

Rethinking systems thinking: from a perspective of Chinese philosophy and sustainable development

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Abstract : As we know, the approach of systems thinking is fundamentally different from that of traditional forms of analysis. Traditional analysis focuses on the separating the individual pieces of what is being studied. Systems thinking, contrast, focuses on how the thing being studied interacts with other constituents of the system.

Chinese philosophy is in its nature different from the philosophy in the western world. It is mainly based on experience sciences, not on the experimental sciences. However, Chinese traditional thoughts are in their nature something system thinking. For example, the concept of entirety is the key element of systems approach, and the thinking mode of taking the objects as an entirety has a long history in China. If we study Chinese philosophy more deeply, we would find there are some relations between the concept of sustainable development and Chinese philosophy. Regarding human and nature as a whole, ancient Chinese tried to make overall plans and take all factors into consideration, and they tried to keep harmonious with the nature.

So there remains a triangular relationship among Chinese philosophy, sustainable development and systems thinking. The exploration of this relationship will benefit human beings' efforts of sustainable development following systemic principals.

1. Relationship between systems thinking and Chinese philosophy

As we know, the approach of systems thinking is fundamentally different from that of traditional forms of analysis. Traditional analysis focuses on the separating the individual pieces of what is being studied. Systems thinking, contrast, focuses on how the thing being studied interacts with other constituents of the system.

Although the approach of systems thinking is believed has its foundation in the field of system dynamics, founded in 1956 by MIT professor Jay Forrester, but some Chinese researchers believed the original sources of systems thinking are lying in ancient Chinese philosophy (Liu, 1992).

Chinese philosophy is in its nature different from the philosophy in the western world. It is mainly based on experience sciences, not on the experimental sciences. However, Chinese traditional thoughts are in their nature something system thinking. For example, the concept of entirety is the key element of systems approach, and the thinking mode of taking the objects as an entirety has a long history in China. About 2500 years ago, the author of "The book of changes" believed that the entirety and the nature of objects had some relations with the dynamic functions of objects, the entirety characters of objects were showed up by the dynamic functions of objects. It was also the universal principal that every thing had some special relations with others and every thing had some special structure (Luo et al. 1995). Another Chinese traditional

thought of systems thinking is the indirect observation. The ancient Chinese inferred the changing tendency of astronomy, meteorological state, agriculture and human affairs by means of indirect observation. The principal of indirect observation is as following, the attribute of object A had some marks in object B because of the interaction between A and B, so the marks became the information of A, by the studying of B, we can know the characters of A. Besides, there are other Chinese traditional thoughts had the nature of systems thinking.

Another example is the thought of Confucian. The teaching of the Confucius sought for the method to composite the entire society including different grades into a harmonious entirety applying the traditional concept of system from the social practice of ancient China. From the Dynasty of Xi-Han (206 B.C.), the teaching of the Confucius was the thought system that the ruling class of feudal age mainly relied on. The life of Chinese feudal age was very long, and China was the most developed, open-minded and vigorous feudal society in the world, and in the feudal age Chinese science and technology were leading the world, all of the achievements were because of the theory of social management of Confucian.

According to the teaching of the Confucius, the social management is in its nature the management of man. So the base of the theory of Confucian is the study of man. The most remarkable characteristic of Confucian's study of man is that it regards the society as a whole although it is constituted of individuals. The teaching of the Confucius thinks that man is the real foundation of the society, and it emphasizes that we can understand the characteristics of man from the social relationship of man. Since it is one of the Chinese traditional thoughts that emphasizing the relationship and structure of the object, the teaching of Confucius studied man and society from a perspective of relationship and structure, it thinks the society is a system with a structure of several levels, the first level is the world, the second level is the country, the third level is the family and the fourth level is the man.

But why are the origins of the systems thinking lying in Chinese philosophy? Maybe we can find some answers by searching the traditional concept of Chinese. One of the fundamental concepts of Chinese traditional culture is the concept of circulation. The concept of circulation believed that universe and every thing are moving circularly, they go round and round from the emergency to the development and to the die out.

In China there are many influences of the concept of circulation, firstly, ancient Chinese scientists gave careful observation and exploration to many phenomenon which changed periodically, such as the movement of Sun, Moon, and Stars, the alternation of seasons, the changes of meteorology, the birth, growth, strength and death of the biology, the circulation of the water in the natural world, and so on.

