Existentialism and Engineering

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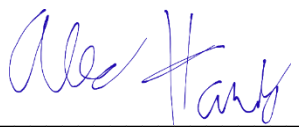

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Abstract

This Thesis explores the existential side of engineering, an area generally missed by the STS department which considered high level interactions among actors rather than the perspective of the individual, human engineer. First the phenomenon of the antitechnology movement is explored and its main arguments against the progress of technology are refuted. Having established a justifiable *raison d'être* for engineers, the paper moves to introduce existentialism be by defining the core concepts of existence, essence, authenticity, bad faith, and the absurd. From there the idea of the existential engineer is realized: a radically free, authentic individual who is not merely a tool of technosocial change. There is a real pleasure in the mere creative act of engineering in itself, and not necessarily as a means to achieving utopia, as once might have been hoped in the early days of the 20th century. A engineer who realizes his radical freedom is moreover better able to be cognizant of inauthentic behaviors that may occur in the workplace, most notably *normalized deviance*.

Existentialism and Engineering

Introduction

Science, Technology, and Society (STS) is an inherently interdisciplinary subject with roots in anthropology, sociology, history, political science, and philosophy. It has been able to establish insightful models for understanding the actions of groups within engineering and scientific communities, such as normalized deviance, trading zones, or actor-network theory. Each of these has immense pedagogical value and as a whole STS certainly merits further research. However, I feel strongly that the discipline misses the value in discussing science and technology from the perspective of the human individual, who is not reduced to a purely rational actor, but is understood as a feeling, living person who acts not merely through rational thought, but through emotion as well. STS scholars certainly reacted against the idea of scientists and engineers as rational agents, but they focus on social or group dynamics – networks among actors. Historians of science and technology may focus on individuals, but this is often in consideration of a certain historical figure's actions, motivations, etc. The gap I see is failure to consider the experience scientists and engineers may have with the human condition itself. It thus becomes clear that something else is needed, and I believe that existentialism is the appropriate area to discuss these issues of the individual. It is also curious that existentialism and modern engineering shared their infancy in the 19th century and blossomed immensely in the 20th century; as the golden age of science came to an end, especially in the post-war world, as it became apparent to the masses that technological advancement was not the road to utopia and the end of suffering that had once been imagined. Indeed, the ideology of "antitechnology" saw noticeably development over that time. This thesis will touch on this antitechnology phenomenon, and then proceed to discuss the issue of existential fulfillment from engineering, and go on to show how such a fulfillment can actually be completely divorced from societal considerations.

Refuting the Antitechnologist

Being an engineer between approximately 1850 to 1950 was to be part of a thrilling human venture. Mankind had a bright future, and the new technological marvels unveiled every few months, from trains to the telephone to skyscrapers to gasoline engine. This boost in public perception was due I great part to the rise of the technological exhibition, such as the 1851 Crystal Palace in London, in which many of the technologies pouring from the industrial revolution were displayed to the public, or the 1876 Centennial Exhibition in Philadelphia, the first of the now famous World's Fairs. A few querulous voices were there, like Thoreau (author of *Walden*), but overall public opinion was pretty positive. The public was excited at the prospect of new technology eliminating the drudgery of life, and burdensome labor. Perhaps some even imagined that this new explosion of creativity, open minded risk taking and problem solving – a new scientifically advanced means of mere *thinking* – might also solve social problems like ignorance and bigotry; the idea that man may free himself from irrationality extends even back to Hegel.

Regardless, such enthusiasm did noticeably decline around 1950, especially with the announcement of plans for the hydrogen bomb by president Truman. This specific concern about ultimate weapons eventually broadened to concern about technology in general. By the 1960s there were many speaking out, like Carson's *Silent Spring* which expounded the human destruction of the natural world and poisoning ourselves with chemicals. Environmental pollution was clearly evident through smog, and, regardless of political belief on the issue, the images of napalm and defoliants destroying the Vietnamese landscape did no favors either. Engineers were called unethical, not even having a code to begin with; they were people following the law of profit only. The board of the National Society of Professional Engineers

