

Fundamental Ethical Responsibilities of Scientists and Engineers: A Brief Refresher

by

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I. Introduction

It is widely recognized that medical doctors have a basic ethical responsibility to their patients to “do no harm.” In contrast, few recognize that scientists (Ss) and engineers (Es) also have “patients” -- those they affect by their professional actions -- to whom they too have an ethical responsibility to “do no harm.” In the case of Ss and Es, unpacking “do no harm” yields what I call the **Fundamental Ethical Responsibilities of Scientists and Engineers (FERSEs)**.

II. The FERSEs

The FERSEs can be expressed with different levels of concision and precision

A. Concise But Imprecise Versions

Ss and Es have fundamental ethical responsibilities....

1. to not cause harm to others (**FERSE1**)
2. to prevent harm to others (**FERSE2**)
3. to alert parties at risk of harm (**FERSE3**)

In addition, any S or E employed by an organization or who works for a client has a fundamental ethical responsibility....

4. to serve the interests of her/his employer or client. (**FERSE4**).

B. More Precise but Less Concise Versions

Although concise, the preceding formulations are imprecise and misleading. More precise formulations follow.

Ss or Es have fundamental ethical responsibilities....

1. to not cause harm or create an unreasonable risk of harm to others (or to public welfare or the public interest) through their work (**FERSE1**)
2. to try to prevent harm or an unreasonable risk of harm to others (or to public welfare or the public interest) from their work or work of others about which they are technically knowledgeable (**FERSE2**)
3. to try to alert and inform individuals and segments of the public at significant risk of being harmed by their work or work of others about which they are technically knowledgeable, that they are vulnerable (**FERSE3**)

In addition, any S or E employed by an organization or who works for a client has a fundamental ethical responsibility....

4. to do her/his best to serve the legitimate interests of the employer/client (**FERSE4**).

III. Nuances

The author's **THE ETHICAL ENGINEER: CONTEMPORARY CONCEPTS AND CASES** (Princeton: 2018) explores the fundamental ethical responsibilities of engineers in considerable detail.^{@, #}

In particular, it...

A. ... clarifies the meanings of three important FERSE terms "harm," "cause," and "others."

"Harm" is to be understood as encompassing societal and psychological damage as well as physical injury and financial loss. "Cause" includes background enabling factors, facilitating factors, conducive factors, precipitating or triggering factors, and other kinds of "contributory causal factors." "Others" includes not just individual affected humans, but public welfare, the public interest, and, for some analysts, certain affected non-human sentient beings, e.g., dogs, pigs, and monkeys.

[@]See Chapter 3, pp. 22-39.

[#] Since the book focuses on ethical responsibilities of engineers, "FEREs" is used throughout and refers to "the fundamental ethical responsibilities of engineers." Since this paper is addressed to scientists and engineers, who have the same fundamental ethical responsibilities, "FERSEs" is used throughout and refers to "the fundamental ethical responsibilities of scientists and engineers."

B. ... underscores the importance of “try” in FERSE2 and FERSE3 and “legitimate” in FERSE4.

Under certain circumstances, Ss and Es have an ethical responsibility to do something about a looming, pending, or imminent harm related to their work or work about which they are technically knowledgeable. This responsibility is *not* to prevent harm or an unreasonable risk of harm; after all, doing so may be actually or effectively impossible. Rather, their ethical responsibility is to *try* to prevent preventable harm or an unreasonable risk of harm to others from such work.

Further, while scientists and engineers have an ethical responsibility to do their best to serve the legitimate interests of their employers and clients, they do *not* have an ethical responsibility to do their best to serve interests of their employers or clients that are *illegitimate*. Examples of illegitimate employer or client interests are stealing a competitor’s intellectual property, bringing a product to market that has not been adequately tested for safety, and cheating in satisfying applicable government regulations.

C. ... argues that the situation-specific ethical responsibilities of Ss and Es offer *initial guidance* to what they should do. The guidance can be overridden, but only if a compelling case is made that acting otherwise is ethically justified all things considered. For example, under FERSE2, a S or an E might have a *prima facie* ethical responsibility in a particular situation to blow the whistle publicly. However, if it could be shown that doing so would jeopardize national security while preventing only relatively minor harm, that consideration might trump that *prima facie* ethical responsibility and make *not* blowing the whistle publicly the ethically right course of action, all things considered, in that situation.

D. ... argues that FERSE1 can be violated not only by acts of *commission* intended to harm others, but also by acts of *omission* that inadvertently but negligently contribute to causing harm or creating an unreasonable risk of harm to others.

E. ... clarifies the circumstances under which FERSE4 applies to a S or E. Suppose a S or E is employed by an organization or has a client. FERSE4 states that s/he has a fundamental ethical responsibility to do her/his best to serve the legitimate interests of the employer or client. However, this responsibility is not incumbent on the S/E under all circumstances. Rather, it is binding *only as long as the employer or client treats the S or E fairly and reasonably regarding compensation and the conditions of work*. If this condition is not met or ceases to be met, then the S or E is no longer bound by FERSE4.

F. ... discusses situations in which FERSEs conflict. For example, suppose a S or E has an ethical responsibility under FERSE4 to carry out a certain course of action, e.g., to design a software app for her/his employer, the NSA, to track online civilian

banking transactions. Further suppose that the S or E in question also has an ethical responsibility under FERSE1 to *not* carry out that same course of action because of the unreasonable risk of harm to others that it would cause, viz., privacy violation. The author explores how the S or E should proceed when faced with conflicts between the FERSEs.

Among other things, in this connection the S/E should do the following:

1. operate on the presumption that, when they conflict, not violating FERSE1 is more important than not violating FERSE4. The reason for adopting this presumption is that society, through its infrastructural resources, enables and facilitates much employer/client technical activity. Hence, society could and might well prohibit or seriously restrict that activity if Ss or Es prioritized not violating FERSE4 over not violating FERSE1, causing harm to society as a by-product.
2. ascertain the *natures, likely magnitudes, degrees of reversibility, and likely distributions* of the projected harms and benefits involved, to the employer/client and to “others” likely to be affected by the course of action under consideration. The purpose of doing so is to see if the presumed priority given to FERSE1 over FERSE4 should be overridden in the case at hand.

III. How Can the FERSEs Be Used?

Once the more precise formulations of the FERSEs are internalized by a S or E, how can they be used? Consider a S or E working in a particular R&D situation, with specific personal, social, technical, political-economic, cultural, and environmental characteristics. The S or E can first (i) scrutinize the situation to see if any harms or significant risks of harm are likely to result from a proposed course of action. Then s/he can (ii) **identify the FERSE(s) applicable** to that situation. Next, s/he can (iii) **bring the applicable FERSE(s) to bear on that situation** with its specific characteristics, mindful of the options open to the S- and E-actors involved. By doing so, the S or E can (iv) **ascertain what her/his specific ethical responsibility or responsibilities are in that situation.**

For example, suppose a S or E learns of a lucrative project being pursued by another unit of her/his firm, about which s/he is technically knowledgeable. S/he has evidence that if completed it poses a serious risk of harming a certain group of people likely to be indirectly affected by it. FERSE2 and FERSE3 arguably apply to this situation. By considering them in light of the specific features of the concrete work situation, e.g., how far advanced the project is, the firm’s workplace culture, and whether there is still time to alert and inform the group in question, the S or E will be able to determine whether s/he has a presumptive ethical responsibility to raise the matter in-house or to publicly blow the whistle to try to prevent (or mitigate) the

harm, and whether s/he has an ethical responsibility to try to alert and inform the potentially impacted group re its vulnerability.