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The Nature of Engineering Ethics

What This Book Is About

This book is a practical guide to ethical decision making for practicing engineers and others in technologically oriented business and industry. It will help you to make ethical decisions yourself and to understand the reasons behind company policies, legal rules, and professional codes. It is also meant to change the way you think and feel about engineering, so that you can be a better and happier engineer. And it just may cause you to take a new look at the ethical dimensions of life generally.

Unlike many ethics books, this one is geared to finding answers. I have attempted to present clearly and economically some factors you may use in making decisions. To make it easy to use this book as a reference or study guide, I have listed key points in Appendix 2. Of course, there is no such thing as an ethics rule book. Rather, what you need is an ethics construction kit that provides you with tools and materials to construct your own solutions to problems you may face. This book imparts some specific recommendations, many examples of ethical decisions, several tech-

niques for ethical decision making, and a variety of rules, principles, and values upon which you can draw. It explains the reasons behind many of the rules and principles and gives you guidance in weighing them.

I have tried to capture and summarize the best in the literature of engineering ethics and also to add a good deal that is new. Some of my recommendations are quite specific, others fairly general. Some of the material will raise new ideas, while some details represent a clear and thorough summary of "common sense." Some of my recommendations are controversial, others are widely agreed upon.

Together, these materials present a comprehensive picture of and guide to engineering ethics.

Why Ethics for Engineers?

Practicing engineers often think that ethical problems are not really their concern. Many ethical decisions are not made by any individual. After all, legal and company rules determine much of what an engineer may or may not do, and committees or executives far removed from the average engineer decide many of the ethical questions that do arise. Of what use, then, is a book or program or course on engineering ethics?

Books such as this one are essential because, for several reasons, engineers must have a clear grasp of engineering ethics. First, many of the ethical decisions that individual engineers must make are not settled by rules. After all, rules do not encompass every situation: often the rules only set limits within which decisions must be made, and some

situations are not covered at all.[1] In addition, rules require interpretation. In some cases it may be easy to see which interpretation of a rule is best, but in others it is not so easy. No set of rules or policies can anticipate every ethical problem that may arise, and even the sincerest engineers may need help in understanding the ethical aspects of some situations. **So** only ethically aware engineers can correctly apply ethical rules to complex situations, keeping to the spirit as well as the letter of ethical rules.

Second, organizations function best when the values implicit in rules and executive decisions are widely understood and discussed within the organization. The best employment situation, both for the employer and for the employees, is a community atmosphere where everyone works together for a common goal in which everyone believes. Companies and firms flourish when their people have common values, a situation impossible to achieve if the rules are bureaucratic mandates handed down from above rather than ways of working toward commonly understood goals. Furthermore, without communication between all levels of an organization, ethical problems may slip between the cracks. Such synergistic effects arise when employees are insensitive to complex ethical dimensions of company operations. It becomes more difficult to overlook ethical problems when each engineer is aware of and sensitive to ethical concerns and potential problems. In general, large decisions are often the resultant of many small decisions made at different levels. Thus, the large decisions reflect the values and ethical aims of the company only when those making the small decisions understand those values and aims and also understand how their

decisions fit in with the ethical outlook of the company. In addition, engineers who understand the moral basis of the rules have a greater motivation to obey them, both because they see the rules as morally sound directives rather than as annoying and senseless restrictions and because there is less incentive to make one's own "numbers" look better if the company functions as a community rather than as an arena in which individual "gladiators" can better their own prospects. Moreover, the single most powerful influence on the operation of a firm or company is its corporate climate. John Fleming notes, "An ethical climate involves the total organization and must pervade and infuse all who work for the company."[2] Although the corporate climate is heavily influenced by those at the top, people who advance in the corporation tend to take with them the attitudes they learned before being promoted. And so, Donald Jones advises, "the best time to give ethics training to senior managers is before they become senior executives."[3]

Third, engineers should be sensitive to ethical questions because engineers who understand the ethical dimension of engineering are better and happier engineers. Engineers will be happier in a company in which every engineer understands the value of community, since a community atmosphere requires everyone's participation and it is more pleasant and rewarding to work in a place with a community atmosphere. Engineers who understand the "engineering way" and the values of engineering as a profession, who see engineering as serving a high social goal, will put more into (and take more satisfaction in) their work than those who view engineering merely as a way of drawing a paycheck.

