Chapter 14
Professional Ethics Without a Profession: A French View on Engineering Ethics

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Abstract Bioethics and business ethics have their international conferences, their networks, their international scientific journals, as well as their schools of thought and their internal disagreement. To the contrary, engineering ethics is a little known area of study which gives rise sometimes to scepticism. First developed in the US, this academic field it is now present in many countries. In this article, we intend to make known the progress made and the issues at stake in this area of contextualised ethics: philosophical issues, but also cultural one. We will defend the idea that reflecting upon the ethical issues of engineering is not of interest to engineers alone. However, as it also concern engineers, we will try to describe what could (or should) be the focus of an ethical reflection on engineering for engineers in countries (like France) where the concept of profession does not hold an ethical dimension as it seems to be the case in the US.

14.1 Introduction

Ethical reflections applied to engineering are a lot more recent than to other professional activities. Nevertheless, there is a subject called "engineering ethics". Created in the United States in the 1980s, it has since developed in other countries, starting with countries where the professional organizations have a code of ethics. In France, this concern is novel and faces some specific problems: it is not well understood. 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:

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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 the morals of engineering. For others, the ethical challenge of techniques is not the concern of engineers. I do believe that observing engineers, their everyday practice and, sometimes, their quest for moral signposts deserve the attention of those who are interested in the ethical challenges of technical development as well as those who are interested in a more general way in the challenges of professional ethics.

I will first say a few words about the concept of engineering ethics, which is very hard to translate in French, in France especially, because the meaning of the word profession carries different connotations. Then, I will try to identify the specific characteristics of human actions that engineering ethics focuses on. 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? Three questions will be discussed: What is their legitimacy when taking into account their ethical values in their decisions at work? What do engineers know about the ethical issues of engineering? What can they actually do?

14.2 Engineering Ethics: Professional Ethics, Applied Ethics, or Something Else?

14.2.1 Is Professional Ethics Inherent to Professions?

In France the word *profession* can refer to any kind of job; in the United States, a profession legally means a type of activity whose members are provided with specific rights. The division of the job market between professions and occupations fits in with the functionalist theory of professions that dominates professional sociology in many countries such as Great Britain and the United States. According to this framework, professions are characterized by intrinsic attributes from which come obligations of their members towards their clients, their peers, and the public. These obligations are inscribed in a code of ethics

In fact, what distinguishes professions from mere occupations is not agreed upon. Professions are often characterized by their function: they are indispensable because they serve a crucial social need such as Health or Justice. . . Some authors insist on the pursuit of a common ideal between members of professions. But professions can also be described by the type of organization of their members. The interactionist sociologists insist more on the monopoly practiced by the professions on certain activities, than on the ideal they are supposed to serve. They consider professional groups as processes of interactions which lead the members of a same work activity to organize themselves, to defend their autonomy, and to protect themselves against competition: socially idealised occupations organized in closed occupational communities.

The code of ethics promoted by the organized professions is therefore understood differently according to the authors' appreciation of what is a profession. Codes can be seen as distinctive signs freely chosen by a group which contribute to raising their activity to the rank of a profession. They can be understood as intrinsic attributes of activities whose nature itself would make them professions. They can also be seen as a strategic tool to defend the corporation's interests.

14.2.2 Is Engineering a Profession?

"Is engineering a Profession?" is a question that can be found in all of the introductions of engineering ethics text-books in the USA. But this question may seem a little useless in other countries such as France. Some scholars in the field of sociology of the professions consider that it is not possible to talk about engineering professional ethics because engineering is not a "true" profession. This field does not satisfy all of the necessary requirements to be recognized as a profession as health professions or law are, for example. For others, the affirmative answer to this question is evident. Engineering is "not just a way of making a living" but "a calling in which individuals are personally committed to using their skills and abilities to achieve a high social goal" (Schlossberger 1993). But this is more an act of faith than a demonstration.

