

Ethics and Computing

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Chapter 3

Professional Codes of Ethics

These standards expand on the Code of Ethics by providing specific statements of behavior in support of each element of the Code. They are not objectives to be strived for, they are rules that no true professional will violate.

— from the *AITP Standards of Conduct*

Commitment to ethical professional conduct is expected of every voting, associate, and student member of the ACM. This Code, consisting of 24 imperatives formulated as statements of personal responsibility, identifies the elements of such a commitment. ...

— preamble to the *ACM Code of Ethics*

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 ...

— preamble to the *IEEE-CS/ACM Software Engineering Codes of Ethics*

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to conduct of the highest ethical and professional manner

— preamble to the *IEEE Code of Ethics*

3.1 Introduction

Some students react with surprise when told that there is even one published code of ethics for the computing disciplines. In fact, almost every professional organization dealing with the field of computing has published its own code of ethics. Influential organizations for computing professionals include the Association of Information Technology Professionals (AITP), the Association for Computing Machinery (ACM) and the Computer Society of the Institute of Electrical and Electronics Engineers (IEEE-CS). Each of these organizations

(AITP, ACM and IEEE) has its own code of ethics. In addition, the ACM and the IEEE-CS jointly sponsor a code of ethics for software engineers. In this chapter, we will examine all four of these codes.

A variety of other professional organizations have published codes of ethics that are potentially relevant. Among these are the National Society of Professional Engineers (NSPE), and the Computer Ethics Institute. The NSPE code is reprinted in Appendix B, because it contains some interesting points of contrast to the other codes.

As you study the codes of ethics presented in this chapter, it will become apparent that a code of ethics is a vehicle for promoting a variety of purposes and goals. Luegenbiehl identifies 12 functions that a professional code of ethics might serve [4]. I summarize these functions here as follows.

1. *Symbolize professionalism.* The fact that a group has its own code of ethics suggests that the group views itself as constituting a profession and that it wishes to be viewed in this way by the public. All four codes have some element of this purpose in them.
2. *Protect group interests.* A code of ethics can also act to promote the economic interests of the group. The Software Engineering code has an element of this in the clause where it states that software engineering managers and leaders should “offer fair and just remuneration.”
3. *Specify membership etiquette.* A code of ethics may also specify standards of professional courtesy, saying how members should treat each other. There is an element of this in each of the codes, but it does not seem to be a large factor.
4. *Inspire good conduct.* The code of ethics for a group may serve to inspire members toward high standards of conduct. There is certainly an element of this in each of the codes, as evidenced by mention of service to the public, responsibility to clients, and other such phrases.
5. *Educate members.* Each of the codes serves some degree of an educational purpose just by its existence. The circulation of a code of ethics naturally serves to teach current members and students about the accepted practices and standards of the profession.

The ACM code has been published with a set of brief hypothetical case studies that help illustrate how to use the code in making decisions about specific situations. These case studies appear as a reprint at the end of this chapter. This sort of elaboration on the practical meaning of the code seems valuable and possibly should be done in a more comprehensive manner. For example, the American Psychological Association publishes case histories of actual allegations of code violations, important facts determined by a subsequent investigation, and the conclusion reached [2].

6. *Discipline members.* A code of ethics can also be a basis for disciplinary mechanisms. Of the four codes, this purpose is most clear in the IEEE code. An element of this purpose is also evident in the ACM code and the Software Engineering code.
7. *Foster external relations.* Each of the four codes offers some guidance on how members of the profession should relate to clients and others outside the profession.
8. *Enumerate principles.* Each of the codes attempts, to some extent, to enumerate general moral principles that members should respect. For example, the admonition

to “reject bribery in all of its forms” (item 4 of the IEEE code) is a statement of general moral principle. Also, one element of the AITP code is “I have an obligation to my country, therefore, in my personal, business and social contacts, I shall uphold my nation and shall honor the chosen way of life of my fellow citizens.”

9. *Express ideals.* Each of the three codes also has in it some element of expressing ideals that each member should aspire to. The distinction between a principle and an ideal can be a fine one. A *principle* is imagined to be something that you could in fact keep to. An *ideal*, on the other hand, is more of a goal that may not always be possible. The admonition “to avoid real or perceived conflicts of interest” sounds like a general moral principle, but it is not always possible to achieve it. A conflict may be missed because “perceived” depends in part on who is doing the perceiving. So this admonition is followed by the qualifier “whenever possible” in item 2 of the IEEE code.
10. *Put forth rules.* Rules are much the same as principles, but are meant to address more specific and concrete situations. If “reject bribery in all of its forms” is a general principle, then “when awarding a contract, you may accept no gifts with a total value of more than \$50 from any entity competing for the contract” would be a specific rule meant to clarify the meaning of the general principle as applied to a certain situation.
11. *Offer guidelines.* Guidelines are, practically speaking, much the same as rules. A set of “rules” may tend to imply that these are all the do-s and don’t-s that you need to worry about. On the other hand, labeling them as guidelines may give more of the feeling that this is not an exhaustive list of do-s and don’t-s and that there may be gray areas that require careful interpretation.
12. *Codify rights.* A code of ethics may also serve to enumerate the rights of members as well as their responsibilities.

As you read through the codes of ethics in the next sections, keep in mind the 12 functions just described. Note things that the codes have in common, things that might represent a conflict among them, and things that seem somehow incomplete, incorrect, or just plain inappropriate.

3.2 The AITP code of ethics and standards of conduct

The AITP code of ethics really comes in two parts. The more general of these is labeled the “code of ethics.” A more detailed and specific list of guidelines is termed the “standards of conduct.” These were updated in August and October of 1997, respectively. The code of ethics is presented as a set of seven obligations that are acknowledged by members of AITP.

Code of Ethics

I acknowledge:

That I have an obligation to management, therefore, I shall promote the understanding of information processing methods and procedures to management using every resource at my command.

That I have an obligation to my fellow members, therefore, I shall uphold the high ideals of AITP as outlined in the Association Bylaws. Further, I shall cooperate with my fellow members and shall treat them with honesty and respect at all times.

That I have an obligation to society and will participate to the best of my ability in the dissemination of knowledge pertaining to the general development and understanding of information processing. Further, I shall not use knowledge of a confidential nature to further my personal interest, nor shall I violate the privacy and confidentiality of information entrusted to me or to which I may gain access.

That I have an obligation to my College or University, therefore, I shall uphold its ethical and moral principles.

That I have an obligation to my employer whose trust I hold, therefore, I shall endeavor to discharge this obligation to the best of my ability, to guard my employer’s interests, and to advise him or her wisely and honestly.

That I have an obligation to my country, therefore, in my personal, business, and social contacts, I shall uphold my nation and shall honor the chosen way of life of my fellow citizens.

I accept these obligations as a personal responsibility and as a member of this Association. I shall actively discharge these obligations and I dedicate myself to that end.

The AITP code of ethics is supplemented by a statement of standards of conduct. Sections of the standards of conduct relate to the professional’s obligations to management, fellow professionals, society and employer. Each section consists of six to eight specific obligations.

Standards of Conduct

These standards expand on the Code of Ethics by providing specific statements of behavior in support of each element of the Code. They are not objectives to be strived for, they are rules that no true professional will violate. It is first of all expected that an information processing professional will abide by the appropriate laws of their country and community. The following standards address tenets that apply to the profession.

In recognition of my obligation to management I shall:

- Keep my personal knowledge up-to-date and insure that proper expertise is available when needed.
- Share my knowledge with others and present factual and objective information to management to the best of my ability.
- Accept full responsibility for work that I perform.
- Not misuse the authority entrusted to me.
- Not misrepresent or withhold information concerning the capabilities of equipment, software or systems.
- Not take advantage of the lack of knowledge or inexperience on the part of others.

