

THE GLOBAL VALIDITY OF ETHICS: APPLYING ETHICS TO ENGINEERING AND TECHNOLOGY DEVELOPMENT

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Abstract: Recently several attempts have been made to define and implement new codes of ethics in dealing with technology today and tomorrow. Thus the *global validity of Ethics* under the impact of new technologies has become visible as an issue widely discussed within engineering, philosophy and society. It requires increasingly the awareness of our own responsibility towards all humans as well as towards the natural environment and towards future generations. The issue has been taken up by the several groups of engineers, entrepreneurs and politics. Some examples of such strategic approaches towards ethics of technology will be described and discussed in this presentation. An earlier version of this paper was presented at the IFAC Multitrack Conference On Advanced Control Strategies For Social And Economic Systems, Sept. 2-4, 2004, Vienna University of Technology. *Copyright IFAC 2005*

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1 THE QUESTIONS OF ETHICS

ìThe Principles of a Global Ethic:

Our world is experiencing a fundamental crisis: A crisis in global economy, global ecology, and global politics. The lack of a grand vision, the tangle of unresolved problems, political paralysis, mediocre political leadership with little insight or foresight, and in general too little sense for the commonwealth are seen everywhere: Too many old answers to new challengesì (Declaration, 1993).

What is right or wrong to do? How do we decide about right or wrong? What is the *Ethics of our Actions*? These are the questions that come up when thinking about Ethics. In this presentation, we are

going to focus on *Technology Ethics* and its connection to business, in particular.

Not every situation from which we gain short term win, is sustainable with regard to interpersonal or intercultural settings. The questions of how to decide and how to act, are the questions of ethics. But not only philosophers have to take up the challenge answering them. It is the duty of every person him- or herself to consider and discuss processes of everyday decision finding, be it in engineering, entrepreneurship and business, science and research, university teaching or any other activity. (Rose, 2003)

The far aim is to develop a common frame of reference, a code of *universal ethics*. The ethical way of acting means: unlimited liability towards our actions in the broadest sense. It involves - without being complete - environmental consciousness, human-centredness in technology development and other fields of action; responsibility in our actions toward next generations, social responsibility; furthermore sustaining, growing and passing on civilisation and knowledge, accepting mistakes but striving towards excellence; freedom of actions, and accepting everybody as being equal.

2 THE HISTORY OF ETHICAL CODEX

2.1 *The Hippocratic Oath - classical version*

It is amazing how early humankind started to think about ethics. The first well-known written example which relates to ethics, dates back to Hippocrates. He created *the Ethical Code of Medicine* which has had a tremendous effect on medicine and science. By creating this set of principles, he turned medicine from a superstitious, magic activity - as it was believed to be in those times - into science. And by doing so he started a process which has led towards the wide acceptance of sciences.

̀I swear by Apollo Physician and Asclepius and Hygieia and Panacea and all the gods and goddesses, making them my witnesses, that I will fulfil according to my ability and judgement this oath and this covenant:

To hold him who has taught me this art as equal to my parents and to live my life in partnership with him, and if he is in need of money to give him a share of mine, and to regard his offsprings as equal to my brothers in male lineage and **to teach them this art - if they desire to learn it - without fee and covenant; to give a share of precepts and oral instruction and all the other learning to my sons and to the sons of him...**

I will neither give a deadly drug to anybody who asked for it, nor will I make a suggestion to this effect. Similarly I will not give to a woman an abortive remedy. Whatever houses I may visit, I will come **for the benefit of the sick**, remaining free of all intentional injustice, of all mischief and in particular of sexual relations with both female and male persons, **be they free or slaves.**

What I may see or hear in the course of the treatment or even outside of the treatment in regard to the life of men, which on **no account one must spread abroad**, I will keep to myself, holding such things shameful to be spoken about.

If I fulfil this oath and do not violate it, may it be granted to me to enjoy life and art, being honoured with fame among all men for all time to come; if I transgress it and swear falsely, may the opposite of all this be my lot.̀

In the following we will examine to what extent the Hippocratic Oath lives up to the ideas we have about ethics nowadays, as mentioned above:

̀to teach them this art - if they desire to learn it - without fee and covenant; to give a share of precepts and oral instruction and all the other learning to my sons and to the sons of him̀ This part relates to passing on civilisation and knowledge.

̀I will neither give a deadly drug to anybody who asked for it, nor will I make a suggestion to this effect. Similarly I will not give to a woman an abortive remedy.̀ It means: being responsible toward next generations, and human-centredness.

̀for the benefit of the sickÖ be they free or slaves.̀ Freedom of actions, and accepting everybody as being equal.

̀What I may see or hear in the course of the treatment Ö on no account one must spread abroad` Human rights, not giving out personal information which is very much in the centre of discussions nowadays.