Secondly, the concept of circulation formed the thought of entirety and the synthetic method in ancient China. Some ancient Chinese thinkers believed that since every thing moved circularly, there are outer limits to the movements of everything, so every thing in the world is an entirety with the obvious boundary to other things. To know the objects comprehensively and thoroughly, we should composite every section of the object to an overall circulated entirety, and only with the understanding of the overall circulated entirety, we can reveal the essential qualities of the object. So, the

concept of circulation itself contains the thought of entirety, and it determined that the method of entirety and synthetic is in the first place among other methods of traditional Chinese thoughts.

Thirdly, the circulation circle itself is a special structure, and the stable relationship forms structures in broad sense. So there are relatively stable structures among the sections in every circulation circle, otherwise the circulation circle itself can't be established. Because of the concept of circulation, the ancient Chinese regarded every thing from the viewpoint of development and structure.

Fourthly, from the concept of circulation, the ancient Chinese thinkers took the lead in raising the theory of information feedback and adjustment in a plain and simple way in the world. Since the object doing circulated movement will come back to the original starting point, the cause of the movement of the object will coincide with the result by the careful investigation step by step. In the process of circulated movement, the cause will become the result and the result will become the cause, and such a logical relationship brings about the feedback adjustment. From the theory of system science, we know that the foundation of the feedback is causal loop and structure of the system. Without the circulated movement, there will no any feedback and adjustment. So the concept of circulation promoted the ancient Chinese to realize the feedback adjustment inside the system. The ancient Chinese theory of feedback and adjustment mainly applied in social management and traditional medical science.

Fifthly, one of the forms of the dynamic balance is the circulated circle, so from the concept of circulation the ancient Chinese looked upon every thing from a perspective of dynamics, and focused on the balance of every process. In Chinese theory of contradiction, the thought of harmonious and balance was in the leading position all the time.

Sixthly, because the movement of everything is a process of dynamical balance and has the ability of adjustment by itself, it is easy for people to find the similarity other than the difference between objects. The method of analogy and the simple model method were applied widespread in ancient China, and the concept of seeking common points while reserving difference was one of the Chinese traditional thoughts.

Seventhly, because of the concept of entirety, the ancient Chinese philosophers paid attention to the difference of internal causes and external causes comparatively early. Because inside the entire object with a circulated structure, one section was the cause of other section and maybe at the same time it was the result, there were several causal loops within the object, so it was easy for people to find the causes of changes inside the object and find that the most important factor was the internal causes.

Eighthly, from all of the discussions above we can safely draw the conclusion that the ancient Chinese philosophers regarded every thing as a system with the ability of self-adjustment and had the independent characters, so the concept of circulation caused the concept of system, the concept of circulation itself contained the possibility of developing into the concept of system.

2. Relationship : sustainable development and Chinese philosophy

If we study Chinese philosophy more deeply, we would find there are some

relations between the concept of sustainable development and Chinese philosophy.

Since the Industrial Revolution and the advent of mechanisation the Countryside has become more akin to the factory environment and less a place of beauty and a diverse natural environment, but in more recent times in opposition to this trend there is now a movement toward integrating more sustainable and environmentally sound principles into the way we use the land and other natural resources.

Over the past decade or so, the concept of sustainability has become a special word, widely accepted as the way to live in harmony with the natural environment. Sustainability of modern sense is generally associated with the definition of sustainable development given by the Brundtland Commission Our Common Future (WECD, 1987). But some valuable ideas do exist in the background of Chinese philosophy or general culture that can be related to sustainability. Those ideas as conformation to natural laws, thriftilly use of natural resources, generation concern, understanding about man's function in the relation between nature and man are really favorable for the content of sustainability. We can say the origins of sustainable development lying in Chinese philosophy.

The fundamental thought in Chinese philosophy that can be related to sustainable development is the concept of regarding human and nature as a whole (Xie, 2005). By the guides of this concept, ancient Chinese tried to make overall plans and take all factors into consideration, and they tried to keep harmonious with the nature. The objective ancient Chinese pursued happen to coincide with the trend of international environment protection. In fact, the natures of the issues ancient human beings faced up and the contemporary human beings facing up are same, namely, the issues of how to survive and how to survive better.

Sustainable development is in its nature an issue of the treatment of the relationship between human beings and the nature. But to a more strict sense, sustainable development is not equal to the relationship between human beings and the nature. The relationship between human beings and the nature is an important issue with some philosophy sense and has a long history from the beginning of the human's awareness.

In fact, the relationship between human beings and the nature involves in several directions. Firstly, it is a problem of philosophy, and human realized they are a part of the nature and they thought about the questions such as "what are we?" and "Where did we come from?" Secondly, it is a problem of science, human thought they are opposed to the nature and human wanted to know and to rebuild the nature. Thirdly, it is a problem of environment protection or sustainable development, human realized that they are not only opposed to the nature but also a part of the nature, they try to do every thing in concert with the nature. Although the concept of sustainable development is popular in recent days, and human beings realized this urgent issue gradually by bitter lessons, the source of this kind of thoughts has a long history. We can find some sources in ancient Chinese philosophers' thoughts.

