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Engineering Ethics : European Perspectives

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EUROPEAN PERSPECTIVES

In most European countries, engineering ethics has been increasingly conceived early in its development as an interdisciplinary reflection at the crossroads of profes- sional ethics, the human and social sciences, and the philosophy of technology. This is in marked contrast with the situation in the United States, where engineering ethics has long been considered as a form of professional ethics.

Europe includes countries with diverse cultural, juridical, professional, and educational traditions of engineering, something that has promoted efforts within the European Union to harmonize technical education, including its nontechnical requirements in the humani- ties, social sciences, and professional ethics. European integration has further required the development of professional guidelines for the mutual recognition of diplomas and titles. Any comparison of engineering ethics in Europe and the United States cannot ignore this diversity of professional traditions. Engineering ethics in Europe requires a contextualist approach referencing the perceptions of the various engineers who formulate them.

ENGINEERING EDUCATION: BRITISH VERSUS CONTINENTAL MODELS

Histories of engineering education frequently begin with France, ignoring that the first engineering school in the world was the Moscow School for Mathematical and Navigational Crafts, established in 1698. As for western Europe, from its commonly accepted origin with the Bureau of the King's Draftsmen, established in France in 1744 (and the forerunner of the Royal School of Bridges and Roads, founded in 1747), it is still a long way to engineering education as known in the twenty-first century, with its strong theoretical and practical content.

The creation of the Bureau of the King's Draftsmen was followed by the School of Military Engineering at Mézières in 1748 and Royal School of Mines in 1783. If these are among the oldest engineering schools in western Europe, the one that has most influenced the engineering educational system is l'École Polytechnique. It was founded in 1794, one year after the dissolution of the French universities and soon after the failure of the school at Mézières, from which it borrowed the idea of a formal curriculum, rather than imitating the ancien régime tutorship in place at the Royal School of Bridges and Roads. Polytechnique's formalized theoretical curriculum, with its emphasis on mathematics, became an influential model for engineering education throughout France and beyond. It also contributed to the establishment of a high scientific and technical education outside the university.

Engineering in the United Kingdom adopted a different approach and only later established a structured education for engineers. Engineering degrees were not offered in the United Kingdom until 1838, when King's College, London, began to teach civil engineering. Indeed, the universities at Oxford and Cambridge did not offer engineering degrees until the first decade of the twentieth century. Instead, British engineers were, for a long time, given occupational training exclusively in workshops; apprenticeship promotion is what truly integrated them into their peer group. For this same reason, Britain is the uncontested birthplace of industrial technology. These engineers were at the heart of the Industrial Revolution and played a major role in the development of both the steam engine and its uses.

Because of their habit of meeting in clubs to exchange ideas and proposals—and above all to capitalize on their experiences and projects—British engineers prepared the ground for professional engineering organizations well before their continental colleagues. It is also significant that when engineering degrees did begin to be offered in the United Kingdom, it occurred not in independent institutions but in universities that already offered degrees in the liberal arts and sciences.

PROFESSIONAL ENGINEERING ASSOCIATIONS

IN EUROPE

Historians of the engineering profession in France often point to the Engineering Corps, established in 1676. This early engineering institution was, in fact, a military organization, and thus it had little to do with the professional organizations that arose later in most countries. The engineers of the corps were exclusively engineers of the state, that is, royal functionaries. Because of this state service, the Engineering Corps did not constitute a truly free organization of professionals, such as was established by "civil" engineers in Great Britain as an outgrowth of the previously mentioned informal clubs, notably the Society of Civil Engineers founded in 1771. Another of these societies, the Institution of Civil Engineers (ICE), was founded in 1818 in Britain by a small group of young engineers. In 1828, it obtained a royal charter and became a leader in the profession, with eighty thousand members in the early twenty-first century.

