

ENGINEERING: HELPFUL OR DETRIMENTAL?

APS1018 WINTER 2020 - TEAM 3 EXECUTIVE SUMMARY

The objective of this report is to analyze the positive and negative effects of engineering on society and the environment. Four engineering domains (robotics, civil, automotive, industrial) are analyzed according to social impact and sustainable development criteria.

Findings:

The robotics domain considers two technological contributions: robotic-assisted surgeries and lethal autonomous weapons. Robotics-assisted surgeries reduce patient trauma and recovery and physical toll on surgeons. They can increase medical costs, incite fear, and have latency issues. Lethal autonomous weapons reduce the need for human soldiers and reduce deployment costs. This technology has significant negative impacts; it violates Asimov's rule that machines shall not harm humans, increases the risk of civilian and ecological damage, incites public fear, and puts the weight of human life on artificial intelligence.

Historically, civil engineering provided the infrastructure, including railways, water, and sewage, to support city development. Now civil engineers deliver public transportation and participate in urban planning. Negative consequences include ecological effects of urban sprawl and the inability of infrastructure and services to serve rapidly growing populations.

Automotive engineering has made private vehicles safer and financially accessible. The environmental impact has been significant, but automotive engineers have innovated to reduce emissions with hybrid and electric vehicles and to increase product lifespans.

Industrial engineering has allowed for the efficient, reliable production of essential devices and streamlined implementation of essential services. Due to industrial engineering's close ties to the capitalist system, it has also provided tools that contribute to ecological harm, deny workers' rights, and increase inequality.

Overall, we conclude that engineering has had a net positive effect by producing countless beneficial technologies that address challenges and improve the quality of life. We also recognize that capitalist greed has misused engineering's innovations to disastrous effect, and this is often what the broader public notices, resulting in a negative perception of engineering.

Recommendations:

Robotics engineers need to interact with members of the community who fear the technology, in order to understand their fears and help them adjust over time. Changing terminology can also improve perceptions, e.g. Human Guided Intelligence is a more accurate descriptor than Artificial Intelligence.

Similarly, civil engineers need to aspire to build "community" along with infrastructure, balancing sustainable environments, economies, and societies.

Industrial engineers need to assert their roles in corporate social responsibility, addressing environmental and social dimensions on top of production and consumption. This includes applying their strengths to demonstrate to capitalists and politicians the benefits of healthy, well-compensated workers and environmentally conscious supply chains.

Automotive engineering has been improving towards a promising direction that mainly focuses on the harmful environmental effects of motor vehicles. Automotive engineers need to keep innovating towards eliminating all negative environmental effects caused by the industry, which is evidently a work in progress in major automotive companies.