Taoism is one of the most ancient philosophies in China with a documented history dating back over five thousand years with many treatises on agriculture, social development, medicine, and art, and at its core is a recognition of the profound link

between man and nature both on the individual and social and environmental levels (Wei et al. 1994). Although it may seem foreign to some people it is in actual fact as close as we can hope to get today to the kind of natural philosophy followed by our forefathers in pre-Roman times, and it has its roots in practical methods that are directly applicable to the problems we face in the modern world. We are not separate things from the world around us but our destiny is bound up with the fate of the natural environment and how we interact with it. In our society today people can become bogged down living in an urban environment and they find it hard to find any meaning in life other than consumerism and materialistic goals. Our foodstuffs have become processed and denatured, and materialism drives us to exploit natural resources rather than conserve them as part of the natural heritage of the planet. If we follow the principles of Taoism, we can solve this kind of problems.

Confucianism is distinguished by its concern for the cultivation of human relations towards a harmonious society rather than one's relations with the supernatural or natural. Confucianism is a philosophy that also contains profound environmental ethics through its inclusiveness of Heaven, Earth and the Human order. These form the traditional Chinese trinity which configure the ultimate harmony. Here Heaven means the rule of the nature and Earth means the natural environment.

This unaccustomed extension of Confucianism to ecological considerations is timely in the present age. With the planet's widespread industrial development and the rapid growth of population, ecosystems are in urgent need of ethical consideration. 'Saving' the environment requires that we understand it, our place within it, and our responsibilities toward it. The environment's unprecedented exploitation, in the absence of practices of protection and renewal, now threatens future economic and social development. In other words, an impoverished natural environment impedes both the material standard of living and socio-cultural quality of life. To the Confucian mind, this problem originates in the misconstruing of relations between humankind and nature. The solution may therefore begin with people understanding how to conduct such relations.

Confucian thinkers characteristically regard nature itself as holistic, all things in nature depending on each other and forming an organic whole. They also consider human beings as part of nature, as an existence within it, emphasize that people and nature are closely bound in a harmonious, not conflicting, primary relationship. The pre-Qin (i.e. pre-221 B.C.) Confucian thinkers developed these ideas into the theory of the unity of man and Heaven or nature. Though Confucius (Kong Zi) did not put forward the theory, it was embodied in his thought. (1)Confucius affirmed that the example of Heaven - or nature - could be followed. The affirmation showed the unity of the human being and nature.

The theory of "oneness of Heaven and man" was developed by later Confucians. In the Doctrine of the Mean (Zhongyong),(2) it is said: "All things exist together, and they do not do harm to each other; all ways exist together, and they do not come into conflict."(3) Mencius (circa 385-312 B.C.) also expressed this idea of unity and its manifestations: "In all places by which the sage passes, misguided people are helped to change; in places where the sage stays, a mysterious role is played by him; the sage

lives on up with Heaven, down with the earth."(4) Lu Jia (died 170 B.C.) expressed the linkage thus: "Tradition has it that Heaven gives birth to the myriad things to be nurtured by Earth and brought to completion by sages."(5) These expositions take the change and development of humans and nature as a related, harmonious and balanced movement. Heaven, Earth and human are not considered in isolation. On the contrary, the three are placed within a larger system and are taken as a whole (Wei et al. 1994).

3. Relationship : systems thinking and sustainable development

Another interesting phenomenon is the essential relationship between systems thinking and sustainable development. As we know, there are obvious linkages between the emergence of sustainable development of modern sense in the world and the method of system thinking (Meadows et al. 1972), and many researchers believed that the nature of sustainability is to develop systematically (Cabezas et al. 2005). The approach of systems thinking is believed to be an effective method to develop an empirical study of sustainability (Xu et al. 2004).

The release of the "The Limits to Growth" report had caused great shock among the economists and the politicians, and it also caused a radical debate worldwide. Although there are different comments on the conclusions of "The Limits to Growth", and Tietenberg called it the basic pessimist model. (Tietenberg, 1992) Many researchers mentioned the report "The Limits to Growth" when they thought about the origins of sustainable development. (Lumley et al. 2004 and Xiao, 1997) We can say because of the suddenly awareness of the physical limits of the planet Earth, human society begun to think about the possibilities of sustainable development. As a matter of fact, Sarah Lumley believed that while the term "sustainable development" was popularized by the WCED report "Our Common Future" in 1987, it is generally recognized that notions of sustainability were promoted in "The Limits to Growth" and "Green" discourses in the early 1970s (Lumley et al. 2004).