From the middle of the nineteenth century, several European countries followed the British model, beginning with France in 1848, Germany in 1856, and Spain in 1861. But while the prestigious British ICE was a club for practitioners, the French, German, and Spanish organizations were all created by a group of certified engineers from a single school in each country: the Paris Central School of Arts and Manufacturing, the Berlin Technical Institute, and the Madrid School of Industrial Engineers. Each association was only later opened to qualified persons from other institutions and, in some cases, to autodidacts (the self-taught). By contrast, in the United Kingdom, there is still no institution of higher education devoted exclusively to engineering, such as those found on the continent.

The status of the engineering profession and the use of titles differ profoundly from one country to another. In 1920, the British ICE was given sole authority to designate who was a chartered engineer (CEng) or an incorporated engineer (IEng). But the practice of engineer- ing was not

regulated before the creation of the Engineering Council in 2002. The title CEng is in use in much of the Commonwealth, including the Republic of Malta, where the Chamber of Engineers was founded in 1998 and the adoption of the Engineering Professional Act gave engineering the status of a profession. The title CEng is also used in the Republic of Ireland, where the title is regulated but not the practice.

The engineering profession is also regulated in some countries of southwestern Europe. In Portugal, engineers and technical engineers are full chartered professionals registered at the Order of Engineers, the regulatory and licensing body for the engineering profession and the accreditation body for engineering courses. The profession is similarly regulated in Spain, where registration with the Engineers' Colegio or Technical Engineers' Colegio is compulsory to be able to practice. In Italy, where 30 percent of engineers are consultants, registration isnecessary for those who work independently, but 50 percent of engineering graduates are registered in their Provincial Order.

FROM PROFESSIONAL ORGANIZATIONS TO PROFESSIONAL ETHICS

The early institutionalization of engineering education did not directly lead to the establishment of professional engineering organizations. Instead, it was the autonomous organization of practitioners that promoted the initial affirmation of a collective identity and the formalization of a collective moral framework for professional conduct. It is not, therefore, by chance that the first code of professional ethics written by and for engineers was formulated in Great Britain.

Indeed, historians of the professions commonly consider the "professional code of conduct" adopted by the ICE in 1910 as the model for engineering ethics codes, first in the United States and subsequently throughout the world. The first US code of ethics for engineers, adopted in 1911 by the American Institute of Consulting Engineers, was composed of twelve articles, five of them strongly inspired by the British ICE code.

The development of contemporary codes of profes- sional ethics in Europe has not been the same in every country, and such codes are much less important in Europe than in North America. Generally speaking, professional codes of ethics for engineers are more common in countries more influenced by Anglo-Ameri- can cultural models. Among the European code-like guidelines of the twentieth century, three were from northern Europe countries, one from Germany, and some from member states of the British Commonwealth, including the young Republic of Malta.

Northern European codes include the "code of honor" of the Swedish Association of Graduate Engineers, first adopted in 1929 and revised in 1988. The Association of Swedish-Speaking Engineers in Finland adopted a similar code in 1966. The code of honor of the Finnish Association of Graduate Engineers, first published in 1966, was revised in 1996. Finally, an "ethical code" was published by the Norwegian Engineers Association in 1970.

The Association of German Engineers (Verein Deutscher Ingenieure, or VDI) has never adopted a code of ethics. In 1950, the VDI issued the Engineer's Confessions, which was more a moral

pledge than a code of professional ethics. In 2002, the VDI released its Fundamentals of Engineering Ethics Guideline. Similarly, the British ICE, which was the first engineering association in the world to codify the profession, published a document in 2004 called Advice on Ethical Conduct, though it is not a code of ethics. The Chamber of Engineers in Malta adopted a code of ethics in 1993. The Republic of Ireland

Standards of Professional Conduct have been in place since 1971. The first code of engineering ethics in France, a country with a long engineering tradition, was an awkward adaptation of the North American ethical framework, adopted in 1997 and rewritten in 2001.