first approved ethical canons in 1956 (*History of the Code of Ethics for Engineers*, n.d.), although publications in Ralph Nader's 1965 indictment *Unsafe at Any Speed,* lambasting the ethical practices of automotive engineers, garnered significant attention (Nader, 1965). Antitechnology sentiment would moreover become emblematic of the Beat Generation, and much art at the time explored the human struggle to escape from an overly technological world. Also on the rise was the so called "Appropriate Technology" Movement, emphasizing decentralized, autonomous technology as well as labor-intensive (versus capital-intensive) developments. This movement, largely credited to EF Schumacher and his book *Small is Beautiful*, largely argues against the unsustainability of large-scale engineering and encourages the development of technology that is useful only to its immediate locality (Schumacher, 1973). This may be useful in trying to support developing countries that do not presently have resources for macro-engineering, but may unfortunately be transmuted into antitechnology sentiment by some supporters.

Antitechnology sentiment has perhaps died down in academic spaces, as the more pragmatic approaches of, say, the anticipatory governance model applied to technology, but we see it has remained consistently in the bleak futures depicted in fiction. Examples include the cyberpunk genre (eg *Do Androids Dream of Electric Sheep?)*, techno-dystopic (eg *Brave New World*) and speculative television programs like "Black Mirror." The lamentation of increased technological use is also a common sentiment that my generation is exposed to constantly.

The academic arguments still bear mentioning in moving toward and existential appreciation of engineering, for clearly if technology were truly a wretched thing that damaged our very human nature, then the practice of creating of would surely be a practice of crushing the human spirit. Antitechnologist sentiment swings far past the legitimate concerns of the

environment or the aesthetic concerns of artists, into seeing technology as the root of evil in modern society. Technology is to them a distinct anonymous entity, an emergent property of humanity. Samuel Florman, author of the *Existential Pleasures of Engineering* (in which serious effort is undertaken to combat antitechnologist sentiment) mentions five antitechnologists specifically by name: Jacques Ellul, Lewis Mumford, Rene Dubos, Charles A. Reich, and Theodore Roszak. Without getting into the nuances of their individual beliefs, what is important here is the essence of their beliefs: technological development has escaped human control, is ruining our lives, forces men to do tedious and degrading work, forces consumption of things people don't truly desire, strengthens the elite upper classes, cuts off man from the natural world, and finally destroys one's existential sense of being with technical diversion. Their usage of the term "technology" is extremely broad, extending to essentially every element of the modern lifestyle. Ellul use the term "technique," referring to all deliberate, rational behavior and efficiency and organization, which has become an end in and of itself, as opposed to the necessity of creation that facilitated the flourishing of primitive humans. In essence, man has become enslaved by the drive toward increased efficiency and comfort toward engineering and are thereby degraded.

It is often not any specific technologies they point to, but rather the concept of technological development itself. The blaming of technology by these thinkers is a clear scapegoat for all the undesirable aspects of modern society and the human condition. Technology has not escaped human control; philosophers like Daniel Callahan asserts that man is inherently technological, and thereby the idea of man-technology dualism is false (Callahan, 1971). The real problem appears to be a symptom of the fact that the problems facing the modern world are extremely complex, and the technologies that rise to meet them are as well; they are not so easily

understood by common sense as, say, a Roman gazing upon an aqueduct. By extension, these complex solutions interacting in a complex world create consequences that may be unforeseen, like traffic from the invention of cars, which led to a whole discipline of traffic management and road design that when observed by the average person may seem to be garish evidence of technology encroaching on the nature through the construction of elaborate highways, when indeed engineers are merely responding to the new challenges faced by that underlying desire of easy transportation by humans that facilitated the invention of the automobile in the first place. Moreover, clearly it is not technology itself somehow contriving new artificial desires; mankind has an inherent, instinctual desire to increase his status, comfort, and productivity, and if this is not accomplished through subjugation of human beings, then it must be through technology.