From the employer's standpoint, employing ethically sensitive engineers has several benefits. First, ethics is good business. Ethical sensitivity often avoids costly situations. Although acting ethically often costs more in the short run, acting unethically usually costs more in the long run. Engineers and businesspersons are sometimes tempted to act unethically because the benefits of unethical conduct are immediate and highly visible, while the benefits of ethical conduct are often long-term and hard to calculate. For example, an employer can easily show exactly how much money is being saved when the company denies a worker a $2,000 bonus to which he is entitled. What an employer loses by treating employees unfairly, although real, is more difficult to calculate. The financial effects of a community atmosphere, of employee loyalty, of good engineers coming to work for the firm because the firm has a good reputation, and so forth are indirect. While employee motivation certainly affects productivity, it is impossible to point to the particular extra widgets produced by greater motivation. And no one can calculate precisely how many people refrained from buying Fords because of negative publicity surrounding the Pinto. Acting ethically and responsibly may prevent a costly government regulation, but no line in the budget documents the value of regulations that were not passed. No line in the budget shows the money saved by forestalling litigation as a result of good and fruitful communication with environmental groups. **So** a standard dollars-and-cents analysis will often fail to take account of the hidden but real costs of unethical decisions. Thus, a good understanding of the ethical dimensions of engineering decisions is a business neces-

sity. Gerald Ottoson contends, "Neglecting to take steps to insure an ethical corporate climate has proven to be an ill-considered risk for many organizations."[4]

Moreover, when firms and companies hire ethically trained engineers they become more marketable. Due to growing concern about ethical issues on the part of the public and regulatory agencies, a company whose engineers are ethically trained has a considerable advantage in public relations. Other companies are increasingly more likely to hire consulting firms that show a strong awareness of ethical issues. Government agencies favor dealing with a company that has a strong ethical profile. Regulatory agencies pay attention to a firm's or a company's efforts to hire ethical engineers or to provide ethical training to the engineers it already employs. Moreover, the public perceives every employee as a representative of the firm or company, and the company or firm is judged by what its engineers say and do, both on and off the job. Ethically aware engineers serve as ambassadors of goodwill, both for their firms and for engineering as a profession.

Companies further benefit from ethically trained engineers who better understand the concerns of environmental groups. **A** partnership between engineers and environmentalists, based on mutual understanding, is more productive than an adversarial relationship.

Further, companies often desire ethical engineers because ethics makes for better and more productive engineers. Ethically aware engineers are more likely to create **a** community atmosphere and show trust and fairness in the workplace. In addition, engineering is not just a job but a profession with an ethical dimension. Engineers who see

their work as part of a moral project take greater pride and satisfaction in their work, are more productive, show greater loyalty to the firm or company, and are more willing to go the extra mile. When employees regard their work as meaningful, liabilities such as turnover, accidents, and employee theft decrease, while the quality of work output improves.

Finally, since each firm functions best as a community with a shared set of goals and values, it is important that the values implicit in the firm's decisions are widely understood and discussed within the firm. Firms make better decisions when all engineers add their free and informed input.

Hiring and promotion practices illustrate some of these points. The ethical company has a model of what sort of engineer it wants to hire and promote. A company that wishes to make ethical decisions, for example, should give serious thought to the integrity and ethical commitment of an employee. **A** company that wishes to function as a community will seek to hire and promote team-spirited engineers who consider the needs and welfare of those they supervise. A company that values community will be less eager to promote abrasive, self-centered engineers. If those involved in hiring and promotion decisions do not clearly understand these goals and criteria, the company is unlikely to achieve the personnel profile it seeks. After all, the personnel profile of a company results from many smaller decisions at different levels. Moreover, because traits such as team spirit are difficult to describe or quantize, decision-makers who do not clearly understand the moral outlook of the company cannot apply these criteria correctly. Finally, traits valuable to the company as a whole are not always as

clearly and immediately useful to a supervisor. So the motivation for hiring or promoting the right people increases when those doing the hiring understand the reasons for looking for people with these traits.

In sum, the ethical profile of a company depends not only on the rules set by upper-level executives, but also on the ethical outlook and understanding of each and every employee.

A Revealing Case

Here is an example of an ethical problem that no simple rule will solve. It is a problem that any engineer might have to face. And the problem must be solved by the individual engineer, not by a committee or a superior. The case also serves to illustrate why ethics should matter to you and how to think through an ethical problem.

Case 1: While eating lunch in the cafeteria, you overhear Smith, the supervisor of another department, speaking to another engineer. Smith says that Jones appears to be on a fast track and may soon prove a rival for promotion. **So** Smith intends to lie to Garcia, Jones' supervisor. Smith is going to tell Garcia that he continually hears Jones saying that Garcia is incompetent and that Jones tells everyone that she would do the job much better than Garcia. You realize that this false "confidential" information will not appear in Jones' evaluations or personnel file and that Jones will have no chance to answer this false accusation. What, if anything, should you do about this?

Discussion: Your first response might be, "This is not my problem. Why should **I** care what happens to Jones?"

In a broader sense, you are asking, "Why should I care about ethics in the workplace?" The answer to this question relates directly to nearly everything discussed in this book. I suggest that if you do not care about Jones and if you do not care about injustice, then you are not only doing wrong: you are also hurting yourself. You must understand how you hurt yourself by not caring about ethics, for the two points made in the following pages lie at the center of engineering ethics. In the short run, ignoring ethics is often profitable. It sometimes seems more practical not to do the right thing. But, as I suggested above, in the long run, if you are not ethical, you will pay for it. From the corporate standpoint, as we saw, ethics is good business. From the individual's standpoint, you are better off doing the right thing. **So,** before you read about what to do in Case 1, let us pause a minute to consider two major reasons why you are losing out if you do not care deeply about ethics.