In recognition of my obligation to my fellow members and the profession I shall:

- Be honest in all my professional relationships.
- Take appropriate action in regard to any illegal or unethical practices that come to my attention. However, I will bring charges against any person only when I have reasonable basis for believing in the truth of the allegations and without any regard to personal interest.
- Endeavor to share my special knowledge.
- Cooperate with others in achieving understanding and in identifying problems.
- Not use or take credit for the work of others without specific acknowledgment and authorization.
- Not take advantage of the lack of knowledge or inexperience on the part of others for personal gain.

In recognition of my obligation to society I shall:

- Protect the privacy and confidentiality of all information entrusted to me.
- Use my skill and knowledge to inform the public in all areas of my expertise.
- To the best of my ability, insure that the products of my work are used in a socially responsible way.
- Support, respect, and abide by the appropriate local, state, provincial, and federal laws.
- Never misrepresent or withhold information that is germane to a problem or situation of public concern nor will I allow any such known information to remain unchallenged.
- Not use knowledge of a confidential or personal nature in any unauthorized manner or to achieve personal gain.

In recognition of my obligation to my employer I shall:

- Make every effort to ensure that I have the most current knowledge and that the proper expertise is available when needed.
- Avoid conflict of interest and insure that my employer is aware of any potential conflicts.

- Present a fair, honest, and objective viewpoint.
- Protect the proper interests of my employer at all times.
- Protect the privacy and confidentiality of all information entrusted to me.
- Not misrepresent or withhold information that is germane to the situation.
- Not attempt to use the resources of my employer for personal gain or for any purpose without proper approval.
- Not exploit the weakness of a computer system for personal gain or personal satisfaction.

Clearly, the obligations listed in the AITP code of ethics are meant to be general statements that set up an ethical framework for AITP members. You can view the obligations in the code as enumerating the typical stake-holders in generic information technology situations: management, fellow professionals, society, university / employer, country and self. The standards of conduct expand on the general statements in the code to give more detail about the relationship to management, fellow professionals, society and employer.

Probably the main elements of the AITP code that stand out as different are the “obligation to school or university” and the “obligation to country.” I believe that the statement of “obligation to school or university” is best read simply as trying to be inclusive of students as members of AITP. If the code mentioned only an obligation to employer, it might seem as if student members were left out. At one level, the obligation to country seems very reasonable. However, this item could clearly lead to conflicts as IT professionals in some other countries try to conform to the code. For example, the federal government in some countries might have a policy toward eavesdropping on computer communications that IT professionals would see as conflicting with privacy and confidentiality obligations. Overall, the content of the AITP code and standards is reasonably comprehensive and, as we shall see, largely similar to that in the other codes.

3.3 The ACM code of ethics

In 1992, the ACM adopted a new code of ethics and professional conduct with supplemental explanations and guidelines. The ACM code of ethics consists of eight general moral imperatives, eight specific professional responsibilities, six organizational leadership imperatives, and two elements for compliance. Appendix B contains the complete code with explanations and guidelines. Here we present just the statement of the basic items of the code.

1. General Moral Imperatives. As an ACM member I will...
 - 1.1 Contribute to society and human well-being.
 - 1.2 Avoid harm to others.
 - 1.3 Be honest and trustworthy.
 - 1.4 Be fair and take action not to discriminate.
 - 1.5 Honor property rights including copyrights and patents.
 - 1.6 Give proper credit for intellectual property.
 - 1.7 Respect the privacy of others.

- 1.8 Honor confidentiality.
- 2. More Specific Professional Responsibilities. As an ACM computing professional I will...
 - 2.1 Strive to achieve the highest quality in both the process and products of professional work.
 - 2.2 Acquire and maintain professional competence.
 - 2.3 Know and respect existing laws pertaining to professional work.
 - 2.4 Accept and provide appropriate professional review.
 - 2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.
 - 2.6 Honor contracts, agreements, and assigned responsibilities.
 - 2.7 Improve public understanding of computing and its consequences.
 - 2.8 Access computing and communication resources only when authorized to do so.
- 3. Organizational Leadership Imperatives. As an ACM member and an organizational leader, I will...
 - 3.1 Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities.
 - 3.2 Manage personnel and resources to design and build information systems that enhance the quality, effectiveness and dignity of working life.
 - 3.3 Acknowledge and support proper and authorized uses of an organization's computing and communications resources.
 - 3.4 Ensure that users and those who will be affected by a computing system have their needs clearly articulated during the assessment and design of requirements. Later the system must be validated to meet requirements.
 - 3.5 Articulate and support policies that protect the dignity of users and others affected by a computing system.
 - 3.6 Create opportunities for members of the organization to learn the principles and limitations of computer systems.
- 4. Compliance with the Code. As an ACM member, I will...
 - 4.1 Uphold and promote the principles of this code.
 - 4.2 Treat violations of this code as inconsistent with membership in the ACM.

A large degree of content overlap in the AITP code/standards and the ACM code should be readily apparent. For example, the themes in the ACM general moral imperatives 1.1, 1.2 and 1.7 appear in the AITP code's obligation to society. The theme of ACM general moral imperative 1.6 appears in the AITP standards of conduct in relation to fellow professionals. The themes of ACM Specific Professional Responsibilities 2.3, 2.5 and 2.7 appear in the AITP standards of conduct in relation to society. You can easily identify a number of other strong similarities.

For the moment it may be more interesting to consider things that seem to be different between the ACM code and the AITP code / standards. The AITP standards of conduct contain explicit statements against several methods of unfair personal gain: "Not take advantage of the lack of knowledge or inexperience on the part of others ...," "Not use knowledge of a confidential or personal nature ...," "Not attempt to use the resources of my employer ...," and "Not exploit the weakness of a computer system ...". This theme does

not appear so strongly in the ACM code. On the other hand the ACM code contains the statement “Be fair and take action not to discriminate.” This theme does not appear so explicitly in the AITP code or standards.

3.4 The Software Engineering code of ethics

The Software Engineering code of ethics begins with a “short version” overview of the eight general ethical principles. The eight principles represent different areas of concern for the software engineer: public, employer, product, judgment, management, profession, colleagues and self. The short version is followed with a “full version” in which each of the eight general ethical principles is elaborated upon by six to thirteen more specific obligations. The text of the full version appears below, and the complete text of both versions is reprinted in Appendix B.

Preamble.

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 behavior 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 in 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.

It is not intended that the individual parts of the Code be used in isolation to justify errors of omission or commission. The list of Principles and Clauses is not exhaustive. The Clauses should not be read as separating the acceptable from the unacceptable in professional conduct in all practical situations. The Code is not a simple ethical algorithm that generates ethical decisions. In some situations, standards may be in tension with each other or with standards from other sources. These situations require the software engineer to use ethical judgment to act in a manner which is most consistent with the spirit of the Code of Ethics and Professional Practice, given the circumstances.

Ethical tensions can best be addressed by thoughtful consideration of fundamental principles, rather than blind reliance on detailed regulations. These Principles should

influence software engineers to consider broadly who is affected by their work; to examine if they and their colleagues are treating other human beings with due respect; to consider how the public, if reasonably well informed, would view their decisions; to analyze how the least empowered will be affected by their decisions; and to consider whether their acts would be judged worthy of the ideal professional working as a software engineer. In all these judgments concern for the health, safety and welfare of the public is primary; that is, the “Public Interest” is central to this Code.

