The Looming Era of Ethical Minefields: Challenges awaiting engineers in the decade ahead

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1. INTRODUCTION

1.1 The Global Perspective

The engineering profession has traditionally been focused on meeting the growing needs and desires of society [Cruickshank, 2003]. Throughout the centuries, engineers have introduced many essential and foundational inventions that continue to be used today [Cruickshank, 2003], such as bridges, cars, electricity, and computers. However, in the past, engineers did not need to closely consider the amount of natural resources they were using or the long-term effects of their work on the environment to the extent that today's engineers do. This was due to the abundance of resources available to them at the time. As a result, they did not feel the same urgency to protect the environment as future engineers will need to. While engineers in the past primarily focused on fulfilling the needs and wants of the people, current and future engineers face the challenges of being more mindful of the impacts of their work, including social and psychological effects their products will have, as well as ecological effects resulting from the finite physical resources at their disposal.

Future engineers will be working on the then already vulnerable environment [Macnaghten, 2006]. According to the Intergovernmental Panel on Climate Change (IPCC) projections, rainfall, among other things, will have worsened by the year 2030 [Suppiah et al., 2007]. These projections highlight the pressure that future engineers will face in fulfilling their responsibilities while also protecting the environment. They will have to work under tighter constraints and deliver services while balancing Edward B. Barbier's three cycles [Barbier, 1987] of economics, society, and environment. Imbalances in these cycles can lead to violations of ethical values such as autonomy, beneficence, and justice, which can manifest as individuals not receiving decent lives or having their health and other needs met. Engineers in the future will have to make careful design choices to avoid harming the ecosystem or causing social and psychological harm while fulfilling their duties to society of providing solutions and improving the ways of living.

This essay argues that engineers in the future will face greater challenges in fulfilling their responsibilities while also protecting the environment and the social and psychological well-being of the people. It also argues that engineers in developing countries like South Africa will be especially impacted

1.2 The Impact on South Africa

Given the fact that South Africa is still a developing country [Bakari and Ahmadi, 2018], its engineers will be even highly impacted. Other, though not all, parts of the world have made significant technological advances back when the shared ecosystem in good health. It was also then when the world was less conscious of the environmental and ecosystem damages done by the products engineers made. They as a result got ahead technologically as well as economically.

South Africa on the other, due to its complicated history and unique sets priorities, did not. Unfortunately the ecosystem harm was still done for all even then. This puts South Africa and its current and future engineers at a greater disadvantage. This being because they, now and will still have in to a decade's time, will need to be equally careful and considerate of the ramifications of their work, irregardless of who contributed what harm amount to the then current ecosystem harm. The effects will be especially dire to the countries like South Africa, countries that are not yet fully developed. This mainly because of the need for them to ensure better living for their people, the need to keep up with living standards.

2. PROBLEM ANALYSIS

Given the state the environment has been projected to be going to be in the near future [Collins et al., 2014], thinking about the overall environmental impacts the engineers make will be of even greater importance. Similar challenges will be faced in an attempt to develop and engineer internet and online tools, while still respecting the people's core ethical values.

The values that will be at violation risk includes the autonomy ethical value. With the rise of AI and other online tools, the people's privacy violations will continue. These violations will lead to the perpetrators dictating the behaviors of others, without them even knowing. Hence it will be vital for software engineers to carefully think about the ramifications of their projects, considering all the possible moral implications. They will have to also consider the social and psychological impacts their products will be having on the people and families whole lives they are to improve.

The engineers will have to be more careful in their designs and projects to make sure the individual corporation's asserts and valuables are not obtained at the public's expense, be it social, psychological, or environmental. They will have to try harder to make sure they do not violate the beneficence ethical people's right. As raw resources get fewer, the competition to provide services that involve those resources ethically gets tougher. With the large amounts of data that will be available to them by then, they will also need to be more careful to be sure they do not use then unethically for individual's benefits over the public's. They will have to do so to not only be ethical but also to keep the people's trust [Masur and Trepte, 2020, Smith et al., 2011].

