**Chapter 2: Professional Codes of Ethics**

*Summary*

Nearly every professional association for engineers has its own code of ethics. This chapter discusses three of the most influential codes embraced by some of the largest engineering organizations in the United States: the National Society of Professional Engineers (NSPE), Institute of Electrical and Electronics Engineers (IEEE), and Association for Computer Machinery (ACM).

A code of professional ethics is a convention agreed upon by a group of professionals, but the mere fact that the members of an organization have agreed on a morally wrong code does not make the content of such a code right. No code of ethics can cover all the unforeseeable moral problems that may confront an engineer, and nearly every code has multiple interpretations. A code of ethics is not a full-fledged ethical theory.

The moral principles expressed in a code typically fall within one of three categories: prohibitive, preventive, or aspirational principles. Prohibitive principles describe actions that are morally prohibited; preventive principles seek to prevent certain types of problems from arising; and aspirational principles state goals that engineers should strive to achieve.

The chapter includes a discussion of how engineers should reason when two or more principles of a professional code give conflicting advice, or at least appear to do so. One option is to reinterpret or reformulate the principles of the code; a second option is to introduce a mechanism for resolving the conflict (e.g., a hierarchical ranking of the principles); a third option is to interpret the principles as contributory instead of conclusive moral reasons; and a fourth option is to accept the fact that it is sometimes impossible to comply with the code.

*Learning Objectives*

After studying this chapter, students should:

* Be familiar with the concepts of prohibitive, preventive and aspirational moral principles.
* Know the major professional codes of ethics for engineers.
* Know the causes of the *Challenger* and *Columbia* disasters and the lessons for engineers.
* Understand the difference between proper management decisions and proper engineering decisions.

*Essay Questions*

1. Is it ever morally permissible to violate one’s professional code of ethics?

2. What should engineers do if their professional codes of ethics seem to give conflicting advice, or no advice at all?

\*3. According to the NSPE code of ethics, engineers shall “avoid deceptive acts.” How should we understand this principle?

\*4. Who was morally responsible for the Challenger disaster?

5. Who was morally responsible for the Columbia disaster?

*Multiple-Choice Questions*

1. Which is *not* a reason to follow a code of ethics that was discussed?

\*a) It is important for maintaining personal integrity.

b) Joining a profession is effectively making a promise.

c) Having professional standards strengthens an engineer’s ability to stand by principles.

d) The personal cost to refusing moral actions is diminished by practicing the code.

\*2. Philosopher Michael Davies writes, “Without a professional code, an engineer could not object [to doing something unethical] as an engineer. An engineer could, of course, still object ‘personally’ and refuse to do the job. But if he did, he would risk being replaced by an engineer who would not object.” Which ethical theory fits best with this view about professional codes?

\*a) Utilitarianism

b) Ethical egoism, as applied to groups

c) Virtue ethics

d) Kantianism

3. Which of the following is an example of an aspirational ethical principle in the NSPE code? Engineers shall

a) hold paramount the safety, health, and welfare of the public.

b) perform services only in areas of their competence.

c) issue public statements only in an objective and truthful manner.

\*d) conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

\*4. Which of the following principles is a prohibitive principle?

a) Engineers shall hold paramount the safety, health and welfare of the public.

\*b) Engineers shall issue public statements only in an objective and truthful manner.

c) Engineers shall perform services only in areas of their competence.

d) Engineers shall conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

5. According to the Fundamental Canons of the NSPE Code of Ethics, engineers shall conduct themselves

a) honorably, morally, responsibly, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

b) honorably, morally, ethically, and lawfully so as to enhance the prestige, reputation, and usefulness of the profession.

\*c) honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and prestige of the profession.

d) None of the above

\*6. The moral principles expressed in a professional code of ethics, including the NSPE code, can typically be characterized as a

a) prohibitive, descriptive, or normative principles.

\*b) prohibitive, preventive, or aspirational principles.

c) prohibitive, descriptive, or aspirational principles.

d) factual, descriptive, or normative principles

7. Which of the following are Fundamental Canons of the NSPE Code of Ethics?

“Engineers, in the fulfillment of their professional duties, shall

a) hold paramount the safety, health, and welfare of the public.”

b) avoid deceptive acts.”

c) conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.”

\*d) All of the above

\*8. Which of the following principles is a preventative principle?

a) Engineers shall avoid deceptive acts.