The dynamic and demanding context of software engineering requires a code that is adaptable and relevant to new situations as they occur. However, even in this generality, the Code provides support for software engineers and managers of software engineers who need to take positive action in a specific case by documenting the ethical stance of the profession. The Code provides an ethical foundation to which individuals within teams and the team as a whole can appeal. The Code helps to define those actions that are ethically improper to request of a software engineer or teams of software engineers.

The Code is not simply for adjudicating the nature of questionable acts; it also has an important educational function. As this Code expresses the consensus of the profession on ethical issues, it is a means to educate both the public and aspiring professionals about the ethical obligations of all software engineers.

Principles.

1. Public.

Software engineers shall act consistently with the public interest. In particular, software engineers shall, as appropriate:

- 1.1 Accept full responsibility for their own work.
- 1.2 Moderate the interests of the software engineer, the employer, the client and the users with the public good.
- 1.3 Approve software only if they have a well-founded belief that it is safe, meets specifications, passes appropriate tests, and does not diminish quality of life, diminish privacy or harm the environment. The ultimate effect of the work should be to the public good.
- 1.4 Disclose to appropriate persons or authorities any actual or potential danger to the user, the public, or the environment, that they reasonably believe to be associated with software or related documents.
- 1.5 Cooperate in efforts to address matters of grave public concern caused by software, its installation, maintenance, support or documentation.
- 1.6 Be fair and avoid deception in all statements, particularly public ones, concerning software or related documents, methods and tools.
- 1.7 Consider issues of physical disabilities, allocation of resources, economic disadvantage and other factors that can diminish access to the benefits of software.
- 1.8 Be encouraged to volunteer professional skills to good causes and to contribute to public education concerning the discipline.

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. In particular, software engineers shall, as appropriate:

- 2.1 Provide service in their areas of competence, being honest and forthright about any limitations of their experience and education.
- 2.2 Not knowingly use software that is obtained or retained either illegally or unethically.
- 2.3 Use the property of a client or employer only in ways properly authorized, and with the client's or employer's knowledge and consent.
- 2.4 Ensure that any document upon which they rely has been approved, when required, by someone authorized to approve it.
- 2.5 Keep private any confidential information gained in their professional work, where such confidentiality is consistent with the public interest and consistent with the law.
- 2.6 Identify, document, collect evidence and report to the client or the employer promptly if, in their opinion, a project is likely to fail, to prove too expensive, to violate intellectual property law, or otherwise to be problematic.
- 2.7 Identify, document, and report significant issues of social concern, of which they are aware, in software or related documents, to the employer or the client.
- 2.8 Accept no outside work detrimental to the work they perform for their primary employer.
- 2.9 Promote no interest adverse to their employer or client, unless a higher ethical concern is being compromised; in that case, inform the employer or another appropriate authority of the ethical concern.

3. Product.

Software engineers shall ensure that their products and related modifications meet the highest professional standards possible. In particular, software engineers shall, as appropriate:

- 3.1 Strive for high quality, acceptable cost, and a reasonable schedule, ensuring significant tradeoffs are clear to and accepted by the employer and the client, and are available for consideration by the user and the public.
- 3.2 Ensure proper and achievable goals and objectives for any project on which they work or propose.
- 3.3 Identify, define and address ethical, economic, cultural, legal and environmental issues related to work projects.
- 3.4 Ensure that they are qualified for any project on which they work or propose to work, by an appropriate combination of education, training, and experience.
- 3.5 Ensure that an appropriate method is used for any project on which they work or propose to work.
- 3.6 Work to follow professional standards, when available, that are most appropriate for the task at hand, departing from these only when ethically or technically justified.
- 3.7 Strive to fully understand the specifications for software on which they work.
- 3.8 Ensure that specifications for software on which they work have been well documented, satisfy the users requirements and have the appropriate approvals.
- 3.9 Ensure realistic quantitative estimates of cost, scheduling, personnel, quality

and outcomes on any project on which they work or propose to work and provide an uncertainty assessment of these estimates.

- 3.10 Ensure adequate testing, debugging, and review of software and related documents on which they work.
- 3.11 Ensure adequate documentation, including significant problems discovered and solutions adopted, for any project on which they work.
- 3.12 Work to develop software and related documents that respect the privacy of those who will be affected by that software.
- 3.13 Be careful to use only accurate data derived by ethical and lawful means, and use it only in ways properly authorized.
- 3.14 Maintain the integrity of data, being sensitive to outdated or flawed occurrences.
- 3.15 Treat all forms of software maintenance with the same professionalism as new development.

4. Judgment.

Software engineers shall maintain integrity and independence in their professional judgment. In particular, software engineers shall, as appropriate:

- 4.1 Temper all technical judgments by the need to support and maintain human values.
- 4.2 Only endorse documents either prepared under their supervision or within their areas of competence and with which they are in agreement.
- 4.3 Maintain professional objectivity with respect to any software or related documents they are asked to evaluate.
- 4.4 Not engage in deceptive financial practices such as bribery, double billing, or other improper financial practices.
- 4.5 Disclose to all concerned parties those conflicts of interest that cannot reasonably be avoided or escaped.
- 4.6 Refuse to participate, as members or advisors, in a private, governmental or professional body concerned with software related issues, in which they, their employers or their clients have undisclosed potential conflicts of interest.

5. Management.

Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance. In particular, those managing or leading software engineers shall, as appropriate:

- 5.1 Ensure good management for any project on which they work, including effective procedures for promotion of quality and reduction of risk.
- 5.2 Ensure that software engineers are informed of standards before being held to them.
- 5.3 Ensure that software engineers know the employer's policies and procedures for protecting passwords, files and information that is confidential to the employer or confidential to others.
- 5.4 Assign work only after taking into account appropriate contributions of education and experience tempered with a desire to further that education and experience.
- 5.5 Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work, and provide an uncertainty assessment of these estimates.

- 5.6 Attract potential software engineers only by full and accurate description of the conditions of employment.
 - 5.7 Offer fair and just remuneration.
 - 5.8 Not unjustly prevent someone from taking a position for which that person is suitably qualified.
 - 5.9 Ensure that there is a fair agreement concerning ownership of any software, processes, research, writing, or other intellectual property to which a software engineer has contributed.
 - 5.10 Provide for due process in hearing charges of violation of an employer's policy or of this Code.
 - 5.11 Not ask a software engineer to do anything inconsistent with this Code.
 - 5.12 Not punish anyone for expressing ethical concerns about a project.
6. Profession.
- Software engineers shall advance the integrity and reputation of the profession consistent with the public interest. In particular, software engineers shall, as appropriate:
- 6.1 Help develop an organizational environment favorable to acting ethically.
 - 6.2 Promote public knowledge of software engineering.
 - 6.3 Extend software engineering knowledge by appropriate participation in professional organizations, meetings and publications.
 - 6.4 Support, as members of a profession, other software engineers striving to follow this Code.
 - 6.5 Not promote their own interest at the expense of the profession, client or employer.
 - 6.6 Obey all laws governing their work, unless, in exceptional circumstances, such compliance is inconsistent with the public interest.
 - 6.7 Be accurate in stating the characteristics of software on which they work, avoiding not only false claims but also claims that might reasonably be supposed to be speculative, vacuous, deceptive, misleading, or doubtful.
 - 6.8 Take responsibility for detecting, correcting, and reporting errors in software and associated documents on which they work.
 - 6.9 Ensure that clients, employers, and supervisors know of the software engineer's commitment to this Code of ethics, and the subsequent ramifications of such commitment.
 - 6.10 Avoid associations with businesses and organizations which are in conflict with this code.
 - 6.11 Recognize that violations of this Code are inconsistent with being a professional software engineer.
 - 6.12 Express concerns to the people involved when significant violations of this Code are detected unless this is impossible, counter-productive, or dangerous.
 - 6.13 Report significant violations of this Code to appropriate authorities when it is clear that consultation with people involved in these significant violations is impossible, counter-productive or dangerous.
7. Colleagues.
- Software engineers shall be fair to and supportive of their colleagues. In particular, software engineers shall, as appropriate:
- 7.1 Encourage colleagues to adhere to this Code.