2.1 Deontological View of the Challenge

From the deontological point of view, the natural-resources-using engineers will have to frequently contend with the ways which they go about implementing their solutions. Closely observing whether or not it will moral or not to implement the projects faced with. This will be the case for both projects that make use of natural resources, as well as projects that will be used by the public in virtual environments.

Given the fact that natural resources are finite, hence are running out [Subramanian, 2018], they will have to be more careful with their usage amounts. They will have to be sure they are not fundamentally wrong in using however much resources they need. More specifically looking at it from the Categorical Imperative point of view, which defines the morality of an action based on ramification should the act be made universally moral [Kant, 1993].

The engineers will have to stay within the bounds of natural resources uses as well as unwanted by-products, as it will be the right thing to do, as per the Categorical Imperative concept [Basara, 2018], since everyone not doing so will ensure the critical damage to the ecosystem

[Appannagari, 2017]. The similar will be the case for virtual and software environment engineers. They will have to be consider the impact of their products on the people socially and psychologically. They will have to consider what would happen to the society if everyone gave the society the same or similar products, or used the data they same way they may be tempted to. Considering carefully the impacts on the society.

On the other hand, they will still have to provide for the needs of the people, as well as to grow and develop the country, for still developing countries like South Africa. They will have to, on every project or innovation, battle with the morality of the project due to the limited resources and the ever dying ecosystem, as well the social and psychological impacts on the society. They will have to do so more frequently since they are one of the main professions that work with and use the environment and whose products contribute to the bad health of the ecosystem. They will also be the people in position to make innovations that may if not properly and carefully implemented have critical impacts on the social and psychological impacts on the people. On top of the impacts on individual people's psyches and groups, communities and cultures' impacts, they are responsible for creating and putting tools on people's hands. This comes with its ethical responsibilities in itself. With the increasing capabilities of AI and software tools in general, engineers will more frequently faced with moral dilemmas where they have to think carefully about the morality of creating some tools. This being because some some tools may have the potential to save individual people's money at other people's jobs and such. The increased potential of technology by then will make these considerations more complex that they are today, considering what would happen if everyone started implementing similar solutions and tools.

2.2 Teleological Point of View

Looking at it from the teleological point of view, which focuses more on the consequences of an action [Ismail and Benlahcene, 2018], they will still have to be careful, or else they end up bringing about the irreversible damage of the ecosystem, which is not a wanted or acceptable outcome or consequence by many forms of teleological frameworks. Looking at it more specifically from the Utilitarian point of view, whose approach is about the greatest good for the greatest number [Ismail and Benlahcene, 2018, Ethics Unwrapped], they will still have to be careful about the amounts of non-renewable resources they use as well as the impact of their project on the environment. They will have to, considering the fact that not doing so will mean significant negative impact on the environment and the ecosystem, the planet on which all live, follow the then regulations that ensures the bettering of the damage, to minimize the damage to all the people's ecosystem.

They will also, from a utilitarian point of view, carefully consider the impacts of their tools and services on the overall society's social and psychological impacts, hence they will be faced with the similar difficulties as the dermatologists.

Acknoledgements

The AI/ML tool was used to shorted the essay's introduction. A raw version on this essay can be found on this Github link `https://github.com/NduvhoEdward/ELEN4019_Essay_01`

3. CONCLUSION

The engineers will have the most restrictions in the coming decade in their productions. These restrictions will come from the resultant ramifications of both the use of the limited natural

resources, as well as the as what creating some products would do the society's social and psychological well-being. They will more frequently faced with dilemmas where they have to fulfil their duties of providing tools and services to improve people's lives, but also ensuring they are doing so. They will more constraints that people today and in the past have and have had. They will have to do these at all times to make sure they do not violate any of the people's core ethical rights. The challenges will be there whether one looks at it from the deontological or teleological point of view. This will impact more severely the engineer in developing countries, such as South African.

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