ENGINEERING ETHICS IN EUROPE AT THE END OF THE TWENTIETH CENTURY

In contrast to the situation in the United States, contemporary European engineering ethics did not arise from a will to renew an existing and explicit reflection at the heart of the profession and to open it to other actors, such as scholars and academics. In the United States, engineering ethics found new inspiration in the collaboration among engineering professionals, on one side, and philosophers, historians, and more recently social scientists, on the other. But in Europe, engineering ethics was not heir to a prior internalist approach. Instead, its heritage was more that of a professional conscience intuitively sensitive to social responsibilities and to legal expectations for professional conduct. With the exception of Germany, there was no formalized ethical reflection in European engineering before the end of the twentieth century. World War II led German engineers to a painful crisis of conscience over the use of science and technology in the service of a monstrous program, and the postwar period saw VDI heavily engaged in reflection on the proper ends of technology and the moral responsibility of engineers.

It is thus not surprising that the first European textbook on engineering ethics, Technology and Ethics (Goujon and Dubreuil 2001), the product of a team of researchers from ten European countries, adopted an approach different from that of US textbooks. This volume distinguishes three levels of analysis. The first deals with the microsocial level and concerns ethical problems encountered by individual engineers (dilemmas and cases of conscience). The second focuses on the mesosocial level, where the technical systems and institutions are in competition. A third emphasizes the macrosocial level and therefore technical development in general as a societal question.

Whereas the first US textbooks were often centered on a code of ethics for the profession—that is, on the roles, responsibilities, decisions, and attitudes of engineers individually confronted by ethical dilemmas—Technology and Ethics situated this dimension within a more comprehensive framework. To some extent, it made engineering ethics more complex by placing it within the institutional and social context in which engineers participate with other actors (scientists, entrepreneurs, end users, and others) in the development of technologies. At the same time, it strove to be more realistic and placed less emphasis on individual moral heroism as the best response to ethical problems.

In the Netherlands, the development of ethics in engineering education came from the joint initiative and strong support of several academic institutions with national scope. While courses

had been offered for more than a decade, the board of the Delft University of Technology (TU Delft) decided in 1995 that the latter stage of all curricula should include compulsory subjects dealing with the ethical aspect of technology, the natural sciences, and the engineering profession. Actually, the Netherlands has become the very place in Europe where engineering ethics could develop as an independent academic field of research and be recognized as an academic discipline with the creation of several full professorship positions. Recently, many research projects have been conducted within the fruitful 3TU Center for Ethics in Technology and Engineering, the largest European research center focusing on engineering ethics, created in 2007.

ENGINEERING ETHICS RESEARCH IN TWENTY- FIRST-CENTURY EUROPE

Since the early 2000s, engineering ethics has developed in Europe as a dynamic field of research that benefits from several international networks. One such network is a working group on ethics in engineering education (EiEE) established within the European Society for Engineering Education (Société Européenne pour la Formation des Ingénieurs, or SEFI) in 1998. Henk Zandvoort, from TU Delft, who chaired the group from 2001 to 2012, organized international workshops and edited several special issues of the European Journal of Engineering Education (2000, 2008) and Science and Engineering Ethics (2013).

Another network started with a European Socrates/ Erasmus project on interdisciplinarity in engineering and management education. In 2000, Steen Hyldgaard Christensen from Aarhus Herning University in Denmark began facilitating collaboration between engineers, social scientists, and humanists in a series of book projects. Christensen's Engineering in Context (2009), edited with Martin Meganck and Bernard Delahousse, was opened to North American scholars like Carl Mitcham, who had already collaborated with German scholars, and the French and Dutch groups from Lille and Delft.

Another network, this one linked to the development of the academic field of philosophy of technology and engineering, involves both European and non-European scholars. The network's first Workshop on Philosophy and Engineering (WPE), held in Delft in 2007, was the largest organized activity bringing together engineers and philosophers since the early 1990s. A second workshop was held in London in 2009, and a first forum was held in Golden, Colorado, the following year. The second forum, held at the University of the Chinese Academy of Science in Beijing in 2013, gathered members of the ex-Socrates

network. The fortieth SEFI conference, held in Louvain, Belgium, in 2013, included a special session at which members of the three networks gathered for the first time.

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