According to Michael Davis, there are three main arguments that are put forth to deny engineering the status of profession. First, there is no intrinsic ideal in the practice of engineering. Second, this ideal, if it existed, would only be technique, that is to say a matter of means, and therefore value-free in contrast to health which is morally good in itself. Third, engineering lacks the type of social arrangement which characterizes a real profession, i.e. a professional organization with authority. Deconstructing these arguments, one after the other, Davis points out that accepting or refusing to count engineers as professionals depends on the choice made by each author among all the available definitions of the word "profession" (Davis 1997).

For Davis, engineering ethics is a kind of practical wisdom in the professional practice which can and must be transmitted. It is a matter of choice. Like the other norms that the engineers use in their work, "ethical standards, like other engineering standards, are not discoveries but useful inventions". He comes to classify engineers as among the professionals because, as he has observed, 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 (Davis 1998, p. 177). If this statement, the existence of standards, can be made in the USA, this is not the case all over the world.

Nevertheless, Karl Pavlovic already considered in the early 1980s that the question for engineering of being or not being a profession uselessly interfered with the debate. He argued that "(a) there is an ethical dimension to the practice of engineering, (b) that this dimension has no essential connection with engineering being a profession, (c) that professionalism in engineering is rather an issue parasitic to this

ethical dimension, and finally, (d) that there are factors in the practice of engineering that make a discussion of ethics in the context of engineering appropriate" (Pavlovic 1983, p. 224). This approach seams to me very helpful especially in a country like France, where *profession*s are neither a cultural nor a judicial matter.

14.2.3 Engineering Ethics as Contextualized Ethics

Some authors who are skeptical towards engineering ethics base their criticism on the arguments generally put forth against the entire field of applied ethics. They disagree with the idea of deducing solutions to particular problems from moral theory. Indeed, the concept of applied ethics is problematic because it suggests that it would be possible to solve problems by "applying" moral theory or the article of a code of ethics. But, it also suggests that the goal of ethics would consist in the solving of problems.

I prefer to use the concept of contextualized ethics than the one of applied ethics. Contextualized ethics is defined as a heuristical method which deals with moral questions posed by a practice in a specific context. With this approach, what come first are not the duties of a profession, but the questions raised by a specific type of activity in its context. This context, this area, is not only the one of a professional group: it is a socially shared space. It is also a space where a dialogue can take place between various stake-holders, where moral theories can contribute along with other methods and tools to understand the reality and study the ethical dimension of choice – past, present, and future.

For Carl Mitcham, the role of engineering ethics is not so much about promoting respect of professional obligations or applying theories. It is an ethical reflection on the technical act in context. Moreover, he adds that in our "engineered world", engineering ethics cannot be a preoccupation reserved for engineers only. On the contrary, it is a questioning about our relationship with objects and technical processes and their conception which must concern everyone without exception (Mitcham 1997, p. 123).

Why not then talk about "technethics" or "ethics of technology"? The concept of engineering ethics seems to me more fruitful, despite the risk of giving it a too narrow definition, because it reminds us of the human origin of the technologies. Engineering ethics refers to a type of work, to humans; functionalists would say to a "profession". It also refers to a human community or social group: the engineers.

14.3 What is Engineering?

How does one then define this activity, the specific area of human action which is at the heart of engineering ethics? Engineering ethics is not an abstract 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

aims of a field called "Technology Assessment" since the 1980s. The focal point of engineering ethics is not a status, a profession. Neither is it knowledge, engineering sciences. The focal point of engineering ethics is an activity.

14.3.1 Engineering as Humanism

According to Hélène Vérin, the word engineer etymologically suggests a certain moral ambivalence. The Latin word *ingenium* meant skill, manual skill as well as spirit and cleverness. But between the XIIth and XVth centuries, it also meant trick and deceit. In the middle of the XIIIth century, *engignement* was used for actions meant to be surprising. The *enginiour* of the XVth century was the person who was skilled (from *engin*, for inborn characters in old French) and who knew how to use his creativity (*engin*, for cleverness) to conceive and build a machine (also *engin* in French). During the same period, the devil was called *enghinhart* or *mal engegneor* and the word *engineresse* was used for witches.

