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Philosophy in Engineering: Why it Matter and How to Apply it

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Abstract

This paper takes deep looking to relation between the philosophy and engineering. The paper introduces the philosophy as concept and also as haw to apply it in engineering and the importance of philosophy for engineering projects. It also answers the question why engineer should learn the philosophy. The application of philosophy in engineering and how to apply the five branches of philosophy in engineering. Also the paper answer the most important question of engineer in view of philosophy

Keywords: Engineering Ethics, Philosophy in Engineering, Metaphysics and Engineering, Epistemology in Engineering, Engineering Ontology.

1. Introduction

Some philosophers focus on uncovering all concepts (such as Thales, and Anamenes), while others seek to focus on distinguishing (such as Aristotle). To help people understand the topic, we should ask (if they aren't philosophically or scientifically inclined) whether they are looking for one or more answers. It's also just as clear that people who don't take their own advice are suspect: it follows that I like to continue with a generalized rule of thumb (Vermaas et al., 2010).

In this case, American pragmatism, known as John Dewey's work, accepts and recommends engineering and science in their techno social and profit-driven use, but expresses concerns about its easy entry into larger capitalist and national laboratories and national systems as a comparative to its European counterparts (Vermaas et al., 2010).

It might be fair to say that philosophy and engineering aren't far apart. There is a lot of space for theory in dealing with the hard issues of practice, and a bigger space for dealing with the hard problems in making the answers clear and metaphysical. Nevertheless, it is apparent that philosophers would make an attempt to do sooth He must be prepared to deal with nontheoretically questions as well as theoretical ones, learn from materials as well as principles, and be able to admit things can be complex. Engineers' job is ultimately about building products where people transform the world, but most of them must be prepared to go into the real world with that attitude (McCarthy, 2007).

An engineering system has social relevance as well as an intrinsic value, and this is clear when it comes to design: between the engineers and their humanity. Hence, we should do a triple list analysis by analyzing “the natural entities in relation to the human societies,” “the natural and human behaviors,” and “and/society” (see Figure 1). It must never be spoken of as "only technological operations" or "only economic activities". often “the adaptation of theory, if you can, to practice”(Yin & Li, 2014). The approach to be “oneness with nature” and to study fundamentals, such as being, and sense of life, in the

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course of doing so. As well as guides and standardize all sorts of practices, people on the "Tao" There's no denying that over the course of human evolution, engineering has always been a means of refining human creations. Furthermore, the engineering work has a history of growth. in other words, architecture shall precedes technology and shall be on which the theory concentrates In the 21st century, the engineering philosophies were almost completely theoretical, so engineering didn't influence our everyday lives the way it does today (Yin & Li, 2014).

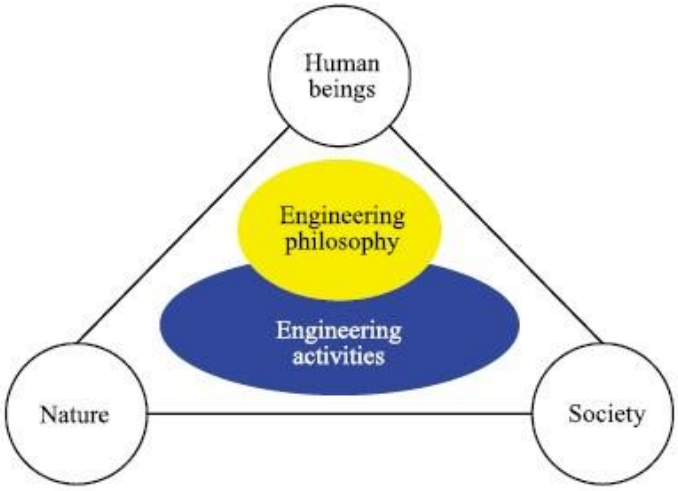

Figure1: nature, humanity, and the society (Yin & Li, 2014)

2. Why is philosophy matter for Engineering?

Philosophy is most vital to engineers when they design everything they use. We started with a study of this topic in the first episode. When does engineering lean on facts and proof, when achieving realistic results, and when does it operate without these? In the realm of risk and protection, it was conceded that theory could serve as a help to the engineers by using conceptual methods that make things clearer, as well as by lending concepts that could provide more clarity for those problems. In point of fact, is it really philosophy that is required here, or are philosophers skilled in it? My problem is that I'm not certain there is a space for purely noninterested approaches to the study of engineering, and also how engineering can benefit from using philosophical principles. However, if so, should engineers be able to serve as philosophers while the theoretical field of philosophy is out of their scope of interest? (Mitcham & Mitcham, 1998).

