

ETHICS: A MISSION FOR THE ENGINEERING FEDERATIONS

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Abstract: Consideration is given to the dilemmas faced by engineers, if and when conflicts arise between the individual's sense of social responsibility and his specific technical interests. A specialized topic included with these is the protection required for whistle-blowers. In general, it is asserted that creating a climate in which ethical behaviour may flourish should be considered as one of the most sophisticated, but also one of the most rewarding, tasks facing the engineering federations. Recommended actions on behalf of IFAC and other engineering federations are outlined. Finally a warning is given against extremist attempts to exploit ethical issues in engineering.
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1. THE SPECIFIC NATURE OF ENGINEERING-RELATED ETHICAL ISSUES

Engineers are affected by ethical problems in an unusual way. Most other professions operate within a framework of long-standing laws and regulations, or are free to follow the ethical norms that are traditionally part of their specialty.

From the ethical point of view, the best regulated profession is *medicine*. It has a very long tradition of ethical practice and the Hippocratic oath itself is still binding on practitioners, although advances in medical science and technology continuously give rise to ethical dilemmas in novel form (Aristotle et al.). *Lawyers* are also part of a tradition rooted in antiquity, namely the principles of Roman law subsequently consolidated into Western European culture. The ethics of *pedagogy*, on the other hand, have changed greatly over the years, and not only the content but also the objectives of education are quite different from what they once were. The earlier aim of education was to prepare pupils as appropriate to their specific roles in society, either as ruler or ruled in a given hierarchy, while preserving the traditional knowledge related to this clearly defined role. Today education is designed to encourage a democratic, participatory citizenship, and to stimulate innovative creativity. Students' and children's rights have become constituent parts of education and consequently the ethical environment of pedagogy has changed radically. Nevertheless, ethical rules and procedures are mostly well defined in diverse cultures and national education systems.

Ethics in the *economic sphere* are perhaps the most difficult to define, because of their frequently problematic relationship with economic success. For this reason, ethics for professionals working in the economy are not particularly well defined and more reliance is placed on legal regulation. Pragmatism and custom have helped to make this a viable way of settling differences, and business partners who find themselves in conflict usually arrive at a compromise brokered by the law.

Ethics in the *engineering field* are quite different from all the above-mentioned. This is because they are mostly oriented to rather short-term relationships, and in the majority of cases they involve bilateral personal negotiation. That means that they have a direct or short-term feedback based on direct human contacts, either as between groups of people, or as between groups representing different functions.

Engineering ethics are indeed global and the creative engineer cannot hope to foresee all the circumstances in which his invention might be put to use. The product, transcending all national borders and penetrating many other civilizations, will inevitably undergo various transmutations of application. Under "*product*" we understand, in this context, any kind of device, software or medium.

2. TYPES OF ETHICAL CONFLICT IN ENGINEERING

From the point of view of this discussion, we can define two classes of conflict that involve ethical considerations. The first is conflict among persons of

the same profession, typically the appropriation of someone else's ideas or invention. The second, more aggressive, form of the same is the periodic suppression of the ideas of others through misuse of power in the organization's hierarchy, through corruption or through other means. The procedures required for redress in these cases are mostly well formulated in countries with consolidated legal systems, but the efficiency of such procedures is variable and much depends on the general level of ethical awareness in the country concerned.

We focus here on the second group of problems, those related specifically to the world of engineering. These can be extremely delicate and concern both the ethics of creative engineering itself and the latter's potential conflicts with financial, political, or ideological interests.

Engineers are creating products for the long term, sometimes for several generations. Thus they are inevitably involved with infrastructures, devices and materials that in their turn have a long-term impact on the environment, on lifestyles and on other aspects of society. Engineers are mostly not independent, but are employed by, or contractually related to, companies that are governed by relatively short-term considerations, typically the need to produce and enhance profits.

3. THE QUESTION OF RESPONSIBILITY

Where does the responsibility of the engineer lie? This is not only a question for the company or administrative hierarchy to which he is answerable, but is also a problem that concerns the definable borders of what constitutes engineering itself. Indeed, it is reasonable to ask the question: What sort of person may now be defined as an engineer? Fifty or a hundred years ago it was very easy to define the traditional engineering professions, which were clearly designated as mechanical, electrical, chemical and civil. This is no longer the case. The whole of *medical practice* is shot through with aspects of engineering, while *management and the economy* cannot be separated from engineering either.

Should an engineer be a whistle-blower when he becomes involved in the design and production of environmentally dangerous objects and materials? Or of foods and drugs whose safety is in question? Or of products that do not conform to the standards of quality that are claimed for them in the advertisements? Or when he knows that the best available versions of a product have been suppressed?

How does an engineer react to projects that will create mass unemployment? Or what about his participation in projects that endanger innocent people or even whole nations?

It is more or less impossible to formulate a definitive general rule for such dilemmas; the context of each problem tends to be highly individual, as is the personal situation of the engineer in confronting it. And that is indeed the reason why it is an ethical problem and cannot be solved purely by regulation.