- 7.2 Assist colleagues in professional development.
 - 7.3 Credit fully the work of others and refrain from taking undue credit.
 - 7.4 Review the work of others in an objective, candid, and properly-documented way.
 - 7.5 Give a fair hearing to the opinions, concerns, or complaints of a colleague.
 - 7.6 Assist colleagues in being fully aware of current standard work practices including policies and procedures for protecting passwords, files and other confidential information, and security measures in general.
 - 7.7 Not unfairly intervene in the career of any colleague; however, concern for the employer, the client or public interest may compel software engineers, in good faith, to question the competence of a colleague.
 - 7.8 In situations outside of their own areas of competence, call upon the opinions of other professionals who have competence in that area.
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. In particular, software engineers shall continually endeavor to:
- 8.1 Further their knowledge of developments in the analysis, specification, design, development, maintenance and testing of software and related documents, together with the management of the development process.
 - 8.2 Improve their ability to create safe, reliable, and useful quality software at reasonable cost and within a reasonable time.
 - 8.3 Improve their ability to produce accurate, informative, and well-written documentation.
 - 8.4 Improve their understanding of the software and related documents on which they work and of the environment in which they will be used.
 - 8.5 Improve their knowledge of relevant standards and the law governing the software and related documents on which they work.
 - 8.6 Improve their knowledge of this Code, its interpretation, and its application to their work.
 - 8.7 Not give unfair treatment to anyone because of any irrelevant prejudices.
 - 8.8 Not influence others to undertake any action that involves a breach of this Code.
 - 8.9 Recognize that personal violations of this Code are inconsistent with being a professional software engineer.

This code seems easily the longest and most detailed of those presented in this chapter. The eight main Principles in the code are at a level similar to the Specific Professional Responsibilities in the ACM code or the standards of conduct in the AITP code, but each Principle in the Software Engineering code is accompanied by six to thirteen Clauses that elaborate on specific points. However, in the long version of the ACM code (see Appendix B), each item is accompanied by a paragraph of text which gives additional explanation. Including this additional text would make the ACM code similar in length to the Software Engineering code.

Now that you have read the AITP, ACM and Software Engineering codes, a number of common themes should be clear. Some likely could have been anticipated before reading any of the codes; for example, duty to society. Others may be somewhat surprising; for

example, commitment to continuing education or lifelong learning. This appears in the AITP standards under obligations to employer, in the ACM code as Specific Professional Responsibility 2.2 and in the Software Engineering code under Principle 8. Clearly the profession expects that you will continue to learn throughout your career.

The Software Engineering code also contains some other interesting points. Clause 1 of Principle 2 states – “Provide services in their areas of competence, being forthright about any limitations of their experience and education.” On a related theme, Clause 4 of Principle 3 states – “Ensure that they are qualified for any project on which the work or propose to work, by an appropriate combination of education, training and experience.” If taken seriously, these clauses may well suggest that software engineers specialize in certain types of applications and should not move arbitrarily between areas.

Clause 7 of Principle 6 of the Software Engineering code states – “Be accurate in stating the characteristics of software on which they work, avoiding not only false claims but also claims that might reasonably be supposed to be speculative, vacuous, deceptive, misleading or doubtful.” Similar sentiments appear in the AITP and ACM codes. Imagine how this would change advertising about software!

3.4.1 Software engineering as a licensed profession

The approval of the Software Engineering Code of Ethics is the first in a sequence of steps that lead to “Software Engineering” being a licensed and regulated profession. It became clear that software engineering was destined to be a licensed profession when, in recent years, individual state governments moved toward licensing of software engineers. The worksheet at the end of this chapter dealing with the development of the Software Engineering code mentions the state of Texas as one example. Some people who currently practice (unlicensed, unregulated) software engineering feel that the introduction of licensing for software engineers will have no net beneficial effect on society. However, I tend to agree with those who feel that licensing is inevitable. And, licensing that is driven by the existing professional organizations is far preferable to licensing driven by state legislatures without input from the professional organizations.

The Software Engineering Code of Ethics clearly anticipates the introduction of licensing. Note the wording in the Preamble – “The Clauses of each Principle are illustrations of some of the obligations ... The Code prescribes these as obligations of anyone claiming to be or aspiring to be a software engineer.” This sounds as if the code is meant to apply to anyone who would want to use the title “software engineer.” Note also the wording in Principle 1 – “Approve software only if they have a well-founded belief that it is safe, meets specifications, passes appropriate tests,” This anticipates that licensed software engineers would have to approve specific elements of a software engineering project.

With IEEE-CS and ACM backing of the Software Engineering code, it is almost certain to be the code of ethics that applies to licensed software engineers. When will licensing of software engineers become a reality? This is a difficult question. This type of professional licensing is typically done individually by each state, and so it may be introduced at different times in different states. Licensing is likely to be introduced, at least for software engineers engaged in safety-critical applications, in major states within the next five years.

3.5 The IEEE code of ethics

The *IEEE Code of Ethics* as set forth in the *IEEE Policy & Procedures Manual*, [3] consists of 10 points, with no amplification or supplemental guidelines. Appendix B contains other sections of the manual with additional information related to ethical issues and IEEE policies, for those interested in examining the IEEE's position on these issues. The IEEE Code of Ethics is as follows.

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to conduct of the highest ethical and professional manner and agree:

1. to accept responsibility in making engineering decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all of its forms;
5. to improve understanding of technology; its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

The IEEE code is by far the shortest of the ones we have considered. Even so, at a general level it covers much of the ground covered in the other codes. The IEEE is concerned with a number of engineering disciplines other than computing. As you might expect from this, one "problem" with the IEEE code in relation to computing professionals is the lack of computing-specific content. For example, there is nothing like the ACM code's statement to "access computing and communication resources only when authorized to do so." Nor is there anything like the AITP standard of conduct to "Protect the privacy and confidentiality of all information entrusted to me." And of course there is nothing so specific as the Software Engineering code's statement to "Treat all forms of software maintenance with the same professionalism as new development."

3.6 Points of contrast between codes

One way to gain perspective on the codes we have examined is to consider how they differ from codes in other professions. I selected two codes from other large and well-known professions. The American Medical Association's *Principles of Medical Ethics* has a long history, originating in the time of Hippocrates, a Greek physician in 377 BC [1]. The current code consists of seven basic principles and another six fundamental elements of the patient-physician relationship. The American Psychological Association's *Ethical Principles of Psychologists* [2] consists of 10 multi-part principles. The following five points are worth examining for contrasts between the various codes of ethics.

1. Implied limits to non-discrimination?

General moral imperative 4 of the ACM code states “be fair and take action not to discriminate” and amplifies this (see Appendix B) with “discrimination on the basis of race, sex, religion, age, disability, national origin, or other such factors is an explicit violation of ACM policy and will not be tolerated.” Item 8 of the IEEE code states “to treat fairly all persons regardless of such factors as race, religion, gender, disability, age or national origin.” Clause 7 of Principle 8 of the Software Engineering code states – “Not give unfair treatment to anyone because of irrelevant prejudices.”