̀If I fulfil this oath and do not violate it, may it be granted to me to enjoy life and art, being honoured with fame among all men for all time to come` Finally, this relates to maturity: in the sense of leadership, not to misuse any power we may have.

As we can see, Hippocrates was a real pioneer in the field of ethics, and many of his original thoughts are still followed nowadays. This document has laid the foundation of, and is still the basis of the current ethical code of medicine. Now, it is interesting to examine how did (or did not) ethical standards change in the course of the last 2000 years.

2.2 *The Hippocratic Oath - modern version*

The new and more modern version quoted here in abridged form, was written in 1964. The author was Louis Lasagna, Academic Dean of the School of Medicine at Tufts University, and it is used in many medical schools today.

̀I swear to fulfil, to the best of my ability and judgement, this covenant:

I will respect the hard-won scientific gains of those physicians in whose steps **I walk, and gladly share such knowledge as is mine with those who are to follow...** I will remember that there is art to medicine as well as science, and **that warmth, sympathy, and understanding may outweigh the surgeon's knife or the chemist's drug.**

I will not be ashamed to say "I know not," nor will I fail to call in my colleagues when the skills of another are needed for a patient's recovery.

I will respect the privacy of my patients, for their problems are not disclosed to me that the world may know. Most especially must I tread with care in matters of life and death. If it is given me to save a life, all thanks. But it may also be within my power to take a life; this awesome responsibility must be faced with great humbleness and awareness of my own frailty. Above all, I must not play at God.

I will remember that I do not treat a fever chart, a cancerous growth, but a sick human being, whose illness may affect the person's family and economic stability. My responsibility includes these related problems, if I am to care adequately for the sick. **I will remember that I remain a member of society, with special obligations to all my fellow human beings,** those sound of mind and body as well as the infirm.

When comparing the classical and modern versions, we note the following aspects:

Ì I walk, and gladly share such knowledge as is mine with those who are to follow.Î It is interesting to see the effect of the increased need for financial welfare, the idea of sharing knowledge has stayed on, but doing it ìwithout fee and covenantî is not in the text anymore! In the same time, the awareness of financial issues is also shown in the following quote:

Ì I do not treat a fever chart, a cancerous growth, but a sick human being, whose illness may affect the person's family and economic stabilityÎ .

Î Warmth, sympathy, and understanding may outweigh the surgeon's knife or the chemist's drugÎ : This part proves the increasing need for human-centredness.

Ì I will not be ashamed to say "I know not," nor will I fail to call in my colleagues when the skills of another are needed for a patient's recovery.Î This aspect of sharing knowledge and experiences among equals leads on to considering not only the medical profession but also the much wider question of ethics for all men and women who are responsible for others ñ as leaders. *Leaders* have specific responsibility to admit that they cannot know everything and do *not have to know* everything. Leaders as humans are allowed to make mistakes. It is not ethically acceptable, though, not to admit mistakes and not to learn from them, or to hide information, endangering the welfare of all when doing so (we may think of atomic disasters, as an example). The last part of this oath also relates to this aspect: ìI will remember that I remain a member of society, with special obligations to all my fellow human beingsî .

3 ENGINEERING ETHICS

3.1 *The Institution of Civil Engineers, U.K., 19th Century*

Being ourselves leaders in engineering and natural sciences, we briefly introduce the *engineering ethics* which was designed many centuries later. An example of what we may regard as a *Code of Ethics of Engineers*, is the poem which was found by the Quaker Edmund C Hambly in 1995, the youngest President the Institution of Civil Engineers had ever had. He struggled too hard, suffered a heart attack and died, half-way through his presidency. Only weeks before he did so, half-way across India, visiting a construction site in the middle of nowhere, as part of his presidential visit to meet engineers in India, he found this text on the wall of a site engineer's hut, (cited from Jim Platts: *Meaningful Manufacturing*, 2003):

Ì I take the vision which comes from dreams
and apply the magic of science and mathematics
adding the heritage of my profession
and my knowledge of Nature's materials
to create a design.

I organise the efforts and skills of my fellow workers
employing the capital of the thrifty
and the products of many industries,
and together we work toward our goal
undaunted by hazards and obstacles.
And when we have completed our task
all can see

that the dreams and plans have materialised
for the comfort and welfare of all.

I am an Engineer.

I serve mankind

By making dreams come true.Î

It is an ethical code of a total different profession than medicine, and it comes from a country with a totally different background. But it basically shares the same concerns as the Hippocratic Oath:

Ì Fellow workersÎ and ìtogether we work toward our goalÎ refers to the freedom of actions, being equal.

Ì I serve mankind (or rather: humankind) by making dreams come trueÎ: this idea involves growing civilisation, and human-centredness.

