

On Effect of Qualified Scientists and Technicians Gathering

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Abstract—The phenomenon of qualified scientists and technicians gathering have been studied based on self-organization theory for the first time. The self-organization mechanism in the course of qualified scientists and technicians gathering was analyzed in this paper. The tremendous positive effect cause of qualified scientists and technicians gathering was revealed through a systemic study on the effect cause of qualified scientists and technicians gathering with multi-angles of view, such as effect for individual, effect for group and effect for society. The revalued effect, the effect to anti-risks, the succeeding effect and the speed up effect are all put forward for the first time. The important affect of bring up the leading personage, build up the group to blaze new trails and the high leveled carriers of talented person in the course of qualified scientists and technicians gathering are expounded based on the analysis of the mechanism and effect of qualified scientists and technicians gathering. And some proposal to bring about a advance in qualified scientists and technicians gathering are put forward.

Keywords—qualified scientists and technicians, gathering, self-organization mechanism, effect, and countermeasure

I. INTRODUCTION

It has been generally recognized that talents play a vital role in the development of society as well as the prosperity of nations. The gathering of qualified scientists and technicians, which refers to the transfer to a certain region or organization due to the influence no matter economic, social, geographical, etc, shared a unique feature of talent flow. The destinations and organizations of these scientists and technicians will consequently take the lead in their development while the values and capacities of these talents may in turn be swiftly improved in the process of such gathering. Therefore, it will have a significant influence on promoting the national talent strategy as well as building the talent pool for the 21st Century

by studying the mechanism of talent gathering and taking the initiative of such gathering.

II. THE SELF-ORGANIZATION MECHANISM OF SCIENTISTS AND TECHNICIANS GATHERING

The gathering of scientists and technicians is considered as the process of flow in certain amount of talent resources to regions and organizations that targeted. Every talent is considered as an individual distributed in every unit of technology system before the process of gathering takes place. Due to the asymmetric and incomplete of information, the law of flow for each individual can hardly be discovered. However, the competition and cooperation can be created by means of talent gathering while those advantageous technical area and subjects may develop and become stronger in the process of gathering.

The gathering of scientists and technicians as well as the evolution of advantageous technical area and subjects is believed to follow the common principle of self-organization phenomena. In the regional science and technology system or all over the globe, such evolution takes place in the basis of non-equilibrium in the development of sub-systems like the geological movement with the shell of earth rising and depressing. In this process, the former non-equilibrium structure in order was destroyed continuously while that disordered was generated. Although some talent groups, technical field, and subjects may decline or even disintegrate leading to partial disorder, the entire technical system is still in the process of developing and rising, namely the general trend from low level to advanced one.

A large number of specialists in science and management may be attracted to flow in by an invention, the technical achievement, and the implementation of certain policy and project. The small fluctuations generated in the technical

system resulted from the flow of the scientists and technicians with special capacity will be intensified by the coherent effect, resulting in the “mega fluctuation” that determines the entire technical system. Thereafter, the unstable structure of such system will transfer into the part of new dissipative structure. Consequently, the gathering of talents occurs resulted from the formation of “mega fluctuation” by the amplification of small fluctuation, leading to the establishment of a new advantageous technical field or subject. This process can be seen as the nesting procedure of termites described by Prigogine. When the large scale of distributed material stacking at some level, a certain material stack may become accidentally large enough, shaping a “fluctuation”. Thereafter, more materials will be added to the fluctuated stack, generating a pillar or wall, which can be considered as the “mega-fluctuation”. The pyramid structure may take into shape if these pillars or wall happen to be close enough. The technical system consists of all kinds of sub-systems while scientists and technicians as well as technical area and subjects, which belong to each sub-system, can form the 3-demensional structure of talent system. Among them, every talent individual can be considered as a “fluctuation”. The technical area and subjects that develop fast with their innate advantage may become the center of attracting talents in a certain period. With the flow of talents in large numbers, such fluctuations may evolve into the “mega-fluctuation” which is the advantageous technical area or subject that takes the lead in the trend of technology development [5].

A “mega-fluctuation” may be generated from a fluctuation under certain circumstances while in most cases the impact of fluctuations can almost be neglected compared with the macro-parameters of the system. The possibility of amplification for a “mega-fluctuation” from a very fluctuation may present the feature of contingency. At the same time, the formation of “mega-fluctuation” that results in the emergence of new dissipative structure may present the feature of certainty in a special level of science and technology development. Hence, the development of science and technology can be the result of a combined effort by both the “contingency” and “certainty”. The link among structure, function, and fluctuation as well as their mutual constraints can attribute to the gathering of talents and technology development. It is the responsibility of the managerial department that timely discovers the potential “mega-fluctuation” which presents the phenomenon or possibility of fast growing trend. Moreover, such department may set the stage for the development of “mega-fluctuation” as well as enlarge the positive effect in order to promote the fast development of entire technical system [6].

