

Presence of Philosophy in Engineering

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Abstract

Philosophy of engineering places the metaphysical substance of gratitude, considerate management of philosophy in engineering. The research recommends and construes the chief theses of engineering ontology, which fluctuates from empathetic of engineering in discrete rudiments. Engineering ontology trusts that engineering is the realistic productivity that turns energetically and practicably and generates values. Engineering encompasses the affiliation between human beings and the nature as well as the relationship between human beings and the society, and it has been a basic motive force and a basic way of promoting the social development, so that engineering gains the ontological status and fundamental value in social existence and social development. The perceptivity would have the engineering appears before the appearance of technology and science. Engineering has its own source for presence, its own arrangement and its own commandments for undertaking and growth. Engineering ought not to be purely viewed as the consequence and plagiaristic from science or technology. Engineering ontology is the academic origin of the triism of “science, technology, and engineering”. To understand and handle the mutual relationship among engineering, technology and science, by the estimation benchmarks of engineering as the through throughput, the progression and consequence of commerce-centered selection, amalgamation and erection must be accentuated and the individual and appliance of collection, incorporation and production must be paid high attention. Under no circumstance may the engineering be reasoned as an unmoved matter, which is constantly evolving and developing, so the studies on engineering ontology are closely and internally related with the theory of engineering evolution.

Keywords: Engineering, Ontology, Philosophy

Introduction

While philosophy of science and philosophy of technology have been established for a long time, philosophy of engineering is slow in coming. At the end of the twentieth century, almost no one showed any interest in research of philosophy of engineering. However, at the beginning of the 21st century, philosophy of engineering rises in the East and the West. Interestingly, three Academies of Engineering, Chinese Academy of Engineering, National Academy of Engineering of America and the Royal Academy of Engineering, have paid attention to philosophy of engineering without previous arrangement since the beginning of the 21st century, which stands out as one of the landmarks in the history of philosophy of engineering. Engineers and philosophers consider engineering ontology the core issue of philosophy of engineering. In this essay engineering ontology will be interpreted briefly. The engineering mentions to all types of making doings by the human beings to advance their own environments for subsistence, imitation and in terms of the thoughtfulness on the nature at that time. It is an occurred labor practice. The engineering is a straight efficiency that rounds dynamically and feasibly, creates values and serves as a material basis for the existence and development of the human

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beings and the society. The engineering mirrors the association not only amongst the anthropological beings and the nature, yet too amid the human beings and the humanity. Consequently, it must be measured and deliberate from the realistic liaison surrounded by the nature-human beings-the society. Under no situation could such engineering actions be merely supposed as the “purely technical activities” or “purely economic activities”. And the engineering, in addition, may not be simply summarized as the “application of science” as well.

1. Observations of engineering from different views

Altogether classes of human doings of formation have both normal traits conforming to natural commandments and societal qualities with determinations. After the fact of interpretation of contemporary understanding, a consistent acquaintance chain exists between the nature and the society. The overhead-declared knowledge chain is one used to know the commonsense bond, pretty than one used to appreciate the inheritable rapport of bygone stretch categorization. It is a complex acquaintance sequence and a multi-coats data system where diversified. The engineering exemplifies the all-inclusive addition for the conformation of fundamentals concerning the flora and the humanoid actualities, in addition the correlated courses on start, pronouncement, preparation, policy, production, seriatim, organization plus the related. It is filled of rational inferences.

The philosophy is a development to pursue the “Tao” and to ask frequently and probe into essential questions about the quintessence and laws of existence, as well as the meaning of human life. And the human beings, in return, shall guide and normalize all kinds of practical activities by following their understanding and conception on the “Tao”. During the development history of the human beings, the engineering serves as an essential form of practice all the time. The placated relationships exist among diverse links and layers. Figure 2 denotes an abstract graph for summarization. Before the appearance of the philosophy of engineering, people used to perceive the engineering from different views and they infrequently observed or studied engineering as engineering itself or on the engineering-centered standard. “Different projections” on engineering will be gained in case of engineering clarifications from different views and diverse understandings will be thus obtained on engineering itself.

From the economic point of view, it may be established that the investment is an important element for engineering activities and substantial engineering activities, including material creation activities, material production & manufacturing activities, material transmission activities etc., are a specific carrier for the commercial operation, as well as the main content and the primary form for substantial economy. From the industrial point of view, it may be resolved that the engineering is a primary unit of industry and applicable engineering entities (factories, enterprises, etc.) of the same type are the “cells” of the industry. Engineering usually has the industry structures. Different types of engineering may form different industries, including the agriculture, animal husbandry, forestry, mining, process manufacturing, apparatus-product manufacturing, transportation, information transmission, medical care, etc.

