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Engineering Ethics

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Introduction

Ethical reflections applied to engineering are a lot more recent than to other professional activities. Nevertheless, there is a subject called “engineering ethics”. Established as an autonomous field of academic research in the United States at the end of the 1970s, it has since developed in other countries, starting with those where the professional organizations have been publishing codes of ethics. The first one was adopted in the United Kingdom in 1910 by the *Institute of Civil Engineers*. It was followed by many others in the US, a few ones in some other countries. But while the codes are discussed and regularly amended in the American associations who adopted them, in other places they sometimes just “exist”.

While some observers question its theoretical foundations and methods, others simply doubt that the engineers’ professional activities may raise specific ethical questions. Thus, nobody seems to be surprised when philosophers and ethicists question certain aspects of technological development; technological development that is barely imaginable in the absence of engineers. Here are two established facts: first, technological development brings up ethical questions; second, engineers contribute, in a necessary way, to the existence and to the deployment of these techniques. For some authors, this confrontation compels us to question ethically engineering. For others, the ethical challenge of techniques is not the concern of engineers.

In this contribution to this first UNESCO engineering report, I will first say a few words about the concept of engineering ethics, which is sometimes hard to translate into other language than English, and to be understood in other cultural contexts than those which developed under Anglo-American influence. Then, I will try to identify the specific characteristics of engineering as a human type of activity. Finally, I will go back to the engineers. If they are not the only ones concerned with engineering ethics, what can be said about their individual and collective moral responsibility?

What is the status of engineering ethics?

In some places, such as France, the word “profession” can refer to any kind of job; in other countries like the United States, Canada, New-Zealand, Ireland, South Africa, Australia, The United Kingdom, a profession means a type of activity whose members are provided with specific rights (or at least social recognition). The division of the job market between “professions” and “occupations”, in those countries fits in with functionalist theories that have dominated the sociology of profession for decades. It also fits in with an understanding of the role and status of the professions in societies which can be traced back a long time ago in the early history of England.

“Is engineering a Profession?” is a question that can be found in all of the introductions of engineering ethics text-books in the USA. Many scholars in this field consider it as a key question which answer is affirmative. For them, engineering ethics is related to the professional status of engineering. Other scholars, also familiar to functionalist theories, consider that it is not possible to talk about engineering ethics because engineering is not a “true” profession. These discussions about the “essence” of engineering do not exist in countries where the demarcation between the professions and other types of activities is not an issue. Even in countries where this demarcation is meaningful, some authors have an understanding of “engineering ethics” (as “professional” ethics) broad enough to encompass many types of ethical problems encountered at work by engineers whether they are considered as “true” professional or not.

Some American scholars consider that engineering ethics rely the fact that the engineering community has adopted standards defining what is morally permissible, which are specific to its members and go beyond the requirement of law, market and ordinary morality. They consider engineering ethics as a kind of practical wisdom in the professional practice which can and must be transmitted. This is an interesting approach but it relies on the adoption of such standards, which is not the case in all over the World. Moreover, where codes of ethics do exist, these codes often they suffer from a lack of legitimacy and reinforcement procedures. Where the engineers have developed an ethical reflection outside without a codification, it seems to be possible to reflect upon the ethical issues of engineering without the use of the concepts of profession and professional ethics.

Following this approach, engineering ethics would not be so much about promoting respect of professional obligations. The focal point of engineering ethics would not a status, a profession. Neither would it be knowledge, engineering sciences. According to me, engineering ethics is not an ethical reflection on technical

objects: this is what I would call “ethics of techniques”. Neither is the role of engineering ethics to evaluate technical decisions: this has been the aim of a field called “Technology Assessment” since the 1980s. Its focal point is an activity. Moreover, in our engineered world, engineering ethics cannot be a preoccupation reserved for engineers only, but for all the citizens concerned by the impact of engineering decisions. I could choose expressions such as “techn-ethics” or “ethics of technology”. The expression “engineering ethic” seems more fruitful, because it reminds us of the human origin of the technologies. It explicitly refers to a type of work and to a human community more in charge of this work than others: the engineers.

What is engineering?

Until recently, human social sciences and philosophy showed little interest for engineers and their practice. In the US, the history of technology independent of the history of science is very recent. Even more recently, we can mention the effort of Gary Lee Downey and Juan Lucena to attempt to trace the outlines of a specific field for engineering studies.

Several characteristics of engineering are described in academic literature. Some insist on the dual nature, scientific *and* economic, of engineering: engineers are scientists but also businessmen because the testing of their work does not occur in laboratories, but on the market place. Others underline the social dimension of this practice which is a combination of labour and capital. The knowledge of engineers has something to do with scientific knowledge, but it remains different. Mike Martin and Roland Schinzinger have defined engineering as a “social experimentation. Carl Mitcham insists on the fact that the product of engineering is not knowledge, but “an object which transforms the world”.

What are then the main characteristics of engineering? Firstly, engineering takes place in a complex work environment. The agents of technical acts are engineers, but also technicians, non-technical executives, and sometimes administrative and political decision-makers... Secondly, this act has the ability to transform the real world and produce consequences which are sometimes irreversible and partially unknown. Engineering is characterized by the potential power and the partial uncertainty of its impacts, both present and future, on the natural and human environment. Finally, engineering is characterized by a central act: the act of designing. This act is a process by which objectives or functions take shape in plans for the creation of an object, a system, or a service which aim at achieving the goal or this function.