We can find this ambivalence in more recent discussions on engineering. The nineteenth century which bore witness to the tragic consequences of industrialization, was also the stage for a profusion of technophile speeches. George Morison, one of the first bridge-builders in the United States, described the engineers as the priests of technical development, "priests without superstition". Edwin Layton who analyzed the speeches given by the American engineering organizations between 1895 and 1920, wrote that their spokesmen described engineers as "the vital force of human progress and of enlightenment", also as "uninterested logical thinkers" whose social responsibility is "to protect progress and ensure that technical changes are used for the good of humanity" (Layton 1986, p. viii).

Although the twentieth century with its human and ecological disasters born of modern techniques shook the ideology of progress, the discourses describing engineering as intrinsic humanism resisted. Eugene Schlossberger, an enthusiastic defender of the profession in the USA, still refers to an "engineering way" whose characteristics are to be "precise, rational and careful". According to him, the engineering way implies being responsible about safety. He also writes that "technology *is* practical wisdom". According to Michael Davis, the first commitment of engineers is not to a theoretical or applied knowledge as we might expect from scientists, but to human well-being. If these discourses are typical of corporate organizations, we can find them in some catholic milieu when engineers are exhorted to carry on the mission of the humanization of the Earth. French Bishop Albert Rouet declared at the 100th anniversary of the *Institut Catholique des Arts et Métiers* that "the engineer is someone who is situated at a place where the world is being created, that is to say, where creation is being perpetuated". This was only ten years ago.

14.3.2 Questioning the Amorality of Engineering

Quite unlike the authors who define engineering as humanism, others consider engineering as being morally indefinable. They are rooted in an understanding of what

technology is which has not changed since Aristotle. For them, the association of the terms ethics and engineers does not make sense because the activity of engineers consists in the putting into practice a means to achieve external goals, whether good or bad. Therefore, the technical act would not be the object of a moral judgment because of its status of "means", value-free by nature.

According to Günther Anders this division of means and ends applies only to singular acts and mechanically isolated actions (Anders 2001). Jacques Ellul also questioned the neutrality of techniques. Although he believed technology had a status of means, he underlined a new specificity which was "that these means now obey their own rules and are not subordinate to ends". According to him, we should not see in technologies only the tools because they constitute a system which modifies the totality of man and his environment. For him, the technical system is not amoral: it imposes "technological ethics", that of "normality, efficiency, success, work, professional conscience, and commitment to collectivity" (Ellul 1983).

Moral judgments on engineering do exist. They reveal feelings of confidence or of fear toward technology. Those feelings are rooted sometimes in beliefs, sometimes in an accurate observation of the world. Anyway, these discourses do not tell us much about the fundamental characteristics of the technical act. How can one study the ethical challenges of an activity whose borders are so uncertain? Until recently, human social sciences and philosophy showed little interest for engineers and their practice. It has been the same for a long time for the sciences and technology.

In the United States, the works of Edwin Layton founded a history of technology independent of the history of science. Walter Vincenti was one of the first researchers who attempted to elaborate on an epistemological distinction between engineering and applied sciences. In France, Bruno Latour is seen as a precursor with his ethnographical works on life in the laboratory. However, similar ethnographical works dealing with engineering remain scarce. Finally, 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.

14.3.3 Engineering in the Literature

Several characteristics of engineering are described in academic literature. Layton insists 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". Downey and Lucena also underline the social dimension of this practice recalling the "combination of labour and capital" which characterizes engineering. Wiebe Bijker and John Law describe it as a contextualized practice where technique and non-technique contribute to building a "political network". Engineering therefore appears intimately linked to a complex context where political, social, ecological and economical challenges intermingle.