From the technological point of view, it may be concluded that the engineering is an assemblage of technologies and the technological knowledge, methods and apparatus are the essential premise and basis for engineering activities. Applicable technical groups with different natures and functions may be joined together through the engineering system and be transformed into the respected practical productivity with definite functions, after the amalgamation of such elements as the capital, resources, labor, etc. Neither may a single technology form the engineering, nor may the engineering simply apply a single technology. As an integral element of the engineering, only may the technologies achieve their particular functions and proficiencies after they are surrounded, in a dynamic and ordered way, into the engineering system (including the engineering design, construction, production & manufacturing, transportation, information transfer, maintenance, fault judgement and disposal etc.). On the one hand, the technology is the basis for the engineering; on the other hand, the selection, integration and creation of different technical routes and apparatus will be inevitably conducted for the engineering design and engineering activities on the basis of the “engineering needs”. To sum up, the technical selection, incorporation and construction are essential for the engineering. During the selection of technical elements for the engineering, the improvement of technical elements themselves may not be simply used as the unique standard. The “engineering purpose” and the “overall engineering requirements”, instead, shall be espoused as the basic average for selection.

From the scientific point of view, alterations between the science and the engineering will be firstly found. The science is truth-oriented, while the engineering (including the technology) is otherwise efficacy-oriented or value-oriented. The science aims to discover and find the conformation and nature of things, as well as their rules of movement. The scientific activities are not future for making new inventions, but they aim to find out the running rules of neutral things that actually exist. Scientific happenstances may be renewed into productivity through the technology and the engineering. Many scientific activities, however, are not always to appreciate the convert into useful productivity. From the historical view, engineering activities have existed since the developing society, while the modern scientific activities only have been recognized for hundreds of years. Within a long period in history, the operation of engineering activities does not rely on the answers of scientific principles. Even the first industrial revolution was not “driven” by scientific theories. After the first industrial revolution, the engineering and the science become more closely allied and the relevance between the engineering activities and the modern science is improved increasingly; at the same time, many new problems and guidelines with deference to the science have been put headlong by the engineering.

From the possessions point of view, it may be determined that specific resources are the essential premise and basis for engineering activities. Among the engineering activities, those “materials” “without any value difference” in physics become valuable “resources” with difference uses. The resources in the world, in addition, are disseminated in an inadequate and unbalanced way. The restraint and development of possessions are important contents under the engineering activities. The resource-based view of engineering activities is greatly different from the material-based view of natural science in their meanings and contents.

2. Consequence of annotations engineering from the view of engineering ontology

As for engineering, we not only need to understand all elements as well as different concerts and sides of the engineering from different views, but also requirement to probe into its nature from spread singularities. In this way, a more comprehensive and overall understanding on the engineering may be gained from different “single sides”. Misunderstanding or one-sided understanding will inescapably occur if we can’t study engineering from the generation, progress and evolution of the engineering itself, and understand the root of the engineering activities.

We have also practiced a gradually extending process for understanding what the engineering ontology is. We have further studied the engineering activity from the view of philosophy ontology and extended and transferred the above-mentioned points of view as our understanding on the ontology. After our basic understanding above-mentioned on the engineering is associated with the scope of the engineering ontology, it is more greatly concluded that the engineering activity is the basis for the presence and development of the society and the engineering shall thus take an ontological rather than involved place. In a word, to understand the engineering from the view of philosophy, it shall be accepted that the engineering has its thoughtful and ultimate nature and meaning as the ontology. With the “engineering ontology” as an essential root and viewpoint, a more all-inclusive and objective understanding of engineering will be obtained, which fits in with engineering reality more closely.

3. Engineering ontology and “derived theory of engineering”

The view of engineering ontology is disparagingly different from that of the derived/attached theory of engineering. The former trusts that since the engineering takes an ontological or root location, we must adhere to understanding the engineering from the engineering itself. The latter, however, believes that the engineering only takes an “attached” or “derived” position. After the Second World War, the view of resultant theory of engineering is very popular both in the western and eastern worlds. Many people “usually” respect the engineering as the “application of the science”, and mix up or “conclude” engineering successes as scientific achievements. For example, the feats by the U.S.A., Russia and China in the troposphere engineering are concluded as the achievements made in the mesosphere science.

Though the upstairs point of view has an intense historical flaw and needs to be supposedly discussed, it has become a very “popular” stance in the whole world. This historical flaw was shown by the fact that in the history of mankind, the modern science only has been developed for few hundreds of years, while the engineering activities of the human beings have been developed for more than thousands and thousands of years. For this reason, the engineering which had been formed even before the advent of the modern science cannot be watched as the application of science.