The strengthening of the elite classes is a more legitimate concern, especially as evidenced by the inordinate levels of wealth inequality present in the world. However, upon just a little inspection this resolves into a political and economic issue. It is no great secret that power in the modern world largely rests with the wealthy and clever (or often, more accurately, conniving), and while it is true that this wealth and power may be facilitated by technology, at the same time technology facilitates greater freedom and gives a voice to the lower classes as well. Indeed, it can be objectively seen that people in the modern technological world experience a greater degree of freedom than in ages past. Similarly, the argument that the work done by man in the modern technological world is degrading seems irrelevant to the advancement of technology. Looking fondly upon the ancient man who had great amount of leisure time and was spiritually and physically fulfilled by agricultural work is a nice daydream, but does not have great thrust beyond appealing to the bored office worker. Agricultural work before technology was indeed extremely labor intensive and performed by slaves. I doubt seriously that this

romanticism of tribal or medieval life would last long to any modern person forced to live in those times. In any case those political, economic, and business matters are more suited to those realms and fall outside the present discussion.

The most serious accusations leveled by the antitechnologist are that man is cutoff from the natural world by technology and that technology destroys a person's existential sense of being. These are grave claims to anyone attempting to reconcile existential fulfilment with engineering. Existentialism, a philosophical realm entrenched deeply with the sensibilities of artists, is no stranger to those poetic and deep-felt notions of arcadian bliss. The technologization of society, namely in the form of the city, is just a result of human desire. One may point to the economic impetus of migration to urban environments, but consider very few of the wealthy choose to go off into the wilderness for some sort of human fulfillment. Moreover, what even constitutes nature? Must one be in a *Walden*-esque cabin living far away from civilization, or does it suffice one to have a small garden behind their home? Also, consider that fields, glades, and mountain ranges are used as synecdoche for "nature," but this is misdirection that a great deal of what is natural, like the arctic, or some deserts and rainforests, are uninhabitable without technology. By all means go on a camping, but the argument that not living in the wilderness somehow debases humanity is without merit. Finally, then there is the destruction of one's existential sense of being by technology, surely the most nebulous claim, characterized by nothing less than derision at the hobbies and lifestyle of the modern person. This claim ought to be rejected forthright, because it implies the pleasure one derives from a "technological activity" such as a videogame or going for a leisure drive are not true pleasures, but something false. Given that is not humanly possible for one to distinguish between real and false fulfilment if they feel the same, then surely it is not an exercise worthy of our concern. It is legitimate to ask if

technologies may be used to actively shape ones desires for some purpose, like advertising or propaganda, but these do not reflect on the technology itself, but on the principles behind it, the latter of which remains a relevant topic for discussion.

It must not be completely denied that there are technologies and effects thereof that have observable detriments on society. As mentioned previously, the flames of the antitechnology movement were in no small part stoked by developments like the hydrogen bomb, pollution, surveillance, genetically modified organisms, and instruments that may enforce propaganda (such as governmentally controlled internet). All legitimate concerns, but it is unlikely that these will lead to the grim world Ted Kaczynski foretold in *Industrial Society and its Future*, which paints the picture of widespread psychological suffering from unfulfilling lives, brutal government/societal control, and overall death of the human spirit through "surrogate activity" (Kaczynski, 1995). The human being is powerless to influence his life by his own free when technology dominates society. But is the human spirit not killed by being forced to do dangerous work better suited to the machine in the first place? Most likely humanity will never reach this terrible future just by virtue of the technological debates we already see occurring, as well as many people clearly finding fulfilment in a technological world (look no further than the students at this university…). Secondly, in the absolute worst-case scenario in which technology becomes a true nightmare, the solution will not be for everyone to turn their backs away from industrial society, because there will remain those using technology nefariously; rather, the solution will be to seek solutions through *more* technology, not less. It is necessary for people and governments to "adaptively manage" these situations as they arise, always pushing forward rather than regressing.

We have hopefully demonstrated at this point that technology is not an evil demon encroaching on society, but a fundamental extension of mankind's defining creative characteristics. Not exactly a revolutionary concept, but one that is necessary in attempting to understand how the engineer may be an existentialist: namely, how he may find meaning and purpose in his life.