The knowledge of engineers has something to do with scientific knowledge, but it remains different. Mike Martin and Roland Schinzinger define 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: "when science takes the world into its laboratory, engineering takes the world for a laboratory" (Mitcham 1987, p. 138).

According to Michael Davis, engineering is not simply resolving a problem: it is "as creative as art, as political as law, and no more a mere application of science than art or law is" (Davis 1997, p. ix). Most authors agree on giving a central role to the activity of design, defined as a creative act of translation of ideas into visible forms. Edwin Layton stresses that the capacity to draw was tacitly the common denominator of American engineers of the last century and sometimes the official criterion for admission to a professional society (Layton 1983, p. 130).

14.3.4 Towards a Definition of Engineering as a Technical Act

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... Latour would certainly add the objects. Engineering is therefore characterized by the complexity of the human organizations in which it develops. Where is there room for ethical decision making? How can we take on responsibility when any individual act is diluted among so many?

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. In whose name should we accept the risks induced by the numerous social experimentations that surround us? Who can and who must decide? What is a socially and morally acceptable risk?

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. How can one evaluate the morality of this act of the transformation of ideas into concrete forms which is the heart of engineering? By which process values and worth are part of the shaping of objects, programs and procedures?

14.4 How are the Engineers Concerned by Engineering Ethics?

The moral obligations of engineers do not derive from the existence of a code of ethics. They come from the dependence of the whole society on engineers, for certain things at least: the acts of technical design. This dependency creates a responsibility for the engineers toward clients as well as to employers, towards neighbors as well as to co-workers, towards the ultimate users as well as to all the animate and inanimate beings who are transformed, in one way or another, by their technical

acts, by their "social experimentations". Kenneth Alpern defines the principle of proportionate care in saying that: "when one is in a position to contribute to greater harm or when one is in a position to play a more critical part in causing harm than is another person, one must exercise greater care to avoid doing so" (Alpern 1983). Therefore engineers have a great responsibility because if they fail to do their job with technical competency or 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. This problem makes it hard to identify who is morally responsible when a lot of different people contribute in various ways to the decision-making. Today, most engineers work in large organizations; moreover, they rarely remain in the same position for a long time. Engineering projects are transmitted from one decision-maker to another, successively taking on the same position. Many engineers change position, and sometimes company, before they see the concrete outcomes of their decisions. The "problem of many hands", as Dennis Thompson calls this phenomenon may favor impunity, and a mentality of hired-guns among engineers.

However, it may be considered 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?

14.4.1 The Legitimacy of the Engineers

For some authors, the ethical questions raised by technical development do not really concern the engineers because of its highly political dimension. Samuel Florman is 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. "Fortunately", he writes, "engineers are no more agreed upon how to organize the world than are politicians, novelists, dentists or philosophers". According to him, engineers have no right to establish goals for society. Already Aristotle recognizing that there were actions which were better judged by the "actors" whereas other actions were better judged by "those acted upon", said: "a feast is judged by the guests, not by the cook."

As such, the engineers would not have a word to say on technical development and even less on the ethical challenges created by these developments. Yet, there

are many places where engineers would have legitimacy alongside other stakeholders of technical development. Engineers can express their point of view 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.

Concerning their obligation inside their company, Christiaan Hogenhuis and Dick Koegela stress that besides the role which consists in the communication of technical specifications, engineers can also (and must also in certain cases) suggest alternatives to their superiors or their clients. If they have no legitimacy to decide which impacts are socially, economically, ecologically, politically acceptable, they are often among the only ones to be able to suggest alternatives. Besides, they often take part in executive teams. And when this is not the case, their superiors or their clients, who have the legitimacy to make decisions, often trust them. Engineers are responsible because those who have to make the choices trust in them.

