

# Competent and Ethical Concerns of Human Beliefs

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**Abstract—** The increasing dependence on computers for critical infrastructures essential for the functioning of a society and its economy has given rise to host of ethical, social, and legal issues. The ability to make sound ethical decisions is thus an important part of Computing and Software engineer's professional skills. This paper argues for the significance of teaching professional, social and ethical issues in Software Engineering in a Swedish context and practice Today computers play an essential role in industry, commerce, government, research, education, medicine, communication systems, entertainment and many other areas of our society. Professionals who contribute to the design, development, analysis, specification, certification, maintenance and evaluation of the many different applications of computer systems have a significant impact on society, making thereby beneficial contributions to society, but also, possibly, some less positive

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## I. INTRODUCTION AND PROFESSIONAL PRACTICE

Engineering is an inherently risky activity. In order to underscore this fact and help in exploring its ethical implications, we suggest that engineering should be viewed Major technical disasters are extremely costly but fortunately happen rarely. The judgment made by an engineer about what risks are acceptable is to a high degree ethical one Professional activity during the design, development, and analysis; of computer systems have a significant real-world impact. To ensure that those efforts will be for the general good, professionals must commit to making Computing in general and Software Engineering in particular beneficial and respected professions, promoting an ethical approach to their professional an understanding of professional and ethical responsibility." ABET strongly encourages engineering schools to provide students with tools to make ethically prudent Guidelines for Undergraduate Degree Programs in Software Engineering indicate the importance of „understanding and appreciation of professional issues related to ethics and professional conduct, economics, and the societal needs." Further professionalism and ethics are recommended as a part of a subject Engineering Practice" in which students will gain ability to make appropriate decisions based on ethical codes and ethical principles, have

concerns for safety and security requirements, human and personal rights, be aware of and follow the laws and standards, and be able to understand the effects of engineering decisions on that. It is thus evident that professionalism and ethical concerns are important parts of any successful Computing and Software for engineering curriculum. However, they are still often overlooked and there is a lack of concrete advice and experience reported on how to incorporate to them in educational practice. This paper to address these shortcomings based on experiences Computer ethics might be defined as the analysis of the nature and social impact of computer technology and the corresponding formulation and justification of policies for the ethical use of such technology. (Moor, 1985) This sense of the word "ethics" is linked directly to the original sense of the Greek word ethos, which meant "customs", as did mores the Latin root of "morals". Ethical problems arise most often when there are differences of judgment or expectations about what constitutes the true state of affairs or a proper course of action. The engineer may be faced with contrary opinions from within the firm, from the client, from other firms within the industry, or from government. An individual makes ethical decisions, in his/her capacity as a member of different groups. In order to make ethical decisions, an engineer interacts in many directions and within many different contexts, each of which can show the actual situation in a different light. For example, solving the problem on the relation individual – colleagues – management could lead to certain choices, which e.g. do not necessarily coincide with the views of his/her own family or friends, or the clients, authorities, societies or other industries.

## II. EDUCATION PROFESSIONALISM & ETHICS

What is the point in studying engineering ethics? What can be gained from taking an ethics course? A professional ethics course is not about preaching virtue so that immoral and amoral students will adopt a certain established set of beliefs. Rather, it means to increase the ability of concerned engineers, managers and citizens, to first recognize and then responsibly confront moral issues raised by technological activity. The goal is to foster moral autonomy, i.e. the skill and habit of thinking rationally about ethical issues, as well as to improve the ability to think critically about moral matters. For the role of computer ethics in the Computer Science Curriculum see

Bynum T. W., 2004 and Moor J. H., 1985. So: why learn Ethics? Here are some reasons

Social context of Computing

- Intellectual property
- Privacy and civil liberties
- Social implications of the Internet
- Computer crime
- Philosophical foundations of Ethics

„Professional Ethics in Science“ as a part of the Computer Science and. A short overview of this course will be given along with our experiences of its impact on students and its relevance for the industry. We will complement this experience with information on PIFF, an on-going educational development project to develop web-based support for master theses in Software Engineering, and how ethical concerns are being addressed there.

### III. TYPICAL ISSUES OF COMPUTER AND SOFTWARE ENGINEERING ETHICS

According to Moor, Computer Ethics should be defined as the analysis of the nature and social impact of computer technology and the formulation and justification of policies for the ethical use of such technology [33]. The social importance of the computer as a revolutionary machine together with its specific features do give rise to new ethical problems and legitimize the introduction of the field of Computer Ethics. Following are unique malleable in that they can simulate any activity that can be characterized in terms of inputs, outputs, and connecting logical - conceptual knowledge of the world. For our epoch they are The Revolutionary Machine in the same sense as the steam engine was for the industrial era.