What about engineers’ responsibility?

The moral obligations of engineers come from the dependence of the whole society on engineers, for certain things at least such as the acts of technical design. Engineers have a great responsibility because if they fail to do their job with technical competency and commitment to ethics, not only may an individual be harmed or killed (as is the case if a doctor fails to do his job) but dozens, hundreds, even thousands of individuals

Although the principle of proportionate care obviously forms the basis of the engineers’ moral responsibility, we must keep in mind one difficulty, the phenomenon of dilution of individual responsibility in large corporations which may favor impunity. On the other hand, it may be unjust to have an individual agent bear the responsibility of the unwanted harm due to a structural failure of a collectivity. The line seems to be narrow between making the individual engineers excessively responsible and the abdication of any responsibility as a subterfuge for inaction.

In the shift from the activity to the actors, from the ethical challenges of engineering to the moral responsibility of the engineers, three questions need to be addressed: What is the moral legitimacy of engineers when taking into account the ethical issues of engineering in their decisions and actions? What is the specific knowledge that they have access to? What is their specific freedom of action within the organizations which employ them?

Legitimacy

For some authors, the ethical questions raised by technical development do not really concern the engineers because of its highly political dimension. Some authors are very skeptical regarding the obligations of engineers in the American codes of ethics that seek to protect the public against the bad effects of technical developments. Thus, engineers can express their point of view, with a full legitimacy, in the debates about the technical choices at different levels: within their companies, with peers and other colleagues but also with staff representatives; outside the company with local associations, standard organizations, governmental agencies, parliamentary commissions, NGOs...

Because of their position in the socio-technical system, engineers are expected to be citizens of technical democracy, more than any other member of society. Moreover, concerning their obligation inside their companies, besides the role which consists in the communication of technical specifications, engineers can also

(and must in certain cases) suggest alternatives to their superiors or their clients. Engineers are responsible because those who have to make the choices trust in them.

Knowledge

The highly compartmentalized work situations of engineers, the labor division which characterizes the large corporations where they work, creates another risk-factor than just the dilution of responsibilities: the loss of direction, the forgetting of the aims, which can turn for the actors into an accepted blindness. There probably is a moral obligation for the engineers not to be ignorant, or worse indifferent, to the goals they contribute to achieving, and a necessity to be able to express their positions clearly for those goals.

One cannot be held accountable for something about which one is ignorant: this has been one of the foundations of the notion of responsibility since ancient times. But there are ignorances that are more morally acceptable than others. Some people believe that the participation of engineers in decision-making is simply unknowable. Thus, their moral responsibility would be indescribable. If ethical decisions are difficult to make for engineers, ethical judgments are always possible, and they can improve.

Power

Another reason put forth for saying that there is no room for ethics in engineering is based on the engineers' status as employees which does not give them enough freedom. The question of the engineers' professional autonomy and of their power in decision-making in the companies was studied by historians and sociologists who looked at engineers not as professionals but as workers. Although it is necessary to remind ourselves that engineers are hardly independent professionals we can wonder if their freedom of action within the organizations which employ them is as narrow as some theses on the "proletarianization" of engineers seem to suggest.

The reflections on the specificity of engineering, its impacts on the social world and its hybrid nature, social as well as technical, compel us to think of the place where the engineers exercise their power outside the most visible aspects, i.e. in the games of relationship vis-à-vis authority. Engineers are close to the "black box" of technology, they are sometimes the principal actors of the closing of this box. But what we remember at the end are the economic and political constraints. Engineers appear then as employees among others whose only social responsibility would be to obey their hierarchy. As many scholars in the field of engineering ethics have already written before me, one of the engineers' obligations may consist of in extreme cases blowing the whistle and in taking the risk to overpass their obligation of loyalty towards their employers. But, another obligation, less spectacular maybe, would consist of engineers contributing to the improvement of the structures in which they act, to turn them into more just and responsible institutions. This point of view fits very well with Paul Ricoeur's definition of ethics as an "aim of the good life with and for others in just institutions".

Conclusion

Engineering ethics is a new field of contextualized ethics, far from its maturity. For many years already, first in the USA, and now in some European and Asian countries, engineering ethics has started to interest a larger community of scholars. Its focus has widened from the specific nature of engineering as a "true" profession, to the relevant characteristics of engineering as an activity which is at the articulation of the social, the economic, the political, and the technical. In this paper, I have tried to define the challenges of research in engineering ethics and stressed the interest in an epistemological approach to the question, aiming at defining the outline of the activity which is at the heart of engineering ethics: engineering.

The most recent research works in engineering ethics also show a greater understanding of the different scales in which engineering may be questioned ethically: on the individual micro-level, on the mezzo-level of a group, a professional body or a company, and on the macro-level of the planet. Some issues related to sustainable development and corporate social responsibility, which are now considered as a relevant matter for engineering ethics, can mingle macro and mezzo levels. Most courses in engineering ethics have long offered studying the ethical dilemmas that students could encounter in their careers. Although this approach seems to me interesting and useful, I have tried to show in this chapter that numerous other entries can contribute to broaden the individual responsibility and ethical sensitivity of future engineers.