Fluctuations

In systems in different states, fluctuations can have different effects. In a system that is in equilibrium or close to equilibrium, fluctuations can negatively interfere with system balance; in systems far from equilibrium, fluctuations will play a positive role in rebuilding the system balance. Because, in systems far from equilibrium, random fluctuations may amplify the "butterfly effect" caused by nonlinear interactions between system variables, causing giant fluctuations, which in turn cause the system to mutate. Due to the contingency of the formation of giant fluctuations, in a very complex nonlinear interaction system, each variable will fluctuate, but it is not known which specific fluctuations can form a large fluctuation, so in the extremely complicated system, in colleges and universities, a small variable may form a huge fluctuation through the amplification of the "butterfly effect", which becomes the key to the transformation and upgrading of the application-oriented colleges. Therefore, they should pay attention to each variable and increase the probability that the variable will produce a huge fluctuation.

1) *College leaders*: In the face of new opportunities for development, how can colleges respond to the country's call for transformation and upgrading, how to correctly respond to the state's requirements for higher education teaching models and teaching function reforms, and whether they can correctly understand the country's policy orientation, have a great

relationship with college leaders. It can be seen that this variable, college leader, is extremely important for the transformation and upgrading of institutions. As the spokesperson of the college, the principal holds the internal governance power of the institution and assumes corresponding responsibilities. He must exercise his ability and quality to keep pace with the times, to be forward-looking, to seize the opportunity to meet the challenge and seize the opportunity to smoothly transform and upgrade.

2) *Teaching staffs*: The teaching staff is the specific implementer of the transformation and upgrading of the colleges and universities, and its minor changes will also cause great changes in the institutions. For example, one of the newly introduced teachers in colleges and universities has a high level of achievement in the professional field, and has achieved outstanding performance during his tenure, which has intensively strengthened the teaching level of the institution. At the same time, due to the existence of the teacher, the corresponding research funds and academic status are inclined to the field where the teacher is located, which makes the subject gain more resources and capital advantages and promotes the development of the subject. And because of the leading role of the discipline, the college's visibility will be greatly improved. The national funds and technical support caused by the change of the quality of the teachers' team strengthened the teacher's variable through nonlinear interaction. Finally, due to the fluctuation of the teacher's variable, a huge fluctuation occurred. It can be seen that the variable of teacher quality can cause huge fluctuations, but colleges and universities cannot rely solely on recruitment, but should actively cultivate teachers and work hard to build a "double-skilled" faculty.

3) *National policies*: At present, the transformation of colleges and universities mainly depends on the national call and policy. Therefore, the country's policy is of great significance to the transformation and upgrading of colleges and universities. In the process of transformation and upgrading, institutions must pay close attention to national policy, and only in this way can transformation and development have lasting significance. When the state's policy on institutional transformation is introduced, variables such as the teaching staff, the decision-making of the college leaders, and the mode of teaching will change accordingly. These variables will strengthen the national policy through non-linear interactions. Eventually a huge fluctuation is formed. Therefore, institutions should pay attention to the impact of national policies on the transformation and upgrading of institutions.

In addition to the above-mentioned institutional leaders, teachers and national policies and other variables will have an impact on the transformation of institutions, there are some variables, such as the value of the institutions and cultural atmosphere, the slight fluctuations may be generated great fluctuations by the "butterfly effect", and then promote the transformation and upgrading of institutions.

V. CONCLUSION

The transformation of colleges and universities is not only a trend-setting move that caters to the tide of economic development and higher education reform, but also must be the leading and active self-issuance of local undergraduate colleges. In the framework of self-organization theory, openness is the precondition for self-organization formation, staying away from equilibrium is the necessary condition for self-organization, nonlinear interaction is the endogenous basis for self-organization, and huge fluctuation is the cause of self-organization. The open transformation and development helps institutions to obtain timely information and resources such as national policy and external demand for talents. The development of institutions away from equilibrium means breaking their transformation concepts, professional construction, curriculum, and personnel training, the balance and stability of the construction of the teaching staff, reflect on the current difficulties and shortcomings, realize the dynamic development away from the equilibrium state; attach importance to every contingency and random factors affecting the transformation and development of the colleges, these random fluctuations play an important role for the transformation and development of the newly built college, because a small change will form an unpredictable "butterfly effect". Therefore, the formation of huge fluctuations needs to pay attention to every variable that affects the transformation of institutions such as college leaders, national policies and the teacher team and increase the probability that each variable will be strengthened to form a huge fluctuation.

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