Over the past decade or so, the concept of sustainability has become a special word, widely accepted as the way to live in harmony with the environment. Chinese philosophy in history is in its nature different from the philosophy in the western world. It is mainly based on experience sciences, not on the experimental sciences. Some valuable ideas do exist in Chinese philosophy or general cultural background which can be related to sustainability. Those ideas as thriftily use of natural resources, generation concern, understanding about man's function in the relation between nature and man are really favorable for the content of sustainability. But nowadays, sustainability of modern sense is generally associated with the definition of sustainable development given by the Brundtland Commission Our Common Future, namely, development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (WECD, 1987) In fact, many researchers think this definition is not scientifically and practically enough. The Brundtland Report may be considered to be a political document, not based on rigorous scientific analysis (Glasby, 2002).

From the year 1987, many researchers defined the concept of sustainable development from the viewpoint of nearly all kinds of disciplines. In terms of

economic development, the typical definitions are as following. Maximize the net benefit of economic development with guarantee of the quality and the provided services of natural resources. (Barbie, 1987) When development ensured the increased well-beings of contemporary generations, it should not decrease the well-beings of later generations. (Pearce et al. 1993) Sustainable development is the economic development without lowering of environment quality and destroying of natural resources in the world (WRI, 1993).

Although the definitions above were accepted worldwide and regarded as the typical definitions, many researchers think they are not explicit enough. In fact, human's activities couldn't be harmless to the eco-environment, and economic development couldn't be costless, the definitions of sustainable development caused too high expectations and it is hardly to operate in practice. (Ren, 2003) Glasby believed that the concept of sustainable development as presently defined is a chimera, quite divorced from the reality of our occupation of this planet (Glasby 2002).

I do think the definitions above only emphasized the should-be of sustainable development with limited normal sense, they didn't reveal the sustainable development with empirical sense. Namely, the definitions above are with the stress on the result of sustainable development, they didn't deal with the implementing way of sustainable development. Because the nature of sustainability is that human's development must coordinate with the natural environment, the implementing method of sustainability is to establish a media restrain mechanism between the human society and natural environment, so the harmoniousness of human and nature will be ensured. The definitions above didn't reveal the key restrain mechanism. Because of the deficiencies of sustainable development theories, it becomes a series of theories lack of practical sense, it is hardly to convert the theory into practice.

At the same time, many researchers from worldwide believed the nature of sustainability is to develop systematically. The representative views are as following.

Our society has been undergoing a transition process from a mechanical to a systemic or ecological paradigm. Within the environmental context, this transition represents an issue of survival for man and for the biosphere itself. Which is being constantly assaulted by mans productive activities and as a result of this has been suffering great physical changes (Seiffert et. al 2005).

The concept of sustainability applies to integrated systems comprising humans and the rest of nature. The structures and operation of the human component (in terms of society, economy, law, etc.) must be such that these reinforce or promote the persistence of the structures and operation of the natural component (in terms of ecosystem trophic linkages, biodiversity, biogeochemical cycles, etc.), and vice versa. Thus, one of the challenges of sustainability research lies in linking measures of ecosystem functioning to the structure and operation of the associated social system (Cabezas et al. 2005).

The pattern of sustainability means the implementing way of sustainable development, the theory of the pattern of sustainable development needs discussions from the systematical and dynamical characters of the development of human's society. Systematical character require us to regard the factors of population, resources,

environment, economy as an entire system, to study the structure and the interactive function among each part, namely, to study the pattern of the harmonized development of the whole system consistent of each part. Dynamical character require us to consider the equality among generations and equality within one generation, so sustainable development not only deal with the current generation or the coordinate development of population, resources, environment and economy of one nation, it also deal with the later generation and the conflicts and contradictions of population, resources, environment and economy among nations or regions (Yao et al., 1998).

From the view point of system science and system engineering, the sustainable development system is an open system with the characteristics of complexity, uncertainty and non-linear. So the synthetic coordinate and optimization, the intensive growth is the necessary condition of the sustainable development (Fan et al., 1997).