Andrew Feenberg reminds us that there is, at the beginning of the development of any plan, a large range of possible technological choices, all of them responding to the interests of one or more social groups: the entrepreneurs, their clients, the engineers, the political leaders. . . The struggle between these groups leads to a selection at the end of which technology becomes a "black box". Before it is closed, the social interests at stake in the process of choice come through very clearly but, they are quickly forgotten: retrospectively, the object seems purely technical and its creation just inevitable. The engineers are not legitimate decision-makers for the whole society. But they are situated close to this barely visible and strategic place, the blind spot of technique: the black box. And this position implies a specific responsibility.

14.4.2 The Knowledge of the Engineers

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. The study of Evelyne Desbois on Mining engineers in Northern France during the German occupation gives a good example of this possible loss. She shows how most mining engineers continued to work as they used to do before the war, with one goal: searching for results. For them, there was just one way of working: "when one has a job", said one of them "he is easily polarized about it. He easily steps back from all external circumstances, even if they are a lot more important than the job itself" (Desbois 1984, p. 118). 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. Prudence is required because the impacts of technologies are partly uncertain, but many industrialists worry about seeing a precautionary principle put forth wrongly. They believe that it would restrict crucial innovations because of fear of potential unwanted drawbacks. What about the engineers? They are not expected to become experts in ethics or in public health. But, they probably have the moral obligation to be aware of the debates which surround highly-controversial engineering question, especially when they concern their own work or their own companie. They certainly have to be among the best informed of their fellow-citizens, and even the most educated among them.

Some people believe that the participation of engineers in decision-making is simply unknowable. Thus, their moral responsibility would be indescribable. I do believe that there are, in any case, means to broaden their room for freedom and responsibility through enlarging their knowledge and their understanding. If ethical decisions are difficult to make for engineers, ethical judgments are always possible, and they can improve. Considering the intrinsically risky nature of engineering, they could be expected, for instance, to be able to answer the questions such as: are the stake-holders involved correctly informed? What are the social benefits of the decision worth in comparison to its social costs? Is the distribution of risks just?

14.4.3 The Power of Engineers

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. This old argument is put forth either to say that, by principle, the position of an employee is incompatible with the exercise of professional ethics because of a lack of autonomy, or to say that it is often true in practice. Ralph Nader already wrote more than thirty years ago: "in essence, how free is an engineer within a large corporation, whose primary mission is profit-maximisation via all possible shortcuts, and whose bureaucartic structures pose real problems for individual expression and initiative both in matter of skill and conscience?" (Nader 1967).

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. Their approach was often linked to the concept of social class and was more present in countries such as France where there has always been a very hierarchical system. 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 proletarization 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. The actor-network theory may give us a new outlook with scholars such as John Law and Michel Callon, for instance, who describe the engineers as "social activists", because "they design societies and social institutions to fit machines" (Law and Callon 1988, p. 284). Langdon Winner also observed that the design of nuclear power plants had implications for the structuring of societies and the distribution of social roles. Wondering if the artifacts "had politics", he concludes that "the issues that divide or unite people in society are settled not only in the institutions and practices of politics proper, but also, less obviously, in tangible arrangements of steel and concrete, wires and semiconductors, nuts and bolts" (Winner 1989, p. 29).

Thus, the engineers are not only 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 an "aim of the good life with and for others in just institutions" (Ricoeur 1990, p. 202).

14.5 Conclusions

Engineering ethics is a new field of contextualized ethics, far from its maturity. It has been marked by its north-American origins where it developed among other "professional ethics". 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 chapter, 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. These works study situations where these different levels articulate, run into each other, and even disturb one another. 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. The discussion on whistleblowing which used to focus solely on the engineer's individual heroism or lack of courage, can take into account the mezzo level of corporate regulation and culture. Thus engineers' freedom of expression in the working place and whistleblowers' policies can be part of a larger scope for engineering ethics.

These evolutions of the scope of research in engineering ethics should have (and have already had in some places) impacts on engineering education. 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.

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