Proceeding Paper

Discrimination and Analysis of Concepts and Relationships Related to Information and Intelligence [†]

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Abstract: At present, there are many opinions and much confusion in the discussion of the concepts of information, knowledge, data, digit, practice and intelligence, and even the regulations and appellations and their interrelations in the information society and intelligent society, which directly proves that it is necessary to find a reasonable explanation dimension to explain such concepts, appellations and their relations clearly and uniformly. This will certainly help to promote the progress of research in this field.

Keywords: information; knowledge; practice; intelligence; information paradigm

1. Division of the Field of Existence and the Essence of the Information World

Contemporary science has regarded material (mass), power (energy) and information as the three basic elements of general things. However, at the level of general philosophy, mass and energy are the existent forms of matter, which also shows that matter and information are the two basic fields that make up the world at the ontological level of philosophy.

In general, "the division of the field of existence" is the highest paradigm of philosophy, because only by determining the field of existence in the world can we explore the relationship between different fields, and then make a hierarchical division and interpretation of different things and phenomena.

In the tradition of western philosophy, existence belongs to three major fields: God (an objective idea, absolute spirit), substance world, higher animal and human spiritual world. With the development of science, God has been gradually dispelled in the field of general science and philosophy, so what remains can only be the latter two fields. This constitutes a basic model of the highest paradigm of traditional philosophy: existence = matter + spirit.

With the rise of modern information science, an information world (indirect existence), which is different from the substance world (direct existence), has been gradually accepted by the field of science and philosophy, so it is necessary to change the basic model of the highest paradigm of traditional philosophy. Chinese information philosophy has put forward a set of systematic theories of dual existence of substance and information through more than 40 years of development. According to this theory, the expression of the new highest paradigm of philosophy should be as follows: existence = matter + information. Information also includes two fields: objective information and subjective information, and human spirit is the subjective information, which is the advanced form of the information world.

As early as the 1980s, Chinese information philosophy defined the essence of information from the ontological level of philosophy: "information is a philosophical category indicating indirect existence. It is the self-manifestation of the existing mode and state of matter (direct existence)" [1] (pp. 33–35). Chinese information philosophy divides

information into three basic forms: in-itself information (objective information), for-itself information (information grasped by a subject's perception and memory), regenerated information (information created by a subject's thinking) and a comprehensive form: social information (cultural world created by human beings). Based on the classification of information forms, Chinese information philosophy also puts forward an extended definition that includes all information forms: "Information is a philosophical category indicating indirect being. It is the self-manifestation and re-manifestation of the existing mode and state of matter (direct being), as well as the subjective grasp and creation of information by the cognitive and practical subject, including the cultural world that has been created by human beings" [2].

Since matter and information are the two basic fields of existence that make up the world, all other things and phenomena should belong to these two fields. The knowledge, emotions, consciousness, intelligence, etc., that are generally considered to be spiritual phenomena, therefore, should all be contained in the information world, rather than detached from the information world.

2. Knowledge, Digit and Data

Knowledge is systematic subjective information formed by human beings through the grasp, processing and creation of information through subjective spiritual activities. From the perspective of the genesis of knowledge, it originates from the cognitive subject's grasp and creation of information, and from the way of the existence of knowledge, it can only exist in the form of subjective information (including its externalized form—the cultural world created by human beings belonging to social information).

The contemporary theory of knowledge divides the knowledge created by human beings into two categories: classified knowledge and tacit knowledge. Since the second half of the last century, the wave of digitization, as termed by academic circles, has been established in the sense of the technical processing of classified knowledge. Digitalization is not another field besides informatization, it is only a kind of technical means adopted by human beings to realize informatization at present, because it is possible to deal with it only by transforming the corresponding information into the form of digital code and achieving it in a mechanical way.

Mr. Luciano Floridi, a representative of western information philosophy, puts forward a definition of the nature of information: "information = data + meaning" [3]. According to his explanation, data is excluded from information, and only those data that are given meaning are information. The parochialism of this view is obvious. In fact, data is the state information of the object obtained by people through perception (observation and experiment), and it exists in the way of for-itself information. People can only carry out the process of their thinking activities through the processing of the relevant data they grasp. It is data information that provides the basis of information elements for people's thinking activities.