The word “Intensification” has its own form in Chinese, “Ji-Yue” is a special word in Chinese language, “Ji” means concentrate or integration, “Yue” means conserve or giving up superfluous. So “Ji-Yue” means concentrate all kinds of resources firstly, constitute a system, then the resources have qualitative change, new character and function emerged. At the same time, the resources must be conserved, get rid of the unnecessary use of resources and conserve the expensive and deficient resources, save unnecessary operations. In China, development is the “core” principle, the development speed depends on the base of best benefit, the fundamental way to pursuit best benefit is to enhance the efficiency. So, the intensification is the advanced type of the systematization. (Wang Huanchen, 1996&1997)

The core of the theory of system dynamics is materialist dialectics. It emphasizes the viewpoint of system, relationship, dynamics and development, it emphasizes the main contradictory and the main direction of the contradictory, it emphasizes the objective objects and the viewpoint of the world can be know, it emphasizes the practice is the standard to test the truth. (Wang Qifan, 1999a)

From all of the discussions above we can safely draw the conclusion that the nature and the pattern of sustainability is to develop systematically. At first we should take the whole human society and natural society as an integrated system. One of the most important characteristics of system is that the subsystems are interacted each other, and the other most important characteristic is that the total effects are better than the plus effects of individual effect. So the second thing in implementing the sustainable development is to coordinate well with each subsystem in the course of pursuing human’s well-beings. In terms of economic development the most important things are the quality and the efficiency of the development especially in China. So to develop intensively is the prerequisite of the sustainable development and the intensification is the advanced type of the systematization.

4. Conclusion

So there remains a triangular relationship among Chinese philosophy, sustainable development and systems thinking. The exploration of this relationship will benefit human beings' efforts of sustainable development following systemic principals. Nowadays, the western civilization has already exposed many malpractices, the environment problems are among the catastrophe caused by industrialization. We can say human beings should follow the way of ancient Chinese wisdom, such as conforming to the natural laws, the principal of reconcile, balance, and golden mean of Confucian school.

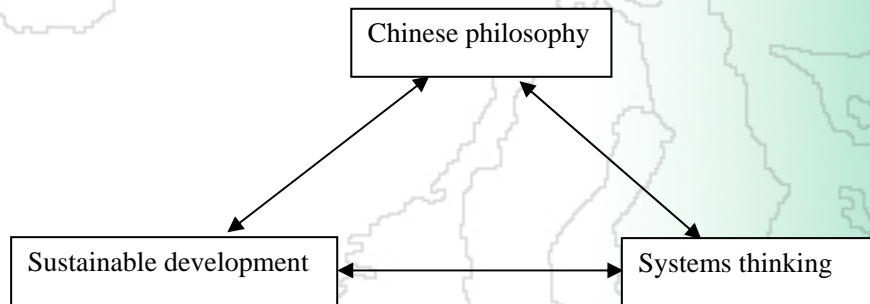


Figure 1. The triangular relationship among Chinese philosophy, sustainable development and systems thinking

From the viewpoint of knowledge development history, the phase of synthetic in ancient times was a time of orient, and the phase of analysis in modern times was a time of western. So the phase of entirety, namely systems thinking, in 21 century will be a time of the combination of orient culture and western culture.

Western culture has greatly influenced the development of human society in the past several centuries. Look what we have done today. The esurient exploitation of nature has caused an enormous waste of natural resources, the depletion of the ozone layer, toxic ocean water, environmental pollution and an imbalanced ecosystem. All these dreadful phenomena have greatly endangered the living condition of human beings. Western philosophy, which believes that “heaven and human are separate,” cannot be excused for these problems with nature.

Different from Western philosophies, the Chinese philosophy emphasizes the “oneness of heaven and humans”-human beings' activity must be analyzed in the research of “heaven (the rule of nature)” and vice versa. The “oneness of heaven and humans,” cornerstone of Confucianism, was first illustrated in “The Book of Change”, an ancient Chinese divination manual and book of wisdom. This model of thinking reflects the inner link between human and nature and will be helpful in addressing the relationship between them.

In the 21st century, we have seen the development of science, technology and economy brought about by Western rationalism as well as democracy and rule of law. Indeed, it has promoted the prosperity and strength of the Western world. However, on the other hand, we have also witnessed two worldwide conflicts inflicted by Western powers. Even today, we are still threatened by terrorism, international conflict and a possible technological war. If Western rationalism can embody the Confucius humanitarian spirit such as “do not do to others what you would not want yourself” and “stay in harmony with each other while tolerating differences,” then genuine peace and

prosperity will be within our reach in the foreseeable future.

At present, we should not only reinstall and spread Confucius' wisdom and his philosophy, but also cultivate a new rationalism embodying his theories-fully integrating human virtues and human knowledge. The whole world should learn to recognize the interrelationship between life and the value of life, the reciprocity of development, the diversity of the world and the openness of study so as to advance global ethics.

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