

1. Professional and ethical responsibility

Like other engineers, software engineers must accept that their job involves wider responsibilities than simply the application of technical skills. Their work is carried out within a legal and social framework. Software engineering is obviously bounded by local, national and international laws. Software engineers must behave in an ethical and morally responsible way if they are to be respected as professionals.

It goes without saying that engineers should uphold normal standards of honesty and integrity. They should not use their skills and abilities to behave in a dishonest way or in a way that will bring disrepute to the software engineering profession. However, there are areas where standards of acceptable behaviour are not bounded by laws but by the more tenuous notion of professional responsibility. Some of these are:

1. *Confidentiality* Engineers should normally respect the confidentiality of their employers or clients irrespective of whether or not a formal confidentiality agreement has been signed.
2. *Competence* Engineers should not misrepresent their level of competence. They should not knowingly accept work which is outwith their competence.
3. *Intellectual property rights* Engineers should be aware of local laws governing the use of intellectual property such as patents, copyright, etc. They should be careful to ensure that the intellectual property of employers and clients is protected.
4. *Computer misuse* Software engineers should not use their technical skills to misuse other people's computers. Computer misuse ranges from relatively trivial (game playing on an employer's machine, say) to extremely serious (dissemination of viruses).

In this respect, professional societies and institutions have an important role to play. Organisations such as the ACM, the IEEE (Institute of Electrical and Electronic Engineers) and the British Computer Society publish a code of professional conduct or code of ethics. Members of these organisations undertake to follow that code when they sign up for membership. These codes of conduct are generally concerned with fundamental ethical behaviour.

The ACM and the IEEE have cooperated to produce a joint code of ethics and professional practice. This code exists in both a short form, shown below, and a longer form (Gotterbarn, Miller et al., 1999) which adds detail and substance to the shorter version. The rationale behind this code is summarised in the first two paragraphs of the longer form:

Computers have a central and growing role in commerce, industry, government, medicine, education, entertainment and society at large. Software engineers are those who contribute by direct participation or by teaching, to the analysis, specification, design, development, certification, maintenance and testing of software systems. Because of their roles in developing software systems, software engineers have significant opportunities to do good or cause harm, to enable others to do good or cause harm, or to influence others to do good or cause harm. To ensure, as much as possible, that their efforts will be used for good, software engineers must commit

themselves to making software engineering a beneficial and respected profession. In accordance with that commitment, software engineers shall adhere to the following Code of Ethics and Professional Practice.

The Code contains eight Principles related to the behaviour of and decisions made by professional software engineers, including practitioners, educators, managers, supervisors and policy makers, as well as trainees and students of the profession. The Principles identify the ethically responsible relationships in which individuals, groups, and organizations participate and the primary obligations within these relationships. The Clauses of each Principle are illustrations of some of the obligations included in these relationships. These obligations are founded in the software engineer's humanity, in special care owed to people affected by the work of software engineers, and the unique elements of the practice of software engineering. The Code prescribes these as obligations of anyone claiming to be or aspiring to be a software engineer.

In any situation where different people have different views and objectives you are likely to be faced with ethical dilemmas. For example, if you disagree, in principle, with the policies of more senior management in the company, how should you react? Clearly, this depends on the particular individuals and the nature of the disagreement. Is it best to argue a case for your position from within the organisation or to resign in principle? If you feel that there are problems with a software project, when do you reveal these to management? If you discuss these while they are just a suspicion, you may be over-reacting to a situation; if you leave it too late, it may be impossible to resolve the difficulties.

Such ethical dilemmas face all of us in our professional lives and, fortunately, in most cases they are either relatively minor or can be resolved without too much difficulty. Where they cannot be resolved, the engineer is faced with, perhaps, another problem. The principled action may be to resign from their job but this may well affect others such as their partner or their children.

A particularly difficult situation for professional engineers arises when their employer acts in an unethical way. Say a company is responsible for developing a safety-critical system and because of time-pressure falsifies the safety validation records. Is the engineer's responsibility to maintain confidentiality or to alert the customer or publicise, in some way, that the delivered system may be unsafe?

The problem here is that there are no absolutes when it comes to safety. Although the system may not have been validated according to pre-defined criteria, these criteria may be too strict. The system may actually operate safely throughout its lifetime. It is also the case that, even when properly validated, the system may fail and cause an accident. Early disclosure of problems may result in damage to the employer and other employees; failure to disclose problems may result in damage to others.

Software Engineering Code of Ethics and Professional Practice

ACM/IEEE-CS Joint Task Force on Software Engineering Ethics and Professional Practices

PREAMBLE

The short version of the code summarizes aspirations at a high level of the abstraction; the clauses that are included in the full version give examples and details of how these aspirations change the way we act as software engineering professionals. Without the aspirations, the details can become legalistic and tedious; without the details, the aspirations can become high sounding but empty; together, the aspirations and the details form a cohesive code.

Software engineers shall commit themselves to making the analysis, specification, design, development, testing and maintenance of software a beneficial and respected profession. In accordance with their commitment to the health, safety and welfare of the public, software engineers shall adhere to the following Eight Principles:

1. **PUBLIC** - Software engineers shall act consistently with the public interest.
2. **CLIENT AND EMPLOYER** - Software engineers shall act in a manner that is in the best interests of their client and employer consistent with the public interest.
3. **PRODUCT** - Software engineers shall ensure that their products and related modifications meet the highest professional standards possible.
4. **JUDGMENT** - Software engineers shall maintain integrity and independence in their professional judgment.
5. **MANAGEMENT** - Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance.
6. **PROFESSION** - Software engineers shall advance the integrity and reputation of the profession consistent with the public interest.
7. **COLLEAGUES** - Software engineers shall be fair to and supportive of their colleagues.
8. **SELF** - Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession.

You must make up your own mind in these matters. In this case, the potential for damage, the extent of the damage and the people affected by the damage should influence the decision. If the situation is very dangerous, it may be justified to publicise it using the national press (say). However, you should always try to resolve the situation while respecting the rights of your employer.

Another ethical issue is participation in the development of military and nuclear systems. Some people feel strongly about these issues and do not wish to participate in any systems development associated with military systems. Others will work on military systems but not on weapons systems. Yet others feel that national defence is an overriding principle and have no ethical objections to working on weapons systems. The appropriate ethical position here depends entirely on the views of the individuals who are involved.

In this situation it is important that both employers and employees should make their views known to each other in advance. Where an organisation is involved in military or nuclear work, they should be able to specify that employees must be willing to accept any work assignment. Equally, if an employee is taken on and makes clear that they do not wish to work on such systems, employers should not put pressure on them to do so at some later date.