Speed and the simplicity of handling: Large amounts of data are easily manipulated (as if they are greased which is connected with ethical problems of privacy and security. Related are also Copyright issues. Images, text (including program code), films and music can be easily copied and used without attribution to the author or out of context. This causes the ongoing discussion about intellectual property.

Storage of huge amounts of data: The ease with which data are saved makes the use of surveillance, monitoring and spyware methods really easy from the technical point of view. a message anonymously like „spam“ for example. There is an ongoing ethical debate about the pros and cons of anonymity. Computer communication does not stop at national borders. What is considered legal in one country might be forbidden in another. Software development projects often include developers from several development ways and outsourcing trends in large engineering companies.

Computer networks make it easy for the user to come across information, even in cases of pornography, gambling, or sites with propaganda, super-station, or other disinformation which might be difficult to handle for certain groups of users. Power mediation Computing is still a well-educated-younger-male-dominated field. This domination can be seen as an inequity. The related ethical questions are the power distribution, equal opportunities, equity, fairness, justice and digital divide.

Ethical problems arise most often when there are differences of judgment or expectations about what constitutes the true state of affairs or a proper course of action. The engineer may be faced with contrary opinions from within the firm, from the client, from other firms within the industry, or from government. An individual makes ethical decisions in his/her capacity as a member of various groups. In order to make ethical decisions, an engineer interacts in many directions and within many different contexts, each of which can show the actual situation in a different light, see Figure 1. For example, solving the problem on the relation individual/colleagues/management could lead to certain choices, which e.g. do not necessarily coincide with the views of his/her own family or friends, or the clients, authorities, societies or other industries. When faced with ethical dilemmas, a professional must be able to make rational and well-justified decisions. Courses in

The growing importance of computers in modern society makes Computer Ethics essential both when it comes to the issues related to the safety, security, privacy, environmental impact, quality, and similar and also in the everyday use of computers which gives rise to numerous ethical dilemmas. The aim of ethics courses in science and engineering is to increase the ability of future professionals to recognize and solve ethical problems, to accept different ethical perspectives and ethical pluralism. It develops the skill and habit of thinking rationally about ethical issues and in that way prepares students for the challenges of their profession Our conclusion is that it is both necessary and possible to make Computer Ethics an integral part of computing curricula, which is the natural way to ensure its integration in the culture of the profession. Because of the fundamental impact computing has on our lives, it is necessary to integrate computing technology and human values in such a way that the technology protects and advances human values. How can we work to ensure that computing and software technology advances human values? One way to establish an integrated value system is based on acceptance of the code of ethics. Codes of Ethics express the consensus of the profession on ethical issues. At the same time they are a means of educating the general public about the ethical norms and values of the profession. An essential characteristic of a profession is therefore the need for its members to conform to its code of ethics. Professional societies in science and

engineering publish their ethical codes or guidelines to ethical codes of societies of professional engineers and scientists.

#### IV. WHY STUDY PROFESSIONAL ETHICS

To sum up, what is the point in studying Ethics for an engineer? One thing is sure: A Professional Ethics course is not about preaching virtue so that students will adopt a certain pre-established set of beliefs. Rather, it aims to increase the ability of students as future engineers and managers to first recognize and then responsibly confront moral issues raised by technological activity. The goal is to develop moral autonomy, i.e. the skill and habit of thinking rationally about ethical issues. For the role of computer ethics in the Computer Science Curriculum, see Bynum and Moor.

#### V. CONCLUSIONS

The aim of including ethics in science and engineering curricula is to increase the ability of future professionals to recognize and address ethical problems, to accept different ethical perspectives and allow for ethical pluralism. Ethics courses develop the skill and habit of thinking rationally about ethical issues and in that way prepare students for the Experiences from the Professional Ethics in Science and Engineering and related courses . An overall impression is that the course participants discovered a very important factor that influences their professional judgments and decision making, the engineering ethical aspect. With all the positive experiences we have, we are definitely intended to continue giving the courses in the future, convinced in their indispensability for educating future engineering professionals in general, and especially Software Engineering professionals, who are among those engineers who are going to meet the largest variety of professionals. One of the steps of establishing the culture of ethical thinking is through Master Thesis works done by students in Computing on specific Engineering Ethics issues as well.

#### VI. REFERENCES

- [1] <http://www.computer.org/education/cc2001/index.htm>
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