

Research on Innovation Principle of Based on Generalized Information Theory

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Abstract

Throughout the history of humanity, innovative activities have been an essential source of power required for the development of human society, driving humanity from the Age of Gathering through agricultural and industrial civilization to the digital age. Therefore, modern education attaches great importance to cultivating human creative abilities. In order to better cultivate human innovation ability and guide the innovative activities of human society, people also recognize innovative activities from different perspectives. This paper uses generalized information theory to understand innovative activities and proposes key capabilities and elements that affect innovative activities based on generalized information theory.

Keywords

Innovative Activities, Creative Abilities, Generalized Information Theory.

1. Introduction

Innovation is generally defined as the act of improving or creating something new in a specific environment, in the spirit of idealized needs or to meet the needs of society, using the existing mode of thinking to propose insights that are different from the conventional or commonplace way of thinking as a guide, and that can achieve specific beneficial effects [1]. Innovation is philosophically an act of creative human practice, which, to increase the total amount of benefits, requires the utilization and re-creation of things and discoveries, especially the utilization and re-creation of contradictions in the material world. By utilizing and recreating the material world, human beings create new contradictory relations and form new material forms [2].

In a sociological sense, innovative activities drive social development and progress, create new things for human society, and meet the needs of individuals or society [3]. In a philosophical sense, innovative activity concentrates on individual life or group wisdom, which gives essential meaning and value to human life and group behavior [4]. For this reason, the development of creativity, innovative thinking, and innovative practices is a top priority in the education of human beings.

In education, applicable practices have been made to develop students' creative abilities. Wang et al. carried out teaching activities based on the concept of STEAM education and explored the path of youth innovation ability cultivation [5]. Zeng et al. practiced a multifaceted and synergistic approach in developing the innovation capacity of professional graduate students [6]. Yang et al. proposed a cultivation system for master's degree students' scientific research and innovation ability based on the theory of hierarchical progression [7]. Jia et al. started from the aspects of curriculum design, model innovation, environment creation, teaching reform, management system, practice carrier, and teacher team to improve the mechanism of innovation education in colleges and universities and to promote the sustainable development

of college students' innovation education [8]. Zheng et al. proposed a solution based on the guarantee of policy, financial guarantee, curriculum system construction, environmental atmosphere creation and dissertation quality assurance solutions to enhance the innovation ability of graduate students [9].

With the rapid development and application of information science and information technology, information theory is gradually understood and recognized by people, and based on information theory, generalized information theory provides a new perspective for people's understanding of the objective world [10]. In this paper, we take generalized information theory as a perspective to re-examine the innovative activities of human beings and put forward the elements of innovative ability based on generalized information theory.

2. Foundations of Generalized Information Theory

2.1. Model of the relationship between the physical world and the information world

The physical world is a multidimensional set composed of physical entities and physical space [11], in which physical entities describe the orderly structure of matter formed according to specific laws, including natural objects, human beings, and artifacts. Natural objects refer to all the objects existing in nature that have not been artificially reconstructed, such as mountains, rivers, plants, animals, etc.; artificial objects refer to the new functional structure formed after the artificial transformation or reconstruction of natural objects, such as trains, airplanes, ships, industrial robots, computers, cellular phones. However, artificial objects cannot be detached from natural objects and made out of thin air simultaneously, and it is still necessary to use natural objects as raw materials. The counterpart to the physical world is the information world, a multidimensional collection of information entities and spaces, as shown in Fig. 1. Information entities and physical entities mirror-image symmetry and do not depend on the information observer and objective existence; information entities describe entirely the physical entity in all dimensions of the static properties and dynamic properties. The static attributes are the intrinsic of the physical entity, including the elemental composition of the elements, size and dimensions, color, and smell. The dynamic attributes describe the interaction behavior of the physical entity with other physical entities in the physical environment, which is a changing attribute, and any physical entity, as long as the environment exists, will exist in these dynamic interaction attributes.

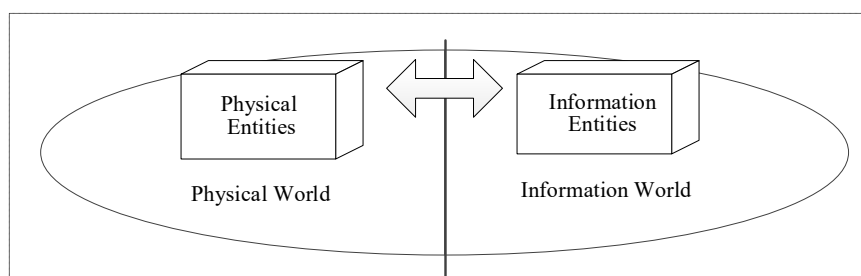


Figure 1. Model of the relationship between the physical world and the information world

At the same time, the physical entities in the physical world have different existence cycles and are in a constantly changing environment. The information entities will change with the physical entities. The physical entities will be deconstructed or transformed into another form of physical entities, and the corresponding information entities will also be deconstructed or transformed into another kind of corresponding information entities. The physical entities and the information entities are strictly symmetrical and synchronized. Therefore, physical entities

objectively exist in the physical world, and the corresponding information entities also objectively exist in the information world. The change of the physical entity is irreversible, and the corresponding information entity changes continuously, non-accumulatively, and irreversibly. Thought belongs to information. There is no physical entity with its direct mirror symmetry, but it must also depend on the physical entity to exist, "This book is beautiful! I like it!", "The moon is full and beautiful tonight!" Thus, on similar thinking, information must be physical entities as a prerequisite for the existence of the non-existence of the book, how to like, the non-existence of the moon, and how to the moon is round and very beautiful. It is only that these objectively existing information entities need to be reflected by the observer in order to be recognized, processed, and transmitted. The information of human thinking is precisely formed after reflecting different aspects of the information of physical entities in the external environment and then processed again in the mind.