Ì For the comfort and welfare of allÎ goes very much in line with being socially responsible, including responsibility towards the next generations.

We are more and more realising nowadays that ìI serve humankind by making dreams come trueÎ has to be carefully considered: people have various kinds of needs which today's business and engineering world can easily satisfy, but *satisfying* such needs does not always contribute to *sustainability*. Thus it

is no longer enough for engineers to satisfy these needs, but they have to carefully think about the future impact of their inventions.

3.2 *The Association of Engineers, Germany, 20th Century*

Another example is the *Fundamentals of Engineering Ethics* suggested by the *Association of Engineers VDI*, Germany, in 2002. They offer to all engineers, as creators of technology, orientation and support as they face conflicting professional responsibilities. Some paragraphs from this document are following here:

Engineers carry both individual and shared responsibilities.

They are responsible for their professional actions: to the community, to political and societal institutions, to employers, customers, and technology users.

Engineers are aware of the societal, economic and ecological context: usability and safety, the welfare of the citizens, and the lives of the future generations.

In cases of conflicting values, engineers give priority:

to the values of humanity over the dynamics of engineering,

to issues of human rights over technology implementation and exploitation,

to public welfare over private interests, and

to safety and security over functionality and profitability of their technical solutions.

Engineers, however, are careful not to adopt such criteria or indicators in any dogmatic manner. They seek public dialogue in order to find acceptable balance and consensus concerning these conflicting values. (VDI, 2002)

Again we find in these quotations the same elements of striving for communication and co-operation among equal partners as in the previous documents. In particular the last paragraph deals explicitly with the issue of finding balance and consensus in the public dialogue – a serious indicator for changes of views within the engineering and science community. Here it is important to point to the individual and shared responsibilities, and the usability and safety issue, which are interrelated in terms of technology. As an example, in case of complex technology failure (like a space shuttle accident) it is hard to find out why the failure occurred: was it the material, the way it was put together, or human failure, or a combination of more factors. This is meant by the concept of *shared responsibilities*.

3.3 *The Memorandum Information and Communication*

The application of these concepts to *engineering action* is described in the following section of this paper as it was discussed during the World Engineers Convention, Hannover, Germany, 2000. This discussion led to the *Memorandum Information and Communication*.

Here some points are quoted from this memorandum:

Global versus Regional Development: Law and Governance

The main trend today is towards globalisation: all communications and transactions take place within world-wide dimensions. To make the world a really global world, however, we need to reconcile national laws at the international level as well as mechanisms to enforce them, without succumbing to any dominant perspective. Hence we need to contribute to more political control of technology-triggered developments through making more information available to all citizens.

Entrepreneurship on Different Scales: Economics and Business

Networking on the *global* – macro – scale is leading to both strong economic co-operation and mutual dependencies of large enterprises and countries. The liability and responsibility of global enterprises is no longer towards any specific country or people. There seems to be no control or governance possible through any single country. In parallel, *regions* are challenging traditional national politics by developing their own political momentum. We need to create awareness for, and adapt policy to the joint design and implementation of technological, political and organisational renewal.

Data Availability versus Data Security: Transportation and Processing of Data

Today, all information on the technological networks is available to everybody. But the misuse of the web and the breaking of data security are well known. Insufficient data reliability, trustworthiness and dependability are increasingly becoming a global problem. Data availability and data security are contradicting challenges on both the technical and organisational level. A new security culture needs to be developed concerning all developers and users.

The Ethics of Multimedia Information and Internet-based Action

The calling-up and exchanging of information and pictures have proved their importance and necessity in personal life as well as in many fields of research, business, politics etc.. There is, however, the freedom of storing and sending all those pictures which

symbolise the harmful or abusive side of human life (e.g. pornography, racism, violence and violent games etc.) It is unethical to transmit consciously and purposefully abusive, wrong and misleading information. Hence the individual responsibility of the engineer needs to be reinforced by a professional code (like the Hippocratic Oath). Furthermore we need to discuss the ethics of information and pictures in view of the *cultural pluralism* of countries, their different traditions and value systems while avoiding to establish any *one value system* across the world. (Memorandum, 2000)

The quotations demonstrate how engineers today are aware of the needs and challenges put forward by Ethics, and the claims for universal validity of values implemented in engineering. In each of the quotes, the attempts become visible to organize engineering activities as co-operative endeavours based on *communication and negotiation among equals*. The activities are meant to also include *society* on equal terms. We all know that such endeavours are only successful as far as the principles of this communication are taken seriously, and we all know how again and again these endeavours fail. Nevertheless the attempts are signals of attitude changes which in the long run may become common practice.