Functional Existentialism

To try and define existentialism in definite terms is an absolute fool's errand, and is not my intention hereupon. Moreover, a great deal of the core writings widely considered existentialist are very abstract and abstruse to the untrained scholar, and thereby completely antithetical to the mental dispositions of engineers. It is then perhaps useful at this point to find a means of defining a sort of *functional* existentialism, that is more actively applied to present being and not itself a phenomenological explanation of the nature of our beings.

The core axiom we begin with is that "existence precedes essence". It is to say, unlike some item that an artisan crafts, or even a device that an engineer designs, that man exists firsts, without reason, and then encounters the world and himself, and then only after defines who he is. Man is nothing, then, but what he makes of himself. A more somber view of this situation is evident in the famous quote: "Man is condemned to be free; because once thrown into the world, he is responsible for everything he does." (Sartre, 1956) The idea that a man is responsible for his actions seems immediately obvious and not of much note, but in practice many people externalize the reasons for their actions.

Immediately following this is the idea of authenticity. This directly extends from the concept of a man defining himself, and refers to how well behavior and action match that definition. This is often a challenge in practice due to all the forces of the world they encounter

that suppress them, like pressure to be or act a certain way, or ignore their moral reservations in favor of comfort. A lack of authenticity then leads to an individual deceiving themselves that something external is restricting them. This is described by de Beauvoir and Sartre as "bad faith." Sartre gives an elucidating example of a waiter who conforms to the notions of what a waiter should be (through movement, speech, etc.). But in play-acting as a waiter, it follows that he is at least some level aware that he is not just an automaton with waiter-ish essence, but deceiving himself into believing he must act that way. He cannot ultimately pretend that he is not a conscious human being underneath, completely unfettered from any kind of external social or pragmatic concerns. Ironically, it is a misguided use of that very freedom of consciousness to restrain itself. (This example is not intended to disparage waiters, but uses a restaurant as a microcosm of the world and the waiter believing mistakenly that his role in the world is somehow fixed or beyond his ability to control.) (Sartre, 1943)

The third concept to introduce is the idea of the "absurd." This idea suggests the conflict between the individual's desire to seek inherent meaning in their life and the inevitable inability to find one. Camus encourages people to accept and live in spite of it: actively rebelling against it by creating one's own meaning but realizing the it can never defeat the absurd due to death's inevitability. In a way, embracing that absurdity. Nonetheless, Camus believes the struggle itself is enough to fill a man's heart. "One must imagine Sisyphus happy." (Camus, 1942) I believe this idea has significant merit for people in STEM fields to understand, since there has always been a results oriented mindset in science and engineering, and individuals in these fields find it to be extremely uncomfortable, to ever discuss failure, and that their value is contingent on contributions to the field or to society. The truth is of course that serious discussion of failure is vitally important, and will help us with dealing with absurdity.

The Existential Engineer

We have shown that the engineer and his technology are not inherently evil nor the blight of civilization that the neo-Luddites would have you believe. Moreover, we have identified the main existential virtues: living authentically and grappling with the absurd. We move now into describing the existential engineer: the technological individual who lives authentically and meaningfully, and aware of himself existentially.

The essence of existentialism is disenchantment with the larger world. Inner emotions like passion, yearning, and anguish, are above all scientific or philosophical viewpoints from the subjective perspective of the individual. An engineer pursuing philosophical curiosity may then at once be attracted to and skeptical of existentialism. It is attractive because it provides an avenue for contemplating being and feeling individually. However, it is also somewhat alien because its appeals to emotionalism may be at odds with the concrete, rational mind of an engineer that has come to tacitly feel comfort only in logic and science (although this is perhaps a healthy excursion out of his comfort zone). Moreover, as discussed earlier, there is a longstanding tradition of anti-materialism amongst the existentialists and philosophers in general, as well as self-styled "spiritualists", or even the Periclean Greeks like Plato and Plutarch, for whom thinking was superior to doing. Historically speaking, however, materialism, in the sense of man's relation to creating and solving problems around him, has always been there, from the very first proto-humans using bones as clubs, to man's setting foot on the moon.