2.2. Information Exomorphism Model

Quality and information are observation objects, which are observed and researched; observation entities, such as people, animals, sensors, etc., are observers, and the observers can also become observation objects and be observed simultaneously. The observer maps the information entity from the physical entity through perception and completes the information out-structure by encoding to form memory and storage; the storage carrier of Out-structure of Information is the medium of Out-structure of Information, and the medium is the material; the content of Out-structure of Information forms the space of Out-structure of Information, for example, all the achievements of human information civilization are contained in the human Out-structure of Information. For example, all the achievements of human information civilization are contained in the space of human exo-constructed information. The observer recognizes, understands, and organizes the observed object through the exo-constructed information, establishes connections with other individuals, and exchanges and communicates experiences. As shown in Fig. 2, the physical world that the observer can observe is limited, and the limited ability of the observer to externalize information entities makes the externalized information asymmetric with the observed physical world. Different observers have different ways of externalizing information entities and different forms of information expression. For example, human beings perceive the elemental physical world through vision, hearing, smell, gravity, etc., and encode and transmit it through language, images, and other tools, and record and store it through text and other media; bats recognize and perceive changes in the physical environment by emitting ultrasound waves, and so on. Humans cannot understand, much less interact with, bats' exoplanar information because exoplanar information varies from observer to observer.

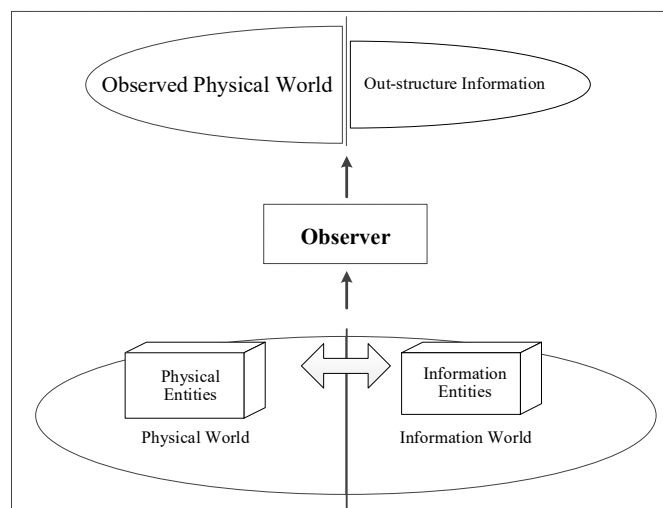


Figure 2. Information out-structure model

3. Elements of Innovative Capabilities Based on the Information Exemplar Model

Based on the information externality model in the generalized information theory, the human being corresponds to the position of the observer in the model, and human innovative activity can be defined as the process of observing the physical world, externally conceptualizing information from the information space, and practicing it in the physical world. Based on the model of information externalization, human innovative activity is not "creation" but rather "discovery" of helpful information in the information world since this information does not depend on the observer. Nevertheless, the observer also plays an essential role in the innovative activity of externalizing and applying information in practice. In the process of externalizing information, the observer needs to encode the information, which can result in loss or even distortion of the information. Therefore, how the observer can ensure the accuracy of information as much as possible in the process of encoding the world of information is crucial to the innovative activities of human beings. While many factors affect the observer's accurate externalization of information, this paper proposes two elements as the cultivation goal of the observer's innovative ability.

1) Necessary knowledge reserves. The innovative activities of human beings are based on past knowledge, which is "discovered" and encoded in the world of information by outstanding "observers" in the history of human beings. It is precisely through the discovery and accumulation of knowledge by previous generations that future generations can continue to discover new knowledge in the information world in a relay fashion and change the material conditions and social structure of human society. At the same time, this paper needs to emphasize that with the explosive growth of knowledge in human society, the necessary knowledge required for innovative activities is not all the knowledge, and too much knowledge reserve may lead observers to get caught up in it, instead of hindering the development of innovative activities. Therefore, a moderate knowledge reserve is more conducive to the development of innovative activities.

2) The observer's concentration in the externalization of information. The observer's degree of concentration in externalizing information will directly affect the accuracy of information externalization. With the rapid development of human society and the abundance of the physical world, the observer receives a large amount of deconstructed information from the information world, and a large amount of unorganized deconstructed information affects the observer's concentration when deconstructing information. For this reason, cultivating human concentration requires reducing the disorder of the input information while cultivating the observer's ability to concentrate and stay focused enough during the externalization of information.

4. Conclusion

Based on the information exostructuring model of generalized information theory, this paper proposes two major elements for cultivating innovativeness: a moderate knowledge reserve and the observer's ability to focus. The enhancement of these two aspects of ability helps people to accurately ex-construct information from the information world and carry out effective innovative activities.

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