Compare these with Part B of Principle 3 in the APA code of ethics – “As employees or employers, psychologists do not engage in or condone practices that are inhumane or that result in illegal or unjustifiable actions. Such practices include, but are not limited to, those based on considerations of race, handicap, age, gender, sexual preference, religion, or national origin in hiring, promotion or training.” The difference in wording is small but clear. The APA wording includes the phrase “sexual preference.” The codes we have examined do not include any similar explicit phrase. The IEEE code gives a list of categories for non-discrimination, but does include anything that might be interpreted to include “sexual preference.” The “other such factors” wording in the ACM code, and the “any irrelevant prejudices” wording in the Software Engineering code are ambiguous. Different people might reasonably interpret the wording differently. The AITP code is not really explicit about this issue.

The issue of discrimination on the basis of sexual “preference” or “orientation” is currently a topic of heated debate in our society. Accusations of “special rights for sodomites” and “genocide” are actually some of the more polite things the two sides have said to one another. It is clear from the voting results for laws and ordinances around the country that our society has not reached any consensus and that this debate will continue for some time.

A specific issue to consider here is that the APA code of ethics explicitly says it would be unethical for someone to be fired solely because that person's supervisor or colleagues do not approve of their sexual preference. The AITP, ACM, Software Engineering and IEEE codes do not. Which is the more appropriate moral stance? Does saying that someone can't be fired for something necessarily imply that society “approves of” the behavior? Should *any* behavior or belief that does not directly impact job performance be protected?

2. Duty to work to correct laws that are wrong?

The APA and AMA codes suggest that at times people must work for change in the status quo of society. Part d of principle 3 of the APA code states, in part, that “both practitioners and researchers are concerned with the development of such legal and quasi-legal regulations as best serve the public interest, and they work toward changing existing regulations that are not beneficial to the public interest.” Principle 3 of the AMA code states “a physician shall respect the law and also recognize a responsibility to seek changes in those requirements which are contrary to the best interests of the patient.” The ACM code touches on this topic in its explanation of professional responsibility 2.3 (see Appendix B), where it says “... compliance must be balanced with the recognition that sometimes existing laws and rules may be immoral or inappropriate and, therefore, must be challenged.” The AITP, Software Engineering and IEEE codes are silent on this issue.

Why do you think the codes differ this way? Consider the existing laws in some areas where computing professionals should have special responsibility; areas such as privacy, communications, encryption and intellectual property. Can you think of points that computing professionals should work toward improving? If your answer is currently “no,” hopefully it will be “yes” before you have finished this text!

3. Duty to be charitable?

The AMA and APA codes appear to try to convey a greater sense of social and community responsibility than do the ACM, IEEE, and Software Engineering codes. Principle 7 of the AMA code states “a physician shall recognize a responsibility to participate in activities contributing to an improved community.” Part d of principle 6 of the APA code states, in part, that psychologists “contribute a portion of their services to work for which they receive little or no financial return.”

The ACM, IEEE and Software Engineering codes are of course centrally concerned with public safety. However, they do not give such specific direction to take actions that benefit those less fortunate and that improve the community as a whole. Clause 8 of Principle 1 of the Software Engineering code is the only thing that comes close to making such a statement – “Be encouraged to volunteer professional skills to good causes and to contribute to public education concerning the discipline.” But compare this to the quotes from the AMA and APA codes given above, and to this quote from Professional Obligation 2a of the NSPE code – “engineers shall seek opportunities to be of constructive service in civic affairs and work for the advancement of the safety, health and well-being of their community.”

This omission in the AITP, ACM and IEEE codes seems rather unfortunate. It can reinforce the negative stereotype of “computer people” being concerned with machines and money, but not with people. Certainly people in computing professions can afford to be concerned about, and give to, their communities. This is borne out in the salaries of graduates in the computing disciplines. Many have a starting salary in their first professional job that is greater than the median family income in our country. Think about it – at the beginning of your career, you, one person, will likely have an income larger than that of half the families in the United States.

What do you think is the source of this difference among codes? Might things be

different if computing professionals typically dealt with individuals, rather than companies, as clients? What kind of “activities contributing to an improved community” would be natural for computing professionals to participate in?

4. **Duty to police the profession for incompetence?**

The AMA code takes a strong position on policing incompetence in the profession. Principle 2 of the AMA code states, in part, that physicians should “... strive to expose those physicians deficient in character or competence, or who engage in fraud or deception.” The AITP standards of conduct contain something similar but perhaps not as strongly worded – “Take appropriate action in regard to any illegal or unethical practices that come to my attention. However, I will bring charges against any person only when I have reasonable basis for believing in the truth of the allegations and without any regard to personal interest.” There is nothing that addresses a similar issue quite so strongly in the ACM, IEEE or Software Engineering codes. Clause 7 of Principle 7 of the Software Engineering code does state – “Not unfairly intervene in the career of any colleague; however, concern for the employer, the client or public interest may compel software engineers, in good faith, to question the competence of a colleague.” But this statement is clearly weaker than that in the AMA or AITP codes. It is also much weaker than the corresponding statement in Professional Obligation 8 of the NSPE code – “Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.”

Again, what do you think is the source of this difference between the codes? Is there any reason to think that incompetence, fraud or deception are any less of a problem in computing than they are in medicine? Should the ACM, IEEE and Software Engineering codes be more vocal on this point? What exactly should it mean to “expose” those who are incompetent, fraudulent or deceptive?

5. **Duty not to lend credence to misinformation?**

The APA code takes a strong position in this area. Part a of principle 1 states, in part, that psychologists should “... plan their research in ways to minimize the possibility that their findings will be misleading...” Part d states that “psychologists have the responsibility to attempt to prevent distortion, misuse, or suppression of psychological findings by the institution or agency of which they are employees.” Relevant analogies to these points could be made in the computing profession. Certainly statistical and simulation results of “computer studies that show that X will happen” are often misused or interpreted in incorrect or misleading ways.

Why do the codes dealing with the computing profession not deal directly with this issue? How much responsibility should computing professionals have to prevent misuse of their work?

3.7 Problems with codes of ethics

We have seen why we cannot count on the legal system to be a complete and correct guide to moral behavior, either for us as individuals in society or as members of a profession. Nor can we expect the professional codes of ethics to be complete, consistent and correct for all situations. Moreover, the codes of ethics included here are mostly voluntary, in the sense

that there is no formal monitoring for compliance and little penalty that can be assessed against violators.

In other words, a person can examine the code and, finding that a certain behavior is not explicitly prohibited, rationalize that the behavior is okay. In addition, a person will eventually encounter situations for which the code makes no explicit recommendations. Even worse, the recommendations of the code may turn out to be inconsistent and conflicting, leaving you to agonize over having no good option.

Codes of ethics suffer the same fundamental problem as ethical theories – goodness cannot be defined through a legalistic enumeration of do-s and don't-s, it must come from the heart. Thus, you must be able to use your internal sense of ethics to fill the holes and resolve the inevitable conflicts. It is my hope that the material in this text will help you develop, refine, and elaborate your internal moral sense.

3.8 Case study

The description of this incident is drawn from news accounts [5, 7, 8]. The dominant theme in this incident is conflict of interest. Related secondary themes are greed, plagiarism, bribes, fraud, and whistle blowing. There is also perhaps a less obvious element of poor management oversight. There is not enough space here to reprint the specific codes of ethics for all of the participants in the incident (government employees, university professors and so on), but try to identify the elements of the codes covered in this chapter that would apply to the actions of the people involved in this incident.

The cast of characters.

The University of Tennessee Space Institute is located in Tullahoma, Tennessee. It is a state-supported university that specializes in graduate instruction and research.

The US Army Missile and Space Intelligence Center is located in Huntsville, Alabama. Employees at MSIC are able to enroll in graduate programs at UTSI.

The NASA Marshall Space Flight Center is also located in Huntsville, Alabama. Employees at Marshall are also able to enroll in graduate programs at UTSI.