Unquestionably, after the formation of the modern science, the relationship between the science and the engineering becomes closer and more complex. After the first industrial rebellion, there seem to be

many phenomena demonstrating that the engineering activities must rely on the science knowledge, and the engineering knowledge is consequent from the science knowledge. The further investigation and studies prove that it is not the case. If the purpose and social consequence and other related issues are taken into account, the standpoint that the engineering is simply deemed as the “application of science” is not supported.

The attitude that “the technology is nothing but the application of science and the engineering is nothing more than the application of technology” was even scrutinized and disparaged by the Professor Chen Changshu in one of his essays. The standpoint that the engineering is the “application of science”, however, seems not to be essentially shaken ever. Tentatively speaking, the decisive, central point of the thesis that the engineering is merely the “application of science” lies in contradicting the root position of engineering. Just as above mentioned, engineering has ontological status, which means that engineering is neither an imitative of science, a derivative of technology, nor an unoriginal of investment.

The engineering ontology trusts that the engineering activities are not resultant but the root. Engineering activities are the practical and direct efficiency that are generated, developed and regularly progressed for the survival, reproduction and development of the human beings. The engineering emerged before the appearance of sciences and engineering activities are the substantial basis for the existence and development of the society. The human beings would not endure without engineering activities.

From the point of view of engineering ontology, it must be concluded that: though the close relationship amongst the engineering and the science & the technology may not be denied, it shall not be thus whispered that the engineering is devoted under the science and the venture activities as well. Of course, it must be accentuated that as to the engineering, the technology is its essential suggestion and the science is its significant element for knowledge sustenance. The engineering, however, has its undeniable “ontological” position. And under no situation shall the engineering be deemed as the derivative, outgrowth or outcome from the science and the technology.

Due to the root location taken by the engineering, the engineering cannot be detached from its integral elements, and shall select and assimilate all elements thereto according to convinced value objectives and principles. The instruments of the selection, integration and creation of the engineering are the conduit to connect together the root theory and the elements theory of the engineering. The physiognomies of the engineering motion should be grasped and analyzed from the view of engineering ontology. The engineering activity aims at making artifacts or connections through selection, integration and construction and at optimization of elements, structure, functions and effectiveness under certain boundary conditions. These processes and results of the engineering activity are both intended for the comprehension of the engineering in the form of a practical and direct productivity.

Under the engineering addition, the unity of opposites presented by “one” root yet “several” elements is personified. The integration is by no means equal to the piece together or random grouping of several elements. The engineering is a kind of material social activities of the human beings. It involves not only those elements with respect to ideology, value and knowledge, but also resources, capital, land, apparatus, labor, market, environment and other elements. Only when a nonterminal and valuable engineering entity, with a certain structure and functions, is formed after the selection, combination, interface and integration of such knowledge, tools, means and elements, may the engineering be appreciated in the form of direct productivity. The implication and elements of the engineering may be preoccupied into the model below.

To sum up, the engineering may be interpreted as follows: the engineering is a purposeful, planned and prearranged “man-making” material practice in order to concept and run artificial realities. In the procedure of engineering human beings utilize their expanded knowledge used in an intended, planned and organized way (including technical knowledge, science knowledge, engineering knowledge, industry knowledge, social-humanity knowledge etc.) and all kinds of resources successfully configured (including natural resources, economic resources, social resources, knowledge resources etc.), through the augmented selection and the active & effective integration of elements, using a variety of apparatus and means of production.

4. Summarization of the engineering ontology

Engineering ontology is a significant issue in the study of philosophy of the engineering. The above examination about engineering ontology can be accredited to the following points of view. Engineering ontology is a philosophical conversation of the origin, medium and root of the engineering. The so-called engineering ontology is to view engineering from the view of human existence and development, in particular, to clarify the important position and role of the engineering activity from human reality and social development as well as the structure and re-establishment of the relationship between man and nature, man and society et al, and other philosophical visions in math of the flop to be the saddling the Brownian philosophy.

From the fact of view of the engineering ontology, the engineering activity is one of the most rudimentary and historic human activities. Engineering convincingly shapes the entrance of nature and the relationship between people and nature, shapes the world of human life and the human beings themselves, shapes the substantial aspect of society and symbolizes the social influences between people. Engineering activity is the substance of human survival and development; as a real productivity, it is the basic way and métier to encourage social development. Engineering ontology stresses the ontological status of the engineering as a real efficiency, as well as the broad values and important values of the engineering activity.

Engineering ontology is the theoretical basis for the triism of “science, technology, and engineering”. Engineering ontology trusts that engineering has its own basis of reality, its own structure, signal and

law of expansion, and its own goals and pursuit of value. We cannot start from the view of scientific ontology, to simply treat engineering as a derivative and evolution of the science or the technology.