4. ETHICS IN FOCUS

The necessity of dealing with ethics in engineering has created several initiatives and differing institutional approaches (Pennington Vann). Most of the engineering federations, as for example in our field the IEEE or ACM, have codes of ethics, and have established committees for dealing with ethical issues. Texas University established a National Institute for Engineering Ethics (NIEE), of which the Online Ethics Center works mostly on the web and is sponsored by the Texas University and the Case Western Reserve University. Several other universities offer courses in engineering ethics, Delft University in the Netherlands being one that is out the USA.

The main activity of these institutions is focussed on education, collecting relevant literature, building up a database of reference cases, establishing contacts among institutions, and holding colloquiums and conferences. The stance of IEEE is fairly typical, in that it excludes specific individual requests from consideration by its ethics committee. The stance is not unreasonable, even if other ways of operating also deserve consideration. The Online Ethics Center, however, offers advice for individuals as well.

5. FURTHER AGENDA

We need to find a way of proceeding towards a better-protected ethical environment for engineers. The first task is to extend the present possibilities for consultation with the relevant individuals or bodies. On the basis of such consultation, the engineering entity concerned should decide what kind of protection can be offered or what alternative measures to resolve ethical problems may be set in place. It is important that engineering entities should be vested with the appropriate powers for instituting such measures.

Engineers have very influential and powerful organizations to represent them. The largest and best known is the IEEE. IFAC and several other non-governmental civil organizations also have worldwide networks. These organizations can create an effective bridge between those procedures that are regulated by law and the everyday practice of engineering that throws up problems of conscience related to any specific engineering task.

It is also desirable that there should be a regular issue of source material relating to precedence and analysing analogous cases, which would imply a further development of the Online service. The collection of data should mirror Common Law cases and materials, but should be accompanied by explanations that are more easily assimilable.

The task is to find good solutions that are based on general principles and mission statements which have been codified in a system of ethics, but which are also able to take into account the specificity of individual problems. We have also to be aware of cultural and economic differences. What can be done in a rich country, with a long history of a stable society, will be different from what can be done in a country where poverty is the major problem. Likewise the solutions appropriate to countries where a high percentage of population has degrees in higher education are likely to be different from those appropriate in countries where illiteracy is widespread.

On the other hand, when considering local differences, we should also not overlook the effects of globalization, both environmental and in terms of the socio-economic impact of products with worldwide distribution.

Furthermore, in engineering education ethics should be an important ingredient, not so much as a separate philosophy, but more as practice related to product design. Ideally, the formulation of each design should have built into it questions concerning the possible environmental, social and other effects.

6. SOME FURTHER RECOMMENDATIONS

Agreement is required on the persons whose task it should be to initiate a policy on ethics. Can this be done, for example, by the IFAC alone? At what stage of the development of a policy should our ideas be negotiated with other engineering organizations and non-governmental bodies chartered by the UN? The process of consultation and enforcement requires very careful guidelines, which are flexible

on the one hand, and concrete on the other. It will certainly require some kind of official or non-official acceptance by related bodies (in this case the IFAC) inside and outside the engineering community. Our task will be to highlight the publications, as well as the relevant case material, that is available in different countries as well as drafting the guidelines referred to in this paper and elsewhere.

Desirable activity would include initiating forums for discussion and blackboards for news. A decision would need to be made as to whether these should be broadcast in the form of a web-site or also printed. We should also investigate the possibility of establishing relations to grant issuing bodies and foundations. The author has previously drawn attention to these matters several times in his capacity as an IFAC member (Vámos et al., 1981; Vámos, 1986; 1987a; 1987b; 1991a, 1991b, 1991c, 1999).

His recommendation has included a call to the IFAC set up a small group of volunteers who can outline the next tasks that need to be tackled in the field, establish contacts with other organizations dealing with the same problem, organize a workshop to assemble and analyze the experience gained so far and stimulate further work.

Against this background, all engineering organizations should be able to approach non-governmental and other international organizations or foundations for more substantial financial support. NSF has supported some activities in this field and the present brief of the Open Society Foundation is certainly compatible with initiatives such as these.

Finally, exaggeration of the problem can be just as dangerous as sweeping it under the carpet. Aggressively pursued, professionally dubious claims can discredit well-meaning efforts to focus on ethics. Political forces, the tabloid mass media, and people seeking publicity for themselves are apt to exploit the anxieties of the less educated masses. This can be detrimental for science and progress in general, and may diminish the credibility of professional engineering in the eyes of the public. We have already seen several attempts to stop innovations that promise a better and healthier life for many. Political conservatism has always failed in the long term, but it has nevertheless managed to apply the brakes for whole nations, in some cases for several hundred years. And that is another reason why the task of formulating and enforcing ethical behaviour should be in the hands of the engineering federations themselves, nationally and internationally.

REFERENCES

Anybody interested in the fundamental problems in the field of ethics is well advised to read or reread the classic texts. These serve to demonstrate how the more intractable problems of human coexistence remain largely unchanged, despite the revolution in communications. Especially recommended are the following:

Nicomachean Ethics of *Aristotle*,

The Ethics of *Spinoza*

Essays of *Hume*

Two Treatises of Government by *Locke*

Metaphysics of Ethics by *Kant*

All the above are available on the web via ethics.acusd.edu/books.html

An excellent review of the current available literature has been compiled by W. Pennington Vann in www.niee.org/references.htm

Some relevant earlier works of the present author are the following:

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