It is most philosophers who search for the verity of an individual's ideas in philosophy, but they will prefer to concentrate on the concepts' status of conviction (the case being Descartes' system of doubt in the Meditations) (whether theories can be true or merely useful, and whether we can know that a theory is true). It is, moreover, an investigation of the kind of information that engineering techniques produce that shows the inherent shortcomings of its method of accomplishment(Mitcham & Mitcham, 1998; Yin & Li, 2014).

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First lesson: It is important to realize that no matter how hard you think you've "learned" something, it is still possible to re-discover something new In several different lectures, a number of speakers have connected the concepts of ‘knowing how' and Ryle's Theory of Mind to the Theory of Engineering Experience Instead of either knowing the statistics or being able to describe the data, Ryle found a third way in which is expressing abilities or concepts. Science is based on, not only on possessing facts, but also on understanding how to do it. The expertise which is absolutely necessary for the role of an engineer is simple knowledge of resources such as knowing how to use them properly, moderate knowledge about designing around the ones that are missing, and well-developed judgment of a solution will work, as well as that will fit, and limited technical research (McCarthy, 2007).

The engineers develop the machines, but physicists dream up the ideas. While idealization can occur in certain stages of design, in the application of the method, the human factor is often essential to cope with real-world complications. It is important to work as a designer. Engineers are experts at devising both the system itself and how the system can be used by several different users. Around the same time, these people will be acting on the processes (Yin & Li, 2014).

a comparison of actual design concepts to abstract ideas reveals intriguing problems that are difficult to detect when studied under idealized conditions "Why" and "how" are often intertwined in explanation Any successes should be commensurable The whole scheme is an all-encompassing summary, and is is it feasible to attempt without it? How is the programmer able to get an understanding of the machine and how it works? (McCarthy, 2007).

Kieron highlighted a number of various distinctions in Plato and the internet's views on information generation in his talk "Plato and the internet: They are freeing us from our brains" in November 2006. Considering the considerable amount of engineering expertise possessed by organizations, one might argue that knowledge is in itself is nothing more than a certain way of particular conviction. The type of information that is created by projects that are complicated, collaborative, and executed by several workers, is typically not owned by one individual. Rather, in databases, in various brains, in brains, and in archives as an architect, O'Hara observes that creative work does have this trait. As a result of our understanding of technology developments, large volumes of data are now stored on computers and networks, and given a broad dissemination across the internet (Greber, 1966).

3. Why Engineers should learn philosophy

It might be worthwhile to explore what exactly the word "ethics" means in the first place. The word "ethics" from the Merriam-Webster and Webster's - deals with good and wrong, as well as spiritual and religious (Grimson et al., 2008). In this instance, it gives an approach to individuals to empower those on the other side of the coin, particularly those who have empathy and influence in personal relationships, to help them improve their ethical decision-making. "Doing the right thing, even though no one is looking." The foundations of trust in many companies are ethical (and moral) values. Ethics for engineers, as most careers regulate how we can carry out our jobs should be written in technical terms (Grimson et al., 2008; Mitcham & Mitcham, 1998).

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Mentoring engineers on applying decided standards and procedures helps them discover "the best thing" about their profession" In this context, ethics will help engineers face and influence all three stages of their professional development: peers, employers, and staff as well as all people referred to as "users" and the public (George Tolley, 1984).

If you incorporate ethical behaviour and values into your work, you would expect to see at least five good results from your learning: -

- Your capacity for empathy will grow
- You may have an expanded understanding of the standard rules of behavior.
- You will become even more perceptive about what is ethical
- increasing your commitment to positive social responsibility will help you develop an ethical perspective.
- People in a working relationship will trust each other tremendously if you use your brain and EQ in tandem. one can refer to an audience member, whether or a customer

  When more people believe you, more things you do will get done.