III. THE GATHERING EFFECT OF SCIENTIFIC AND TECHNICAL TALENTS

The gathering of technical talents can form teams of creativity with a great impact.

A. Individual Effects

Great individual effects can be generated by the participation of creative team for every technical talent. The members of these teams may get themselves improved a lot in capacities and creativities while they are making contributions to their teams. By doing this, the self-value of these team

members may be achieved greatly in the process of team development.

The individual effects of technical talents gathering may include:

The first aspect of the effects is appreciation effect. As individuals are often inclined to achieve more, technical talents decide to flow only on occasion of inadequate to achieve their values. As a rational person, a scientist or technician usually chooses to flow to the region more developed in economy or position with higher level which is easier to play an important role. Since new positions are often more demanding, technical talents can get their values well promoted. As for one person, the working efficiency as well as the achievement may vary greatly utilizing advanced equipments compared with using those need to be updated.

It has been argued by American scholar K. Lewin that the individual performances and the environment have a great influence on their behavior. A function similar to the field theory function in Physics can describe the relation among behavior, performance, and environment, which can be seen below.

$$B = f(p, e)$$

In this formula, B stands for behavior while p for performance and e for environment.

The team members cooperate in long term for a common goal and learn for each other in the process of making creation. They can be good partners to help each other while at the same time they can be competitors. Consensus may be reached when they share the same point of view while there will be a heated debate when their opinions differ. As an accomplished disciple owes his accomplishment to his great teacher, it has been a common sense that scholars in the first-class universities have strong abilities in both research and innovation. Such examples can be found in the famous Cavendish Laboratory where nurtures 25 Nobel Prize winners and the School of Physics in Peking University which is the Alma Mater of 105 CAS Academicians and 7 CAE Academicians.

The second aspect lays in the risk resistance effect. Although a rational person may be risk detested and look for sense of security, there are fierce competitions everywhere among social members in the modern society. Technical talents may carry on the jobs considerably innovative while inevitably filled with risk of failure. The technical talents consequently can find the sense of belonging by joining in the innovation teams. The members in these teams can effectively reduce the risk of failure and improve the chance of success by sharing knowledge within the team. At the same time, public resources and collective achievement can be shared by team members conditionally to reduce the cost and risk of individual innovation.

B. Team Effect

An innovation team can prove to be energetic by gathering talents and grow continually. The long term prosperous of some innovation team can attribute to the team effect of talent gathering.

The team effect consists of the following aspects.

The first aspect is collaboration effect [2] which emerges in association with the social production and helps to improve the producing efficiency. There is a growing trend that modern science and technology is highly integrating in the basis of disintegration, which enlarges the scale of innovation projects so that individual innovation can hardly exist to meet the needs of development of science and technology. Thus, the collaboration is indispensable in the process of innovation with large number of people engaged. In this case, every team member can concentrate on the specific area to complete the accumulation of expertise, skills, and experience. In addition, some deficiency in expertise, skills, and experience can be well made up by collaboration to complete the tasks that impossible to finish for any individuals. In this way, the productivity and creativity can be generated by talent gathering.

The second aspect can be considered as the inheritance effect. Reputation of innovation teams may be established after the accumulation in some special technical area by some pioneer team members, which shows the inheritance feature of team reputation. The explicit knowledge as well as the implicit one is generated in the establishment of team reputation and passed from one generation to another while such knowledge has been greatly enriched and developed in the process. Hence, the successors can start their work very quickly based on the team reputation.

The third aspect is the so called the Matthew Effect which can be found in the Bible. Such effect shows a common existence in every aspect of academic area as well as the daily life. A youth science and technical practitioner may go through the exploration period in which one may start his/her career lack of fund and without reputation. In this case, one can skip that period by joining the innovation team with good reputation in order to solve difficulties of lack in fund and project, which can quickly lead to success. In addition, these innovation teams can gain momentum and improve their reputation by the participation of the youth practitioners. Consequently, the positive Matthew Effect can be amplified by this bilateral effort.

C. Social Effect

The gathering of technical talents can produce a great social effect since the destination of such gathering may shape the talent-concentration area.

The social effect consists of three aspects, the first being the herding effect which means the decision making affected by other technical talents and public opinion with incomplete and uncertain information [1, 2]. Technical talents may make incomplete rational decision affected by herding effect, which greatly reduce the cost of brain gain so as to take the lead in team development. The cultivation of talents often takes as long as 20 years when large amount of input is indispensable by families, government, and entire society. However, such long span can be skipped by the introduction of talents and the organization concerned may obtain the talents partly qualified and the value of investment accumulated on them. Such example can be found in the success in brain competition by the amendment of Immigration Bill and the increase in the

number of H1-B in the U.S which contributes to the “Economic Miracle” and the leading position in some critical technical area.