Whatever way one chooses to look at it, creative acts have always been a fundamental human drive that exists independently of the serving of higher ideals/virtues, or the serving of some tenuous notion of societal good. In modern engineering (ie post 1950s), almost completely vanished is the faith in a utopic future that so defined the outlook of the late 19th and early 20th

centuries, when any all technological advancement was lauded and looked upon with great excitement. “Progress” becomes a more and more difficult idea to define; few agree on what the “correct” direction for humankind is. Florman sees the analogy to Sisyphus useful here: there will never be a time to rest upon the mountain top in a new utopia. There will always be issues facing the absurdity of the new problems and failures that come both directly and indirectly from technology. Make no mistake: these are manifestations of the Absurd. But the engineer is well within his rights to reject the idea that he is a villain or false prophet, as we have shown. This is strengthened because of course no essence precedes what he chooses. He may thus also reject the idea that he is a tool of the technosocial transformation of the world (not himself a machine), but a radically free individual defined only by his own choices. Engineers carry on the legacy of humankind to create, both for instinctual gratification and the existential expression of their own authenticity.

Florman firmly believes that “at the heart of engineering lies existential joy.” Whence this pleasure comes from is complex, ranging from the aesthetic beauty of machinery, to creating the things in the world that artists and others interpret, to the grappling of the inherent beauty of fundamental natural laws. Each of these is certainly valid, but what I find most valuable personally is the desire of the engineer to understand, create and/or change the world around him; it is emphasized that such an impulse is not contingent on the need of mankind for change. Rather, all humans are by nature not satisfied accepting the world as is, and are driven to change it. (Florman, 1996) Engineering is a modern designation that delineates a certain type of technical creation, but shares with artists and craftsmen a creative spirit. Existentialism itself is inherently creative, as man is forced to create himself, and so it is altogether fitting that creative acts appeal to our existential sensibilities. Acts of creation are moreover authentic acts. Some

existentialists may argue that an act of creation must be self-expressive and therefore artistic to be authentic, but it is my sincere belief that all creative acts are self-expressive even if the process seems entirely systematic as they often are in engineering; it is the mere shaping of the physical world in some way that is self-expressive and authentic.

It follows that an engineer's work does not have to be useful, impactful, or even successful to be meaningful. This is the conclusion that I believe many are uncomfortable to hear. But indeed, if the engineer places all his satisfaction on how well his product performed, or the significance of his research on the field, or any other approval by some traditional indicator of success, then this joy will be short lived and unsustainable. This is not to deny that it feels good to accomplish a significant task successfully, and orienting work towards goals is of course necessary. But it is critical to recognize that Sisyphus's boulder slides back down the hill each time without fail. The engineer who seeks true contentment must follow in the steps of the existentialist and realize that the act of doing, pushing the boulder up the hill, is the source of true contentment. Perhaps the engineer will even look upon the boulder, and construct a pulley to lift it up the hill. In the end our only option is embracing this absurdity.

Existential Professionalism

It should not be implied from anything said previously that engineers have complete free reign and are not beholden to any sort of standards of conduct, and a few words on the topic bear mentioning. The reason *why* one must act ethically is a very philosophically fraught, but suffice it to say for now that by behaving ethically, humans do not impede others' freedom or wellbeing and thereby do not maliciously hinder others' ability to express themselves authentically. In any case it is widely accepted that engineers ought to, insofar as they are reasonably able, eliminate any risk to personal safety, act only in their areas of competence, be objective and truthful with

the public, act as faithful agents to clients, avoid deception, and conduct themselves overall honorably and ethically. (These canons are taken from the National Society of Professional Engineers Code of Ethics). Ethical engineering practices are in general well defined and not a serious source of contention, although it may of course be difficult to decide how to apply them in specific instances. In any case, what I propose is that bad faith can be used to understand such phenomena as normalized deviance. The individual, as Sartre would say, always has a choice. Of course, there are almost always obstacles limiting absolute choice, (often referred to as existentialists as facticity), and it should not be implied that every tragedy ever stemming from engineering was solely the lack of an individual's choice. The example of Chernobyl comes to mind, wherein the operators of the No. 4 nuclear reactor, although extremely wary of the commands issued by their supervisor Anatoly Dyatlov, were not in position to defy him because of the heavy-handed consequences that occur in the Soviet Union for insubordination. But even in such a case, radical freedom always affords us a choice: the operators could have appealed to Dyatlov's egoistic desire for promotion, and the consequences of breaking the reactor by overstrain. In many modern settings, engineers can speak out to their superiors against unethical behavior they see in their workplace. They can "whistle blow" to the public. They can resign their positions. On the more extreme end, they can deliberately sabotage an unethical project as a last resort, although obviously this may also come with disastrous consequences and it should not be taken lightly. Essentially, the existential engineer must not let himself become complacent in anything; he should always be considering how the actions of others may be being clouded by bad faith and rally them to overcome it through asserting their radical freedom as individuals. Once again, the engineer is not merely a pawn used to effect technosocial change, but a free human being.