3. Practice and Intelligence

The practical activities of human beings are different from the unconscious activities of ordinary natural objects. Purpose and planning are the main characteristics of human practice, and any purpose and planning is first of all a form of regenerated information created by human thinking. Chinese information philosophy regards human practice as a process of multi-level information feedback chain operation: the purposeful and planned information created by the subject ←→the instruction information for the activation of the subject's behavior ←→the action of the locomotive organs ←→operating tools ←→acts on the object ←→the production of practical products. It is based on such a complex and intertwined information feedback loop that we have reason to conclude that practice is a process in which the purposeful information created by human beings is realized in the object through the implementation of the planned information created by human beings [4] (pp. 57–63). Thus, it can be seen how narrow it is to regard practical activities only as a kind of material activity.

Intelligence is a concept that refers to the superposition of the wisdom and ability of the subject with cognitive and practical ability. On the one hand, human intelligence depends on the physiological and genetic structure; on the other hand, it depends on the acquired construction of socialization. Its possible behavior and possible degree depend on the unity of the comprehensive construction and holographic interaction among physiological function, psychological activity and behavior mode.

Although human intelligence must also exist in the form of knowledge and information, intelligence cannot be equated with general knowledge. Heraclitus once believed that wisdom was the ability to master knowledge [5]. Intelligence is the active way and method for the subject to grasp, process, create, develop, utilize and realize information in the process of cognition and practice. In fact, in the process of human perception, memory and thinking, in the process of the generation of human emotion and will, and in the process of human practice, there must be corresponding intelligent intermediaries to provide corresponding ways and methods. In this way, intelligence embodies the active aspect of the behavior of the subject, which is different from the general thing. It not only plays a role in human cognition and practice, but also plays a role in controlling, guiding and dominating cognition and practice.

4. Levels of Human Information Activities and Interactions between These Levels under Intelligent Guidance

People's cognition and practice is an advanced activity of grasping, creating and realizing information. This process includes many levels of complex interaction (the basic level of in-itself information activities; the level of for-itself information activities of perception and memory; the level of the subject creation of information by thinking; and the level of practical activities in which the information created by the subject has been socially realized). In the interior of these many levels of information activities, as well as the complex interaction between levels, they are bound to be under intelligent control, guidance and domination at the same time [6,7].

Figure 1 briefly shows the complex interaction between many levels of human cognition and practice under intelligent control, guidance and domination.
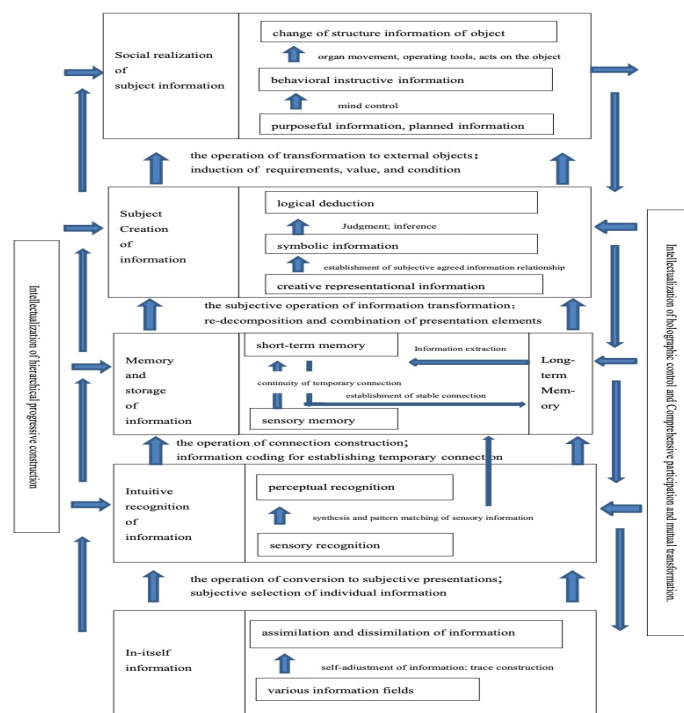

Figure 1. Levels of Human Information activities and Interactions between these levels under Intelligent guidance [8].