The second aspect is believed to be the accelerator effect which occurs in the development of regional economy, technology, and society. The Coastal Opening Strategy implemented by Chinese government in 1980s has promoted the gathering of talents in large scale to the coastal opening area, making such talents head for southeast China. This kind of gathering has greatly accelerated the speed of development in the coastal area such as “Yangtze river delta” and “Pearl river delta” where the economy has been boosted. In some famous colleges, some interdisciplinary bodies which lacked the momentum of development showed the sign of fast development after taking initiatives of brain introduction [10].

The third aspect of social effect is called the demonstration effect. Due to the high working efficiency of introduced talents and the reasonable decision made by team members on best realizing their self-values, the members in innovation teams may become the examples for other individuals and organizations to imitate and learn from, which shapes the demonstration effect that improves the efficiency within all organizations in the society and promotes allocation of human resource effectively.

It goes without question that side effect may occur provided the initiative of brain introduction has been overdone. The resources of talents may be wasted if talents with same academic background and similar research levels, resulting in the decrease in marginal benefit of talent capital. Enough attention should be paid that excessive brain introduction may deteriorate relationship among those talents and result in vicious competition.

IV. MEASURES TO BRING ABOUT SCIENTIFIC AND TECHNICAL TALENT GATHERING

In the era of knowledge economy, the importance of acquiring resources of talents and knowledge exceed that of any other resources. The talents that master advanced technology and the most updated knowledge play a vital role in economic growth [10]. Recently, countries all over the world are taking initiatives to establish and modify strategies for development of science and technology and put more emphasis on the construction of talent pools. It is also a critical point that the initiatives on enriching talent resources and cultivating large scale of innovative technical talents will greatly affect the development of national science and technology as well as the future of nation.

A. More Attention Paid on Talent Leaders

Much importance should be attached to some talent leaders and those with such potential. These leaders are very attractive for other talents who have interest in flowing in. Such small fluctuations are very likely to become “mega fluctuation” which refers to the centre of technical talent gathering. On one hand, those who obtain these talent leaders will stroll to success in the fierce competition on talents [1, 4]. On the other hand, organizations or work units may suffer a lot from the lack of talent leaders. Therefore, it is worth paying much attention and resources in order to attract these talent leaders.

When it comes to cultivating technical talents, much attention has been paid on outstanding talents rather than the leading ones. Such phenomena may attribute to the lack of effective mechanism of talent selection and training. Several plans were carried out in order to training outstanding talents such as the Distinguished Young Scholars Program carried out by National Nature Science Foundation of China and some other incentive plans carried out by local government. Although the outstanding talents and those with leadership abilities share many similarities and many outstanding talents became leaders in their teams, the selection and training mechanisms as well as their functions of these two types of talents may differ. The outstanding talents are indispensable in the development of technology while it is only leaders of those talents that prevail in the competition for talents [7].

B. Further Constructions on Innovation Teams

The gathering of talents is on the way of evolving into the “mega fluctuation”. The technical leaders of those talents can be found in the innovation teams provided there is no effective solution on selecting and training yet. Many leaders spring up from their teams in the process of innovation. Such phenomena can be seen more clearly in the teams on their early age. The construction on innovation teams has gained much attention such as the funded scheme “innovation group” carried out by National Nature Science Foundation of China and many cultivating systems established by universities and local governments, which have a positive impact on talent gathering. However, such initiatives of talent introduction and training are worth being further studied in practise of talent gathering.

C. More Emphasis on Constructing Carrier of Talent Gathering

Compared with remunerations and other benefits, the carriers of talents, considered as the platform of making achievement are important for attracting technical talents [4]. Only by establishing talent carrier with high standard can these first class talents be attracted. Such carrier can be key universities, key national bases for scientific research, key hi-tech parks, national key laboratories, and major scientific or engineering projects. The mega fluctuation may take into shape when the talent carrier of high level reaches a large scale, resulting in the huge talent gathering effect and the fast development of technology and economy.

In general, leaders responsible for regional development in technology, economy, and society should put emphasis on training talent leaders and constructing talent carrier to prevail in the brain competition.

V. CONCLUSION

In this paper, the mechanism and law of technical talent gathering have been studied with self-organization theories.

Initially, the positive effect of technical talent gathering is discussed in aspects of individual effect, team effect, and social effect, etc. Thereafter, the function of talent leader training, constructing innovation teams and talent carrier in talent gathering has been further studied. The study in this paper is supposed to add value to the initiatives of building innovation-oriented country in China.

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