Engineering ontology authorizes the root and ontological location of the engineering, starting from the assessment criteria of direct productivity in the understanding and treatment of the relationship between engineering, science and technology, emphasis on the selection, integration and construction course and results which describe engineering as the body, and attach great standing to the landscapes and mechanisms of selection-integration-construction. Engineering cannot be thought as a fixed matter; it is really evolving all the time. In the progress or changeable processes and mechanisms, there are communications and joint effects among driving force, pulling force, braking force, screening force, etc. There is also a close relationship between the investigation of the engineering ontology and engineering evolution.

5. Engineering excellence and philosophy transcendence: the entrance of philosophy of engineering as the times necessitate

Any engineering is permeated with the search of human values; it is the value-permeated engineering that constructs the life world of human. Engineering activities of human beings are a process of creating and pretty human values. The so-called engineering value, a special value created through engineering activities, reproduces the extent to which engineering activities and their results meet human needs.

Allowing to the different connotations of the subject supplies, engineering value can be alienated into several types, such as economic value, ecological value, military value, social value, cultural value and so on. The diversified, multi-dimensional, multi-targeted features of such values are resolute by the cross-cutting features of the engineering activities and the reality of positive diversification. Engineering has not only a useful value, but an ultra-utilitarian value. The practical value reflects the viability of the engineering; the ultra-utilitarian value engineering represents the taste-humanistic values, i.e. basic interest and pursuit of beauty.

Human life has a dual nature, that is, has not only its own biological life, but also the perfection that makes people diverse from animals. Engineering happens to be a real way to achieve human transcendence. It is through engineering rehearsal that people's theoretical ideality may be successfully converted into touchable reality. It is also through this type of adaptation that engineering shapes "materialness" and "humanity", and shapes the way of people living. Engineering shall follow the unity of uniformity and purpose, that is, pursuing not only utilitarian value but also human transcendence, and embodying humanistic values, to bring people liberty and full development. Visibly, in the process of understanding engineering, people can read nature, read life, read society, and read dialectical relationship of "integration of knowledge and action", "harmonious development" and "harmonious survival".

Conclusion

Philosophy has been reputable in the process of sympathetic the nature, society and people, complementary with inquisitive, repeated questioning, and search of ideal. Ideal is an enquiry about authenticity, and yearning for or quest of future goals. In the background of a new century, engineering shall be a new frontier, or a new layer of state to think about philosophy. It shall be one of the important matters of philosophical echo. For engineering, it is an urgent need to use philosophical thinking for apparatus and upgrades. Because an important goal of philosophy is to think or display a new realm of future “life”; whereas the important purpose of the engineering is to try to build and realize the new realm of future “life”. In this mind, there are many junctures and unions in the course of philosophy and engineering perfection, therefore, engineering needs philosophy, and philosophy must face engineering; the communication between them hasten the delivery of the engineering philosophy.

References

1. Alter, T. (1998) ‘A Limited Defence of the Knowledge Argument’, *Philosophical Studies* 90, 35-56
2. Breazeal, C. and Scassellati, B. (2000) ‘Infant-like Social Interactions Between a Robot and a Human Caretaker’, *Adaptive Behavior* 8:1
3. Herbert, F. (1966) *Destination: Void*, Penguin.
Chrisley, R. and Parthemore, J. (2007) ‘Synthetic Phenomenology: Exploiting Embodiment to Specify the Non- Conceptual Content of Visual Experience’, *Journal of Consciousness Studies* 14(7):44-58
4. Bucciarelli, Liuis L. (2003). *Engineering philosophy*. Delft: Delft University Press
Chen, C. (2002). *A collection of essays of Chen changshu*. Shenyang: Northeast University Press
5. Christensen, S. H., Meganck, M., & Delahousse, B. (2007). *Philosophy in engineering*. Denmark: Academica
Durbin, Paul T. (1991). *Critical perspectives on nonacademic science and engineering*. Bethlehem: Lehigh University Press
6. Dennett, D. (2005) *Sweet Dreams: Philosophical Obstacles to a Science of Consciousness*, Cambridge: MIT Press
7. Wittgenstein, L. (1972) *Philosophical Investigations*, Oxford: Blackwell
8. O’Regan, K. & Noë, A. (2001) ‘A sensorimotor account of vision and visual consciousness’, *Behavioral and Brain Sciences* 24(5): 883-917
9. Hurley, S. (1998) *Consciousness in Action*, Cambridge: Harvard University Press
10. Bickhard, M. (2008) ‘Interactivism: A Manifesto’, forthcoming in Campbell, R.L., Ó Nualláin, S., & Bickhard, M.H. (Eds.), *The Study of Mind: Toward Inter- and Intra-Disciplinary Cooperation*. Available at www.lehigh.edu/~mhb0/InteractivismManifesto.pdf; accessed 11/11/07.