\*b) Engineers shall hold paramount the safety, health and welfare of the public.

c) Engineers shall issue public statements only in an objective and truthful manner.

d) Engineers shall conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

9. According to the NSPE code of ethics, engineers shall “avoid deceptive acts.” This is a(n) \_\_\_\_\_\_\_\_\_\_ element of the NSPE code.

\*a) prohibitive

b) preventive

c) aspirational

d) All of the above

\*10. According to the NSPE code of ethics, engineers shall “perform services only in areas of their competence.” This is a(n) \_\_\_\_\_\_\_\_\_\_ element of the NSPE code.

a) prohibitive

\*b) preventive

c) aspirational

d) All of the above

11. LeMessurier violated the third fundamental canon to only issue public statements in an objective and truthful manner. How might this violation have been required to comply with one of the fundamental canons of the NSPE code?

a) Citibank, his client, specifically ordered him to lie.

b) His honor and reputation and that of the profession rested upon repairing the building without anyone knowing.

c) A faithful agent delegates the responsibility of informing the public to the client.

\*d) Truthfully disclosing all the relevant information to the public would have caused a panic and actually harmed the public good.

\*12. How do the ACM and NSPE codes differ from the IEEE code?

a) The ACM and NSPE codes distinguish between fundamental moral principles and more specific rules.

b) The IEEE code emphasizes honesty and integrity.

c) The IEEE code has no prohibitive principles.

\*d) The IEEE code specifically discusses bribes.

13. The direct technical cause of the *Challenger* disaster in 1986 was

\*a) a leaking O-ring in a fuel tank, which could not cope with the unusually low temperature at the day of the take-off.

b) a lack of respect for the NSPE code of ethics, which stipulates that engineers shall hold paramount the health, safety and welfare of the public.

c) foam-shedding, which was caused by the unusually low temperature at the day of the take-off.

d) normalization of deviance.

\*14. A Proper Engineering Decision (PED) is a decision that

a) requires technical expertise.

b) may significantly affect the health, safety and welfare of others.

c) has the potential to violate the standards of an engineering code of ethics in other ways.

\*d) All of the above

15. A Proper Management Decision (PMD) is a decision that

a) affects the performance of the organization.

b) does not require any technical expertise.

c) does not significantly affect the health, safety and welfare of others or has any potential to violate the standards of an engineering code of ethics in other ways.

\*d) All of the above

\*16. Determining whether *Challenger*’s launch should be delayed or not was treated as a management decision by Gerald Mason rather than as a proper engineering decision and has been identified as a major mistake leading to the *Challenger* disaster. All of the following are aspects of a proper engineering decision *except*:

a) Has the potential to violate the standards of an engineering code of ethics.

\*b) Affects the performance of the organization.

c) Requires technical expertise.

d) May significantly affect the health, safety, and welfare of others.

17. When Gerald Mason told Boisjoly’s supervisor Bob Lund to “take off your engineering hat and put on your management hat,” Mason

a) violated all six fundamental canons of the NSPE code of ethics.

b) violated the first fundamental canons of the NSPE code of ethics.

c) violated the sixth fundamental canons of the NSPE code of ethics.

\*d) did not respect the distinction between Proper Engineering Decisions and Proper Management Decisions.

\*18. Sociologist Diane Vaughn coined the term *normalization of deviance* for describing the process in which

\*a) a technical error is accepted as normal, even though the technological system is not working as it should.

b) an nontechnical error is accepted as normal, even though the technological system is working as it should.

c) the process in which an ethical mistake is accepted as normal, even though the technological system is working as it should.

d) All of the above

19. Which of the following is an example of *normalization of deviance*?

a) The low oil pressure warning in your car lights up every morning for two weeks; you think it is an electric problem until the engine stops working and needs to be replaced.

b) Small pieces of foam fell of the space shuttles many times; nobody took any notice until the *Columbia* disaster.

c) Your computer fails to install the latest updates on several occasion; you don’t worry about it until it crashes, and your work is lost.

\*d) All of the above

\*20. Which aspect of the *Challenger* case is an example of the normalization of deviance?

a) The burden of proof shifted from the engineers being able to prove the launch was safe to launch to having to prove it is not safe to stop launch.

\*b) The O-ring blow-by was an aberration known to have occurred without disaster in the past and so did not alarm engineers.

c) Lund was told to take off his engineering hat and put on his management hat.

d) The conditions were unusually cold for launch that January.