4. The five branches of philosophy

Historically the five main branches are generally agreed to be Epistemology, Metaphysics, Ethics, Logic, and Aesthetics. And a final conclusion about "engineering" is that can be drawn by considering the aspects that all five departments utilize: Engineers are the microscopes that are used to investigate and analyze the subject matter from all points of view.

Ethics: Scoring first place for ethics was voted for by the majority of respondents. The author believes that healthcare is now considers a wide-ranging topics like global equity; along with the questions over nuclear technology and waste, there are global warming, just to name a few. We were also asked about the topic of ‘whistleblowing' (Grimson, 2007).

Metaphysics: Philosophers ignored the first occurrence of the word "metaphysics" and they both found the subject matter so unintelligently. New work on metaphysics, perhaps, would certainly yield a higher score(Greber, 1966; Landauer & Rowlands, 2001).

Logic: appears to be more relevant to machine administration than logical thinking (not just mathematical logic as might have been expected). Additionally, respondents noticed that engineering management has much of analytic thinking in the form of logic added to it. Many have claimed that there was more science than creativity. The average rating was on a Medium to High level (Grimson, 2007).

Aesthetics: Where the reaction was rather subdued, they suggested doing something like that. Overall, medium grades obtained a score of ' less than half of respondents, while the remainder awarded a high one. Researchers in Civil Engineering and Structural Engineering gave more importance to High

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versus Low interest than researchers in Electronic and Computer Engineering gave of low importance to these two types of relevance. Perhaps that their works were first seen in the public eye Architecture and civil engineering may be argued to be twins, as they are called; likewise, it can be claimed that a specialty such as aesthetics may be classified as a close relatives. There was a distinct shift to the middle ranks (Grimson, 2007).

Epistemology: Engineers accord the relationship with Philosophy a significance second only to that of all ethical/ moral ideas dovetails strongly into our current fields of interest (High). Second, the follow-up respondents usually knew much about the sub-corpora of the task and its sub-divisions. You were all expected and remarkably well-prepared for this (Grimson, 2007) .

5. Engineering ontology

Using ontologies is meant to allow information exchange and application reusability (Neches et al., 1991) to understand a topic thoroughly, it is necessary to determine the intended interpretation of words and sentences in a subject area Most libraries attempt to meet two additional requirements: they seek to be as general as possible (more specifically, to highlight commonalities in information) while (ii, they are required to reveal expertise in specialist areas (specifically, a major part of the knowledge in these areas is implicit) (Borst et al., 1997).

Ontologies have to take on these challenges in order to maximize information accessibility and reuse. Information networks supporting diverse tasks and fields are unable to supply their own meaning because of their deficient knowledge base, but therefore foster complexity through their power to interpret data The users are held responsible for system failure because they bear much of the costs We should leave as much work as possible for the information system. A well-defined ontology is enough to recognize their benefits, but it is just one of the elements we would need to consider to solve difficult problems (Borst et al., 1997; Neches et al., 1991).

5.1 How To Apply Philosophy in Engineering

Philosophers evaluate the human mind mostly through experimentation and contemplation on the outcomes. Philosophers such as David Chalmers will begin to determine whether or not robots can or should be alive. Artificial intelligence will yield new discoveries about the essence of consciousness, and one such discovery is the fact that humans and the universe are inextricably linked. In his essay, "The engineering of phenomenological processes," held in July of 2007, Professor Igor Aleksander maintained that the connection between an entity and our sense of movement is essential to form our conscious impressions of it. Thus, in order to create a conscious computer, it is crucial to design a physical mechanism that mimics the way that conscious beings actually work. As an individual known for her psychobiological science work, Aleksander mentioned Owen Holland at the University of Essex, who has investigated the possibility of creating a conscious robot. The robot has to be able to drive and detect its own motion in order to be highly useful. To create an aware infrastructure, you must know what your

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mind is made of. However, he also illustrates the value of engineering work on artificial consciousness (McCarthy, 2007).

5.2 Basic Questions of Engineering What For?

If the engineer had to challenge himself as to himself, “What's going to be built?” the first thing that might occur to him is that “what for?” It can be understood in other words, what exactly is it for? The profound and very critical issue of nature of this has been overlooked by scientific science, which specializes in things outside of human control: the natural environment no longer holds much benefit for mankind. (I) wanted to narrow it down the focus of our discussion, thus, I skipped the most critical topic, and got straight to the next: Are there any parallels between engineering and science?