FWG Associates was a private, for-profit company located in Tullahoma. FWG would receive contracts from a variety of government agencies, including MSIC and Marshall.

Walter Frost was a professor at UTSI. One role of a professor is to supervise and mentor graduate students. Another is to bring in contracts and grants that can help support graduate students and research activities. Separate from his job as a professor, Frost founded FWG Associates. FWG made money, so Frost made money by receiving contracts in the same technical area that he worked in as a professor at UTSI.

Dennis Faulkner is a civilian employee at MSIC. One element of his job was to participate in the awarding of contracts to people doing work for the US Army. Earning a graduate degree in a technical area related to his job could be an important element of career advancement for Faulkner.

Peggy Potter is a civilian employee at Marshall. Similar to Faulkner, an element of her job was to participate in the awarding of contracts to people doing work for NASA. Also like Faulkner, she would like to earn a graduate degree to boost her career.

The anonymous whistle-blower is a former student at UTSI who was also an employee at FWG.

The sequence of events.

Walter Frost began work at UTSI in the 1970s. He was apparently quite good at his specialty and developed into something of a star in his field. He supervised a large number of graduate students at UTSI. He was also the principal investigator for a number of grants and contracts awarded to UTSI from various agencies. Somewhere along the way he started his own private, for-profit company. FWG Associates then began to receive contracts from agencies for the same type of work that previously might have been done under a contract to UTSI.

Dennis Faulkner enrolled in the graduate program at UTSI. Frost became the faculty supervisor for Faulkner's PhD. Faulkner participated in the awarding of a contract to FWG Associates. Frost provided Faulkner with a technical report that was already completed and allowed or encouraged Faulkner to use the technical report as the basis for Faulkner's doctoral dissertation. Faulkner received his PhD from UTSI in 1990.

Peggy Potter enrolled in the graduate program at UTSI. Frost became the faculty supervisor for Potter's MS. Potter participated in the awarding of a contract to FWG Associates. Frost provided Potter with a technical report and allowed or encouraged Potter to use the technical report as the basis for her research report for her master's thesis. Potter received an MS from UTSI.

[More people may have played roles essentially identical to those of Faulkner and Potter, but a complete listing of them is not essential to the story.]

At some point, a former student at UTSI and an employee at FWG became aware of the similarity between a technical report prepared by Frost and the master's thesis of one of Frost's students. The UTSI administration was notified. An investigation ensued.

Walter Frost took early retirement from UTSI in February 1991. Various contracts to Frost's firm were canceled and others reviewed. NASA demoted Peggy Potter, cut her \$55,000 salary by \$18,000, and had her pay back the money that NASA had spent for her course work. UTSI took back the degrees of both Faulkner and Potter. Faulkner's appeal process is still in the courts, but has so far been unsuccessful and appears unlikely to succeed. The incident caused NASA to subpoena documents on 80 students who had Frost as their research adviser. Criminal indictments were made against Frost and another faculty member, and against Potter, Faulkner, and two other students.

Conclusions and questions.

The most obvious "bad guy" in the story would appear to be Walter Frost. Founding a for-profit company to accept contracts in the same technical area as his research work for UTSI guaranteed conflicts of interest.

It is perhaps true that this sort of conflict-of-interest situation "happens all the time." If the people involved have strong moral convictions and the institutions involved have clear and well-enforced guidelines, then such situations might operate without the people involved straying outside the boundaries of ethical behavior. That is, people might handle each of their multiple roles in an ethical fashion. But this is asking human beings to be

essentially perfect in resisting temptation. In this instance, the people and institutions involved obviously did not handle the conflicts of interest well. It was clearly unethical for Frost to provide students with already completed research reports to reuse and submit as their own. This, by itself, was “only” an incident of conspiring in an act of plagiarism. However, that it was done with people who were in the position of influencing awards to his company has at least the appearance of bribery. Knowing that plagiarism was involved in the acquisition of a degree also becomes a sort of fraud on UTSI and the agencies for which the students worked.

All the blame cannot be placed on Frost alone, however. Faulkner and Potter were capable professionals. Having a major professor at the university whose contracts might pass through their hands at the office clearly had potential for conflict of interest. Faulkner and Potter certainly must have known that copying an existing technical report and presenting it as their research was wrong. They apparently rationalized it as being okay because Frost approved of it, but their clear motive was to get a degree. It is less clear if they sought Frost as an adviser because such an arrangement would then have been possible.

The problems at UTSI and the government agencies are perhaps less obvious, but still should be considered. The potential conflicts of interest involved with Frost’s company should have caused administrators on all sides to exercise extra care in avoiding exactly the problems that arose. UTSI, like all universities, should have a policy against professors supervising the work of students with whom they have a business relationship. Marshall and MSIC should have similar policies from their side.

Connections to the codes of ethics.

One of the AITP standards of conduct in relation to your employer is “avoid conflict of interest and insure that my employer is aware of any potential conflicts.” Also, item 4.5 of the Software Engineering code states “disclose to all concerned parties those conflicts of interest that cannot reasonably be avoided or escaped.” We can interpret these statements to mean that Frost should disclose to the University and to the other faculty on the MS/PhD committees that the student was a manager of one of his contracts. For the students, it would have meant disclosing to their employer that Frost was supervising their graduate degree.

One of the AITP standards of conduct in relation to fellow members and the profession is “not use or take credit for the work of others without specific acknowledgment and authorization.” Item 1.6 of the ACM code states “give proper credit for intellectual property.” Item 7.3 of the Software Engineering code states “credit fully the work of others and refrain from taking undue credit.” Item 7 of the IEEE code states “to credit properly the contributions of others.” Each of these statements provides some warning against the sort of plagiarism allegedly involved in this incident.

No doubt you can identify additional elements of the different codes of ethics that would be relevant to this incident.

Points To Remember

Each of the major professional organizations in the computing field (AITP, ACM and IEEE) has its own published code of ethics.

While the codes we considered have differences in presentation and emphasis, they are in broad agreement on general principles.

The general principles underlying most ethical dilemmas that you will confront in your career are addressed in the codes.

Professional codes cannot be counted on for detailed and consistent guidance in all possible situations. You must have your own strong inner sense of what is moral to be able to apply the general principles in specific situations.

Worksheet – What Guidance Do the Codes of Ethics Give You?

Return to the “pornography on the dean’s PC” case study analyzed in Chapter Two. Focus again on the role of the technician. Consider what guidance the technician might have gotten from the codes covered in this chapter.

What items of the AITP code and standards of conduct argue against reporting the existence of the pornography? What items argue for reporting the existence of the pornography?

How does the ACM code argue for or against reporting the pornography?

How does the Software Engineering code argue for or against reporting?

Does the IEEE code provide any basis for arguing either way? If so, what is it?

What does this situation with the various codes mean with respect to how an individual can depend on the codes for guidance? Can you locate a paragraph in the preamble to the Software Engineering Code of Ethics that addresses this point?

Worksheet – What Guidance Do the Codes of Ethics Give You?

What guidance does each of the three codes of ethics give you as to your ethical responsibilities in each of the following situations? What would you actually do if this happened to you?

You realize that your company has intentionally underestimated the cost of a project in hopes of getting the contract.

You have watched your boss take an employment application from a minority applicant and then throw it in the trash after the applicant leaves.

You have been told to sign off on the testing phase of the software project because your group is already a week behind schedule, but you haven't tested the software as called for in the specifications.

You have been "asked" by your boss to contribute \$2,000 to a particular political candidate and told that the company will be keeping track of all employees who make such contributions and giving \$2,000 bonuses to each person.