5. Information Paradigm and Information Civilization

The rise of information science and information philosophy has fundamentally changed the way people understand the world. The first standard theoretical paradigm of human science and philosophy, which was originally put forward in ancient Greek philosophy and modern science, is the entity paradigm. This paradigm holds that the world is made up of particles with mass. The atomic theory in ancient Greece is the philosophical representative of this paradigm, while Newton's particle mechanics and the atomic-molecular theory put forward by modern science are the scientific representatives of this paradigm. The second standard theoretical paradigm of human science and philosophy is the energy paradigm. This paradigm holds that the world is constructed by an energy field that does not have a static mass. The theories of electromagnetic field, quantum mechanics, relativity and modern cosmology in modern science are the scientific representatives of this paradigm, while the contemporary realism based on energeticism is the philosophical representative of this paradigm. The third standard theoretical paradigm of human science and philosophy is the information paradigm. According to this paradigm, the nature of things cannot be simply determined by the amount of mass and energy, but must consider the combination of mass and energy, the information content of things, and the evolution procedure and process determined by information. The rise of the contemporary complex information system theory is the scientific representative of this paradigm, while the theory of dual existence and dual evolution of matter and information put forward by Chinese information philosophy is the philosophical representative of this paradigm.

As early as the early 1980s, Alvin Toffler, an American futurist, vividly compared the development of human civilization to three waves: agricultural civilization, industrial civilization and information civilization. In fact, the division of these three civilizations is based on the mode of production tools used by human beings. The means of production of agricultural civilization are manual tools operated by manpower and animal power; the means of production of industrial civilization are mechanical tools powered by steam and electric power; and the means of production of information civilization are intelligent tools marked by informatization and intellectualization. In addition to the differences in some objects and capabilities of production, the differences among different civilizations mainly stem from the differences in their modes of production. In the era of agricultural civilization, people's physical and mental work is mainly accomplished by the ability directly given by nature, and the large machinery production mode of industrial civilization reduces the intensity of human physical labor to a great extent. In addition, the production methods of informatization and intellectualization created by information civilization liberates human mental work day by day.

With the advent of information civilization, academia has put forward many theories about the division of times: post-industrial era (post-industrial society), post-modern era, digital era (digital civilization, digital economy), intelligent era (intelligent civilization, intelligent society, intelligent economy). Although these formulations are more or less meaningful and valuable from the unique point of view of the proposer's thinking, strictly, they all have a certain degree of imprecise parochialism.

The formulation of the post-industrial era and post-modernism only makes it clear that the traditional era has come to an end and a new era has been opened up. However, modern and post-modern, new and traditional are relative. With the passage of time, the post-modern will also be transformed into the modern, the new will also become the traditional. In fact, this formulation not only fails to reveal the specific characteristics and nature of the new era, but also leads to the confusion of naming in the following era. If another era of renewal comes, should we call it "post-post-industry" or "post-post-modern"?

Based on the point of view we have discussed before, digitization is only a technical means for us to achieve informatization at present, and using it to mark a new civilization era and economic system obviously cannot properly reveal the essential characteristics of new civilization and new economy. Similarly, because intelligence is the active way and method for the subject to grasp, process, create, develop, utilize and realize information in

the process of cognition and practice, it is included in the information world and must exist in the form of information. In this way, it is still impossible to fully summarize the nature and characteristics of the era based on the information paradigm when we call our era by intellectualization alone.

As far as the development of the information age is concerned, it is initially more reflected in the fields of computer and communication technology, microelectronics and network technology, space technology, genetic engineering of biological information, etc. In the recent development, many new fields have emerged, such as big data, cloud computing, deep learning, virtual reality, quantum information, gene enhancement, artificial intelligence technology, etc. Although the intelligence of these brand-new technology fields is indeed increasing, it still belongs to the field of information technology. Accordingly, we can regard the new development of intelligence as a new stage of development in the information age. Obviously, the view that intelligent civilization is regarded as a new era of civilization that transcends information civilization is untenable.

Just as human agricultural civilization and industrial civilization have gone through different stages of development, human information civilization will certainly go through several different stages of development. At present, we are in the era of vigorous development of information civilization. As for what is the next civilization after the information civilization, we still do not see any clear signs.

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