4 BUSINESS ETHICS TODAY

4.1 Russia today

Here follows an example from Russia, presented at the conference on *Business Ethics* in Saint-Petersburg, May 18-19, 2000, by Yelena Dotsenko, representative of the Consortium of Legal Information Codex:

- a) Regarding our staff: adherence to the corporate culture of business conduct; consideration for each individual employee's potential; fair compensation for work output; special benefits; creation of opportunities for professional growth etc.
- b) Regarding our customers: the prohibition of directly or indirectly misleading our customers with distorted information about product quality and the manipulation of independent research data.
- c) Regarding our competitors: the prohibition of receiving undue advantages over other legal systems market participants. Competition should be based on increased work quality and professionalism within legal regulations.
- d) Regarding our partners: the prohibition of violating the legal systems market stability and the legal rights and interests of other market participants. There should be no damage to the

interests of clients or other participants in this market. Trust, credibility and liability should be guaranteed. (Dotsenko, 2000)

It is a widely shared view in the world that Russia has not been performing well in the fields of ethics; the current trends seem to be positive, though. But it is interesting to see that the document is rather based on, and formulated in a way to state *what not to do*. This may mean that Russia is realizing the need to catch up first to the minimum standards, which proves a realistic, long-term approach.

4.2 Western business ethics

It is all very well for consultants to urge entrepreneurs to run business ethically. They don't have to live with the consequences. Do they even know the consequences?

In the course of our ethics considerations, we have run across some very provocative questions concerning ethics and its bottom line. Here are a few:

For Owners/Managers:

1. Can we afford to do business ethically? Won't we lose business to external competitors?
2. How do we ensure that our employees will follow the company's ethical policies?
3. How do we react to unethical behaviour on the part of employees?

For Employees:

1. Will our superiors back us if we choose to behave ethically?
2. What do we gain from ethical behaviour?
3. Will our co-workers (internal competitors) gain competitively if we decide to behave ethically?

These are difficult questions, and they must be answered to the satisfaction of both management and employees before any organization can do business ethically. We do not presume to know how to answer these questions. Yet we can assist in determining answers.

4.3 What about actions?

All theory gains impact only when it is put into practice. Frank Vogl, Senior Ethics Resource Center ÆRCÍ Fellow, came up with some suggestions how to realize ethical actions in the field of business: what are the core strategies needed for achieving it? According to him, corporations need to consider five sets of actions:

1. Learning a lot more about global business ethics.

2. Developing effective in-house corporate global business ethics strategies.
3. Creating internal corporate coalitions involving the corporate Ethics Office, Human Resources, Government Relations, Corporate Communications and Legal Department, to implement new global business ethics programs.
4. Securing dialogue with civil society groups in all the countries in which you operate.
5. Monitoring the impact of your new global business ethics strategies, and monitoring the rising expectations around the world of public expectations of corporate behaviour. (Vogl, 1998)

We cannot afford *not to do business ethically* if the organizational goal is long-term success. But again and again, in practice: the decisions of what is genuinely ethical behaviour, is extremely difficult to make and such decisions are difficult to justify. Here we are putting forward one example which we are going to enlarge on during the Congress: the transportation system. We all know we do need efficient means of transport and we want transportation to take place according to our *wishes and dreams* whether to transport ourselves, or any goods. But it has become obvious that to make such wishes and dreams become true in full, is in contradiction to the basic ethical principle of *protecting the environment*. All development paths of transportation engineering today would need to take into account its janus-faced impact on society and environment to be judged from this viewpoint (Savelsberg, 2005).

5 CONCLUSIONS: SUGGESTIONS BY THE EUROPEAN COMMISSION

Recently the European Commission has taken up the issue of Ethics to be discussed, and developed further across all European countries. Here follow two short quotations from their *Science and Society Action Plan* which symbolize the direction of thoughts in Europe although there is still a long way to go before these perspectives will be part of daily practice in engineering and business.

Put responsible science at the heart of policy making: Most policies have a scientific and technological dimension and decisions must be supported by transparent, responsible opinions based on ethical research. It is therefore necessary to strengthen the ethical basis of scientific and technological activities, to detect and assess the risks inherent in progress, and to manage them responsibly on the basis of past experience...

As recommended by the European Parliament, researchers, business circles, standard-setters and social players need to be encouraged to enter into a

public dialogue across Member States and the Candidate Countries on the new leading-edge technologies as soon as they begin to emerge. This will enable responsible choices to be made, supported by the appropriate policies and implemented at the right time. The European Group on Ethics has helped guide the Community policies on culturally sensitive ethical questions in science.

(The European Group on Ethics in Science and New Technologies is an independent, pluralist and multidisciplinary body which has been set up by the European Commission...)

Networks of ethical committees will be fostered at both national and local levels. The aim will be closer co-operation and a more effective exchange of experience and best practice. (European Commission, 2002, p 8 and p 21, 22)

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