A coworker has been fired essentially because her political views were very different from those of the boss, and the person is now suing the company. You have been asked to make a signed written statement about "any and all incidents of poor work habits and poor quality work you may have observed" with regard to this person.

Worksheet – Relation of the Codes of Ethics to Religion

Carefully study the codes of conduct for the ACM, IEEE, and NSPE. Select your religion of choice and locate the section of its sacred book that best corresponds to describing a “code of conduct” for followers of the religion. Limit the length of the section of the religious book you choose to something reasonable, say 10 pages. If you can’t find a section that short, select the most relevant or most important 10 pages.

Explain how and to what degree the foundations of the various professional codes of conduct can be traced to or derived from elements of the religious code of conduct. Are there elements that cannot be derived from the religious code of conduct? Are there points on which some professional code of conduct seems to conflict with the religious code of conduct?

Try to stress *content* rather than length in preparing your paper. The paper should reflect (1) opinions or conclusions regarding the subject of the assignment, that are (2) reasonably supported by the background materials and (3) clearly expressed. Attach a copy of the section you base your essay on, in English, as an appendix to the assignment. The paper should of course be typed, proofread, and generally prepared according to standard practices as regards footnotes, references, quotations, citation of all sources, and so on. (This might be a good time to read the *Good Writing* reprint in Appendix A.)

Worksheet – Designing the Software Engineering Code of Ethics

Read Don Gotterbarn’s reprinted article, “The Ethical Software Engineer,” in which he outlines the process behind the development of the IEEE-CS/ACM Software Engineering Code of Ethics. Then answer the following questions.

Do you find it unusual that the state of Texas would license software engineers without reference to any code of ethics? What problems could this cause?

What are some of the “external pressures not to follow these guidelines” that you expect to encounter in your career?

“Ethical tensions can best be addressed through thoughtful consideration of fundamental principles, rather than blind reliance on detailed regulations.” Do you agree? Why or why not? When confronted with an ethically difficult situation, are you likely to have time for “thoughtful consideration?”

Gotterbarn says that “several large software companies have posted the code as an expected standard of conduct for their employees.” Identify some common practices in the software industry that would seem to be in violation of this code. What do you think would happen if an employee were to speak up against these practices?

Worksheet – How Should Licensing Boards Support the Public Welfare?

The codes of ethics give primary emphasis to protecting the public welfare. Engineers who conscientiously follow the codes to protect the public welfare may face retaliation from their employer. Those who are unfairly fired may sue in civil court for “wrongful discharge.” Walter Elden’s article, which follows this worksheet refers to the BART whistle-blowing incident that is an example of this. The incident is also discussed in the whistle-blowing chapter.

Keep in mind that software engineers will likely soon be licensed professionals, and that the licensing may reference the Software Engineering code of ethics. Walter Elden suggests that licensing boards should provide “friend of the court” statements in cases where an employee faces retaliation as a result of following their code of ethics. Read Elden’s reprinted article carefully and answer the following questions.

What is the sequence of basic premises in Elden’s argument?

Do you agree with Elden’s conclusion? Why / Why not?

Why do you think the IEEE provided only one amicus curiae statement in the last 25 years?

Why do you think state professional engineering boards have not provided amicus curiae statements more often in court cases?

What do you think of the P.E. board official’s distinction between “protecting the engineer” and “protecting the public?”

Worksheet – What Ethics Help Should a Society Provide Its Members?

The IEEE has a checkered history of providing ethics-related support to engineers who find themselves in trouble with their employers. One high point came with the IEEE provided a “friend of the court” statement in the BART whistle-blowing case. This is referred to in the previous worksheet and in the whistle-blowing chapter. However, this seems to be the only instance in which IEEE has provided such a statement. Another high point came when the the IEEE initiated a volunteer-staffed telephone hot-line which members could use to discuss ethics-related problems. However, this hot-line was discontinued not long after it was initiated. Stephen Unger’s article, reprinted later in this chapter, briefly mentions the hot-line. Read Unger’s article and answer the following questions.

List some of the types of ethics-related help that a professional society could provide its members (telephone hot-line, contacts with others in similar situations, friend of the court statements, ...).

Prioritize the types of help listed in the above question from most valuable to least valuable for the member.

Prioritize the types of help listed above from most valuable expensive to least expensive to provide.

Based on the combination of priorities, what sorts of help do you think societies like the AITP, ACM and IEEE should be providing to their members?

[Note: for a current “Online Ethics Center Help-Line” see <http://onlineethics.org/helpline/>]

Additional Assignments

1. **Something that should not be in the IEEE Code of Ethics?**

Unger [6] describes his concerns over item 9 of the IEEE code, which requires members “... to avoid injuring others, their property, reputation, or employment by false or malicious action ...” According to Unger, “the motivation for the provision was to fashion a weapon for use against a well-known member who frequently attacked fellow members, officers, and IEEE staff members, often in a malicious manner – sometimes falsely. Indeed, after passage of the new rule, it was used against that member in the first case in which an IEEE member was formally censured. That member is now deceased, but the rule remains, perhaps to deter some who might otherwise behave maliciously. It is also likely to silence others with legitimate complaints against those in positions of power” [6]. Look more closely into this incident and consider more carefully Unger’s objections to this element of the IEEE code. Would you keep this element of the code or remove it? Why?

2. **Evolution of the ACM code.**

Look up the previous code of ethics for the Association for Computing Machinery and compare it with the current ACM code. Identify specific changes in the new code and give arguments for why the changes were needed or why they should not have been made.

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The Ethical Software Engineer
Don Gotterbarn
ACM Ethics Committee Chairman

The Association for Computing Machinery (ACM) and the IEEE-Computer Society have adopted the Software Engineering Code of Ethics and Professional Practice (5.2). This is significant, given that the state of Texas has already licensed software engineers without defining any standard of ethical practice. This oversight is dangerous for two reasons. First, licensed software engineers will obey the law, but laws provide inadequate guidance in many critical situations. And second, the failure to connect specific ethical standards to licensing encourages the mistaken view that there is little agreement among software engineers about their professional and moral obligations. The code's development, however, indicates a significant agreement among software engineers about the way they ought to behave.

The code also provides mechanisms to help practitioners make ethical judgments in those situations where the law is silent.

The code was developed by the joint IEEE-CS/ACM task force on Software Engineering Ethics and Professional Practice (SEEPP). The SEEPP task force is multinational in citizenship and in membership in professional computing organizations. After extensive study of several codes of ethics of computing societies, engineering societies and other professions, SEEPP selected imperatives for the draft code. SEEPP also contributed new imperatives related to its knowledge of software engineering and based on external reviewers' suggestions.

The draft code was reviewed by members of several professional computing societies and went through several revisions. Version 3 appeared with a turnaround ballot in the IEEE-CS's and the ACM's flagship magazines. Most clauses received better than a 90 percent approval rating. Contributed comments led to the development of Version 4 which SEEPP submitted for peer review using the IEEE's formal technical standard review process. Again, the code easily passed this process. Comments were used to develop the final version of the code (www-cs.etsu.edu/seeri/secode.htm) which was approved by the ACM in November and the IEEE-CS in December.

I found the consistently high level of agreement about the behavior expected of a professional software engineer very significant. There is general agreement about our obligations as software engineers, even if some software engineers give in to external pressures not to follow these obligations.

The code aids decision making by overcoming two difficulties with other codes. First, most codes of ethics provide a finite list of principles which are often presented as a complete list and the reader presumes that only things on the list should be of ethical concern for the professional. Second, many codes provide no guidance for situations where rules, having equal priority, appear to conflict. This equal priority leaves the ethical decision maker confused. The software engineering code addresses both of these limitations.

The code explicitly rejects the concept of completeness.