5.3 What Does the Product Do?

That is the issue. What is it supposed to do? In more detail: What is it composed of, and how does it behave? How does it behave when it's used by an individual and when it's in the context of their daily life? He also answers more about the product's technological aspects than a regular customer. Since the solution is almost certainly going to be technical, it will include science terminology like ohms and farads. It will seem as if the person who executes and oversees the actual design will find this query simple to address. This is definitely surprising in the case of sophisticated software like a program. And if they have just completed writing a program, they also have to perform an experiment: They cannot understand what it means unless they finally run it. Ideally, as I see it, this is unnecessary. Software behavior specifications should, in general, be written ahead of time, but maintainable code specifications can also be derived from it during design and execution (Balakrishnan & Tarlochan, 2015; Smith et al., 2008).

5.4 How It Works?

Which concerns all engineers - there should be little doubt. It is the third and most important issue of engineering. As for the commodity itself, what does it do? how is the engine currently capable of functioning and what are the components involved? The question to ask is, "How does the plane fly?" It's normally provided by answering the query by giving a description of the product's configuration and its components. It describes how each component is linked and how each component interacts with others (Greber, 1966; McCarthy, 2007; Mitcham & Mitcham, 1998).

5.5 Phenomenology

‘Phenology' is more or less explains how I believe I build structures, so that is what I am going to focus on. The term ‘phenology' is too variable. Husserl remains mostly an early-century philosophical movement that canard aligned with epistemology, logic, ontology, and ethics.

Any of these methods can begin to look like theory to you, but they are just differing methods. F Brentano's father and grandfather have contributed to phenomenology. These things are most likely seen as creative because they seem to have intentions. The first phenomenologist was Edmund Husserl [CE].

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There are a lot of amazing projects and pieces of work that I've found very useful with regards to the architecture of intelligent systems (Mitcham & Mitcham, 1998).

Phenomenology is often described as a science of cognition, and it concerns itself with how consciousness influences our perception of reality. Truth is what we experience, and interpretation, starting from the point of view of the person. In contrast to many previous approaches, though, this approach has the potential to surprise and confound people since in psychology, introspection has been seen as a pseudoscience for many years. There are no sentences such as 'I am concerned about this, and the other' in psychological studies, unless they relate to memory. In that case, there is no way to be sure of being sure. However, it is also a beneficial to approach processes from the inside out, particularly if one has an objective (Greber, 1966).

5.6 A Phenomenological System

To design a phenomenology, one must think about how such a method should be used from a point of view. The view from an observation point "off in the screen" doesn't just mean seeing something from the screen; it means being aware of what you're seeing and of the context in the screen itself. A point of view may be useful for building a computer, depending on the way that the machine views itself (Greber, 1966).

6. Philosophy of Morality and virtue ethics in engineering

An outstanding quality is a virtue. possession is more likely to be habitual (lasting or continuous) than responses like seeing, expecting, valuing, desiring, choosing, and reacting to all in many respects that extend this far down into the depths of their psyche. To be of good character, one must have a sophisticated mentality. People with a take-charge attitude are motivated by taking initiative, feeling in control, getting the recognition they deserve, and having fun when doing their work. The most decent people are those who don't want to profit from other people's misfortunes. People don't do as they do when they believe it to be the honest thing to do or to do the best for themselves, rather than thinking it would be unethical to do anything. Being tactless or indiscreet is not a separate quality from being truthful. But although recognizing "That would be a lie" as a primary factor, he nevertheless provides fair, but not overwhelming, consideration to "It would be a lie" (Hursthouse & Pettigrove, 2016; Landauer & Rowlands, 2001).