*Weblinks*

The National Society of Professional Engineers: <http://www.nspe.org/>

IEEE: [http://www.IEEE.org/](http://www.mspe.org/)

ACM:[http://www.IEEE.org/](http://www.mspe.org/)

A video about the Challenger disaster: <https://www.youtube.com/watch?v=-O_DMyHdq_M>

*Key Terms*

**Aspirational ethics**—Ethical principles that go beyond the bare minimum required for avoiding wrongdoing. For example, an engineer promotes the welfare of society by working for Engineers Without Borders in his free time.

**Association for Computer Machinery (ACM)**—The world’s largest society for computing professionals with thousands of members around the world.

**Code of Ethics**—A set of moral rules for managing ethical problems within a specific (professional) domain.

**Existentialism**—A philosophical theory developed by French philosopher’s Jean-Paul Sartre and others that emphasizes the individual’s freedom and responsibility to make decisions by exercising his or her free will.

**Institute of Electrical and Electronics Engineers (IEEE)**—The world’s largest professional organization for engineers with hundreds thousands of members around the world.

**Moral dilemma**—In a narrow, academic sense a moral dilemma is a situation in which all alternatives open to the agent are morally wrong. Such moral dilemmas are by definition irresolvable. In ordinary, nonacademic contexts, a moral dilemma is a difficult moral choice situation, which need not always be irresolvable.

**National Society of Professional Engineers (NSPE)**—A learned society for engineers that addresses the professional concerns of licensed engineers (called professional engineers, or PEs for short) across all engineering disciplines.

**Normalization of deviance**—The process in which a technical error is accepted as normal, even though the technological system is not working as it should.

**Preventive ethics**—Moral principles that seek to prevent accidents and other types of problems from arising.

**Proper engineering decision (PED)**—A Proper Engineering Decision is a decision that requires technical expertise and may significantly affect the health, safety, and welfare of others or has the potential to violate the standards of an engineering code of ethics in other ways.

**Proper management decision (PMD)**—A Proper Management Decision is a decision that affects the performance of the organization but does not require any technical expertise and does not significantly affect the health, safety, and welfare of others nor has any potential to violate the standards of any engineering code of ethics.

**Prohibitive ethics**—Moral principles that seek to prohibit certain types of actions. Example: cheating and bribery.

**Professional Engineer (PE)**—In the United States, a professional engineer is someone who has obtained a license to practice engineering by taking a written tests and gaining some work experience. Only professional engineers can become members of the National Society of Professional Engineers (NSPE).

*Case Study: The Example of OpenAI*

In 2015, Elon Musk of PayPal, Tesla, and SpaceX; Peter Thiel of Palantir; Reid Hoffman of LinkedIn; and Sam Altman of Y Combinator teamed up to launch OpenAI, a nonprofit artificial intelligence (AI) venture that would aim to generate AI technology for the benefit of humanity and would be made available to everyone. The group maintains that it can best seek ways to use AI only for human benefit by severing the profit motive from the research. The group holds a very high standard for what AI technology must do: “We believe AI should be an extension of individual human wills and, in the spirit of liberty, as broadly and evenly distributed as is possible safely.” In other words, rather than AI becoming a tool of government to conduct mass surveillance on citizens and control them or business using advanced AI to predict, influence, and control human spending, AI should not primarily be a tool of institution, public or private, to be used on individuals. Rather, as an “extension of individual human wills,” AI should be democratized and put to the use of expanding individual autonomy. It is not hard to see how this would be difficult to conduct in an organization seeking profits. All the intellectual property OpenAI develops will be publicly available without charge; the only exceptions would be technology that poses risk to human safety. So far, the main achievement of OpenAI has been its gaming bots that have defeated Dota 2 players. Dota 2 is a video game played by teams and is considered to be more difficult for computers than chess or Go.

Approximately three years after the founding of the organization, Elon Musk stepped down voluntarily as chairman to prevent a future conflict of interest. While Musk will still advise the nonprofit, his own company Tesla has come to emphasize AI more and more. While Tesla is primarily a manufacturer of electric cars, the direction the company is moving is to produce autonomous electric cars. Clearly insofar as the for-profit company is developing AI, there would be a conflict of interest between it and the free AI offered to the public by OpenAI.

How would the mission of OpenAI fit under the types of ethical principles discussed in the chapter? When Elon Musk stepped down as the chair, what sort of principle was he following?

*Case study by Robert Reed*

<https://www.fastcompany.com/3054593/elon-musk-launches-openai-a-nonprofit-aimed-at-using-ai-to-benefit-humanity>

<https://motherboard.vice.com/en_us/article/qveedq/elon-musk-steps-down-from-open-source-ai-group>