"It is not intended that the individual parts of the Code be used in isolation to justify errors of omission or commission. The list of Principles and Clauses is not exhaustive. The Clauses should not be read as separating the acceptable from the unacceptable in professional conduct in all practical situations. The Code is not a simple ethical algorithm which generates ethical decisions."

The code addresses completeness by providing general guidance for ethical decision making, especially in those areas not explicitly mentioned in the code.

“Ethical tensions can best be addressed by thoughtful consideration of fundamental principles, rather than blind reliance on detailed regulations. These Principles should influence software engineers to consider broadly who is affected by their work; to examine if they and their colleagues are treating other human beings with due respect; to consider how the public, if reasonably well informed, would view their decisions; to analyze how the least empowered will be affected by their decisions; and to consider whether their acts would be judged worthy of the ideal professional working as a software engineer. In all these judgments, concern for the health, safety and welfare of the public is primary; that is, the “Public Interest” is central to this Code.”

The first principle asks the developer to consider all stake-holders, not just the software engineer’s employer or client. The second principle—due respect—requires a protection of human values. This section states that in all decisions the public interest is the primary concern.

To reinforce the priority of public well-being, the code asserts the priority of concern for the public over loyalty to the employer or profession. It is a professional’s obligation to take positive action to address violations of the code. The code addresses both the responsibilities of the practicing professional and of the profession. Several large software companies have posted the code as an expected standard for their employees. Its adoption by two large computing organizations is a positive step because this code is not designed to be self-serving to the profession. The code requires software engineering professionals to be ethically responsible to all of those who are affected by their products.

(The IEEE Ethics Committee maintains a Web site at www.ieee.org/committee/ethics. The author can be reached via e-mail at gottarba@access.etsu.edu.)

**Why A State Professional Engineering Board
Should Enter an *Amicus Curiae* Brief
in a “Wrongful Discharge” Case**

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Synopsis.

This paper presents a strong argument as to why, in cases where a terminated licensed Professional Engineer alleges “wrongful discharge” in a suit against a former employer, his/her State or National P.E. Licensed Board should enter an *amicus curiae* (friend of the court) legal brief in the case. The basic premise is the obligation of the P.E. Board to “protect the public,” and not necessarily the P.E. directly. The author shows, however, that by a P.E. Board taking such Pro Active legal action, the result is the protection of the proper practice of engineering, thus “protecting the public,” with an indirect benefit to the P.E.

Wrongful discharge for upholding code of ethics.

The IEEE Member Conduct and Ethics Committees are seeing increasing requests from IEEE members for “ethical support” by having the MCC recommending to the IEEE Executive Committee that IEEE should enter an Amicus Curiae in suits the engineer has brought against a former employer, for alleged “wrongful discharge.” This termination generally has resulted from the engineer engaging in actions aimed at “protecting the public” from the improper application of engineering design or technology, by following his/her professional society’s Code of Ethics. Some of these members are also licensed Professional Engineers, having been licensed by his/her public Board of P.E. Regulation to “protect the public” from the improper practice of engineering.

IEEE Ethical support and amicus curiae policies.

The IEEE, under By-Law 112, has had a policy for nearly 20 years to offer “ethical support” in situations as described above. Further, as part of this policy, the IEEE provides for the providing of an amicus curiae statement, restricting it to matters of ethical principal, in ethical support requests. Policy 7.13 provides for the preparation of the Amicus Curiae, when approved by the IEEE.

In January 1975, the IEEE entered its first and only Amicus Curiae, in a “wrongful discharge” ethics matter, in the Bay Area Rapid Transit (BART) case. This involved 3 IEEE engineers, who brought suit against the BART District entity for their “wrongful discharge” for actions they took to “protect the public” in matters of engineering design of the automated train control system. Essentially, the IEEE legal brief made these statements of law to the court, in this case:

“In any charge to the jury herein, this court should instruct the jury that if it finds, based upon the evidence, that an engineer has been discharged solely or in substantial part because of his bona fide efforts to conform to recognized ethics of his profession involving his duty to protect the public safety, then such discharge was in breach of an implied term of his contract of employment.”

The IEEE brief said that not only should this apply to Public employment bodies, but to private employers too.

What about national/state P.E. licensing boards?

Above, we have seen where the IEEE, as a leading international engineering professional society, has had as its policy for the past nearly 20 years, to offer “ethical support” and an *amicus curiae* to engineers who request it in alleged “wrongful discharge” court cases. It was shown that in 1975, the IEEE did in fact enter one in the BART case. Now, what about National/State P.E. Licensing Boards? What is their policy and history in similar cases to offer *Amicus Curiae* legal briefs in suits brought by their P.E.s to correct “wrongful discharge” treatment?

The author recently conducted a survey of all State P.E. Boards in the USA which had E-Mail addresses listed for them, asking if they had ever had been requested to or actually did enter an *Amicus Curiae* in alleged “wrongful discharge” cases, involving licensed P.E.s. Many replies were received from these contacted P.E. Boards. Of those who responded, there was not one which had ever entered an *Amicus Curiae* in such cases. Several contacted their State Attorney General’s office to have research done to find out the answer to this question.

One reply was found to be of particular interest to the author. This P.E. Board official who responded offered that in their opinion, “it was not the purpose of the State P.E. Board to protect the P.E. but rather to ‘protect the public,’” and therefore, it did not deem it appropriate for them to enter an *Amicus Curiae* in such cases brought by the P.E. licensed by their Board.

After giving this considerable thought, the author responded with the following argument:

The State P.E. Board licenses an engineer as a P.E. to “protect the public.” The P.E. is held legally accountable to know the P.E. law, its Code of Professional Conduct, and to practice in accordance with such Code, to “protect the public.” Further, if the P.E.’s actions happen to result in being in conflict with the P.E. law or its Code of Professional Conduct, the State may bring charges against the P.E. and discipline him/her. This is done for the sole purpose of “protecting the public” from the improper practice of engineering.

Now, when a circumstance occurs when a P.E. is terminated from employment (alleged “wrongful discharge”) for practicing in accordance with his/her State P.E. law or Code of Professional Conduct, and brings suit against the former employer, why shouldn’t the State P.E. Board enter an *Amicus Curiae* legal brief in this case, to advise the court that such actions of the P.E. as alleged, if provable, were done for the purpose of “protecting the public” and as such, the proper and ethical practice of engineering by a P.E. should be afforded the protection of the law, in order that the proper practice of engineering be enforced, to “protect the public.” The reasoning here is the view that by protecting the proper practice of engineering by a licensed P.E., this action would result directly in the State P.E. Board and the court acting to “protecting the public.” It is true, that by taking such protective actions, the court and the P.E. Board’s actions may benefit the P.E. in a favorable outcome of his/her suit. But this would not be the primary reason for the P.E. Board or the court to take such action.

After this argument was conveyed to the State P.E. Board official, the author, as yet,

has not received a reply to this argument.

Conclusion.

While the IEEE has had for nearly 20 years a policy to enter an *amicus curiae* in alleged “wrongful discharge” cases, the current practice of State P.E. Licensing Boards in the USA appears not to be the same. By entering such legal briefs in this type of case, however, it has been argued by the author that this would in fact result in the P.E. Board and the court acting to uphold the proper practice of engineering, and thus “protecting the public.” The end result here is that National and State P.E. Licensing Boards ought to rethink their practice in this area and move towards a more pro-active position of applying legal protections to the practice of engineering, thus achieving the sole purpose for such regulatory Boards, that being to “protect the public.”

(first page from Unger's article, from *Technology and Society*, Spring 1999, page 36)

(second page from Unger's article, from *Technology and Society*, Spring 1999, page 37)

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