An ethical philosophy based on the five principles of creative and expressive (or transformational) ethics has the following characteristics:

First : Hursthouse claims that "a virtue encompasses broad- or multi-track aspects such as emotions, perceptions, behaviors, and sensitivities." That being said, distinguishing between moral and personal virtues, it should be noted that only the aspects of the personality that can be included in rules of conduct could be encompassed by a particular rules of conduct. One particularly notes Hursthouse's proficiencies, namely the "the Five Endurings (Harris, 2008; Landauer & Rowlands, 2001) "

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Second : A professional identifies with his or her job qualities, much as a happy person does with his or her personal qualities. this demonstrates the profession's character traits by referring to Lynn Beason, a civil engineering professor at Texas A&M Beason also provides advice and appears as an expert witness on protection of high-risk window glass buildings. His job has always been criticized by corporate stakeholders and he once received a one million dollar in threats of a lawsuit. he persists in portraying himself as a serious crusader for glassware protection I think as I think of how he does his job, Beason states, “I just want to be proud of it and really don't want you to think about what I did." An attempt was made to produce the most disturbing video possible to spark debate and controversy, even to put the public in an aroused, emotional state to influence their opinions and to attract more members to their website (Rodrigues et al., 2014).

Third: The ability to correctly apply virtues, including spiritual decision-making, is a process of understanding and growing in knowledge over time what the adult has, that the teenager lacks is possessed is a wisdom of situations derived from the knowledge of the effects of behavior and the ability to assess certain elements as more significant than others To know the proper course of action is difficult to describe. Some argue that the innate goodness of humanity not only consists in knowledge of noble behaviors (such as being trustworthy and charitable), but also of their effective avoidance. To some extent, one can consider a virtue to be surrounded by a Penumbraeumba, which is similar to the others that can function as a characterization. Not nice, but curious, is how this list compares with other lists: It is surprising that the list of shortcomings is greater than that of commendable. He describes the newest fad again (Mitcham & Mitcham, 1998).

Forth: Aristotle split the virtues into two classes: religious and intellectual. Virtues are mostly religious or philosophical, depending on the context. Historically, moral integrity has been associated with such qualities as kindness, bravery, honesty, self-discipline, trustworthiness, and the like. The mind's analytical talents are depth, consistency, and discernment. Athletic ability, artistic talent, mental capacity, and creative talent all count too (Mitcham & Mitcham, 1998).

Fifth: Ethics of morality also presents a relatively long and detailed visual portrait of a moral conduct. an exemplary character can possess very many of the characteristics to an exceptionally high degree Bravery may be shown to a degree but does not always represent it. Without any doubt, almost certainly, no person exhibits his full potential virtue. While it is rare for anyone to exhibit more virtue than an average citizen, it is possible. It is no accident that the most well-known portrait of virtue was done by Aristotle, whose popular portrayal is of the “great-souled” or “ (Winiecki & Salzman, 2019).

7. Responsible Engineer

First, the preoccupation of individual responsibility distorts our attention away from societal ones therefore, one must organize in order to assume responsibility(Neches et al., 1991; Swierstra & Jelsma, 2006). We may assume that the requirements (moral agency, causality, free will, and understanding of consequences) rarely obtain in engineering (practice): Moral obligation may be claimed only in the in situations of moral agency Conversely, there is a concept known as “the dilemma of many hands”: engineers can only play a small role in complicated operational and technological systems, since they have many colleagues and fellow actors involved. Furthermore, engineers typically work in “vertical

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organizations" and have a lot of power to choose and influence their own projects (Greber, 1966). managers use organizational, as well as creative, objectives to develop (Conlon, 2013). Davis has a somewhat sceptical view on this concept. He claims that engineers can be separated from their employers by giving them advance warning, but he believes that the proposed change won't go into effect until anything significant happens to prevent it. Quite naïve, it could be said that there are several issues with this idea of work. That may even suggest that even though the engineer is separated from their boss, this is also dubious or immoral. Davis focuses on the justification for whistle-blower's are looking to escape rather than de George's presentation of why it is it important for engineers to protect the public (Fleddermann, 2012). Because it is not assumed that the engineer was a party to the illegal activity, it is not even a violation of the code of ethics to blow the whistle if not part of it.

Conclusion

In conclusion I have taken philosophy on term of engineering and engineer manor, ethics, policies and also how to apply the philosophy in engineering. The philosophy is the basic of every science branch. As well the philosophy applied in engineering as ethics, metaphysics, logic, and epistemology. These five rules of philosophy is also consider as the pillars for engineering and engineering duties. Therefore, philosophy is considered as the platform of engineering.

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