Conclusion

It is almost a cliché at this point to use the phrase “existential crisis,” but it is a legitimate one when describing the current state of engineers. In a life where the engineer faces pressure to be consistently productive and successful, it is easy to feel burnout or even just lack of fulfillment. This may be compounded by the larger world echoing antitechnoligist rhetoric more and more as the nefarious potential of technology consistently resonates louder than the overwhelming positive potential. It is not surprising, then, for an engineer to feel that he has chosen an inauthentic path in life. However, we have shown that this is simply not the case, and indeed at the heart of engineering lies existential joy and satisfaction, especially in the performance of the act rather than any nebulous philosophical waxing on its necessity or direction. That engineering has significantly more rigid structures, like the laws of nature or government/corporate protocols, for creation is not in actuality a hindrance on the engineer’s ability to find this fulfilment of human spirit. Moreover, an assertion of one’s radical freedom as an individual to realize when these structures may be in the wrong and prevents the lapse into normalized deviance. Afterall, the existential engineer fully committed to defining his own existence must naturally continually embrace the absurd in all forms to keep himself truly free, and perhaps in the end a workforce composed of existential engineers will make all the difference to the creation of a less absurd world.

BIBLIOGRAPHY

Callahan, D. (1971, September 23). *Proceedings of the Centennial Convocation of the Thayer School of Engineering at Dartmouth College*.

Camus, A. (1942). *The Myth of Sisyphus*. Éditions Gallimard.

Chernobyl disaster. (2020). In *Wikipedia*. https://en.wikipedia.org/w/index.php?title=Chernobyl_disaster&oldid=950547916

Code of Ethics | National Society of Professional Engineers. (n.d.). Retrieved October 31, 2019, from https://www.nspe.org/resources/ethics/code-ethics

Dubos, R. (1968). *So Human an Animal: How We Are Shaped by Surroundings and Events*. Scribner.

Ellul, J. (1948). *The Technological Society*. Alfred A. Knopf.

Florman, S. (1996). *The Existential Pleasures of Engineering* (2nd ed.). St. Martin's Griffin.

History of the Code of Ethics for Engineers | National Society of Professional Engineers. (n.d.). Retrieved April 13, 2020, from https://www.nspe.org/resources/ethics/code-ethics/history-code-ethics-engineers

Kaczynski, T. (1995). *Industrial Society and Its Future*. 34.

Mitcham, C. (1998). The Importance of Philosophy to Engineering. *Teorema: Revista Internacional de Filosofía*, *17*(3), 27–47. JSTOR.

Nader, R. (1965). *Unsafe at Any Speed: The Designed-In Dangers of the American Automobile*. Grossman Publishers.

Reich, C. (1970). *The Greening of America*. Random House.

Roszak, T. (1973). *Where the Wasteland Ends*. Bantam Doubleday Dell.

Sartre, J.-P. (1943). *Being and Nothingness*. Éditions Gallimard.

Sartre, J.-P. (1956). *Existentialism is a Humanism*. World Publishing Company. https://www.marxists.org/reference/archive/sartre/works/exist/sartre.htm

Schumacher, E. F. (1973). *Small Is Beautiful: A Study of Economics As If People Mattered*. Blond & Briggs.

Mumford, Lewis. *The Myth of the Machine*. Vol. 1. 2 vols. New York: Harcourt Brace Jovanovich, 1967.