Cut-Throat versus Community *Workplaces*

Two sorts of workplaces exist: the cut-throat workplace and the community workplace. In a cut-throat workplace, people are concerned only about themselves, about advancing their careers or getting by as easily as possible. In a cut-throat workplace, people will lie, stab each other in the back, sabotage projects, and exploit each other. In a community workplace, people care about each other because they are working toward common goals based on common values.

Clearly, working in a cut-throat workplace has major disadvantages. First of all, it is not much fun, nor is it

conducive to good work, to deal with people who distrust each other. If you are always wondering who is about to do what behind your back, and if your fellow workers are only out for themselves, you will not enjoy coming to work, and you will do less than your best. If nothing else, you will spend too much time protecting your back. This drawback is especially serious for engineers, since good work requires teamwork, and teamwork requires trust. Moreover, in a cut-throat workplace, where work is merely a means of drawing a paycheck, the forty or so hours a week one spends at work seem like unrewarding drudgery. In a cut-throat workplace, engineering becomes just a series of tasks, rather than a worthwhile project. After all, no one would put changing the oil in her car on her list of favorite ways to spend a Saturday afternoon. Yet, for many people, being part of a winning racing team is exciting, even if one's job on the team is to change the oil. Regarded merely as a task, changing the oil is a chore. Regarded as part of a cherished project, it can be fun and rewarding. The same is true of engineering. The engineer who takes pride in being part of the team developing a socially useful product will enjoy his work. The engineer who views his work as just pushing keys on a computer will not. Since work constitutes such a large part of one's life, the difference between a community workplace and a cut-throat workplace can mean the difference between a happy life and an unhappy one.

Thus, any thoughtful engineer cares very much about the corporate environment. It should be important to you whether the company for which you work is a place in which people sabotage and exploit each other or a place

characterized by honesty and fair dealing. It makes a big difference whether you work in a cut-throat or a community workplace. But establishing a good community atmosphere requires everyone's participation. **So** by caring about other people, and acting to promote fairness and decency in the workplace, you are helping yourself. By contrast, if you do not care about Jones or injustice in the workplace, you are fostering a cut-throat, not a community, workplace.

The Consumer Life versus the Life of Values

Jones is your problem for another important reason. **A** person may lead one of two kinds of lives: one way becomes a dead end; the other way requires caring about what happens to Jones.

Consider two different ways of leading one's life. We can live "consumer lives," or we can lead lives dedicated to intrinsic value. The consumer life centers on personal enjoyment or "goodies" of one sort or another: a consumer life is just one ''kick'' after another. The consumer need not be "materialistic": the commodities he seeks may be love or personal excellence. The point is that he regards them as commodities. He does not, for example, regard human love as a good thing for its own sake, as intrinsically valuable whenever it occurs. Rather, he wants to be loved as one might desire to own a television or a trophy, so as to feel prosperous in the goods of life. He wants love as one might desire a sofa, a massage, or a piece of chocolate cake—namely, for the good feeling one gains from consuming or owning them. Of course, everyone enjoys an occasional "goodie." Enjoying your VCR does not mean you are living a "consumer life." The point is that the

"consumer" is driven by the restless need to satisfy personal desires for a Mercedes, a VCR, fashionable clothes, power, excellence at tennis, or whatever. He sees fame, love, and personal accomplishment only as goods to be obtained to satisfy his personal desires, and the thrill of obtaining them gives his life its meaning.

Put another way, the consumer has desires but no values. What we ***desire*** is what we want for ourselves, what it makes us feel good to have. For example, if I desire courage, then I want to be courageous, and it makes me feel good when I am courageous. What we ***value*** is what we think good for its own sake, quite apart from ourselves. If I value courage, then I want others to be courageous, and I am pleased by courageous acts that have nothing at all to do with me. In short, because I believe in courage, I want the world to be a courageous place. Of course, we usually also desire what we value. If courage is a valuable thing, then of course I want to be courageous. The point is that some people want to be loved because they value love. The consumer does not value love, he merely wants it.

We are constantly being urged to pursue the consumer life. If we listen to advertisements on television, we might think that life is about having sexy nails or about grabbing a six pack of beer and a six pack of women, as one commercial seems to suggest. But the consumer life is a recipe for failure. Anyone who lives the consumer life is necessarily isolated and unhappy.

The consumer is necessarily isolated because no one else can feel what you feel, and so enjoying "goodies" is basically a private project. If you are a consumer, other

people serve only as a way of getting commodities. If your goal in life is to enjoy "goodies," what kind of marriage can you have? Since you only care about obtaining goodies, what can your spouse be for you but a tool to help you obtain consumables, to help you feel more personally excellent, or to provide sex, or financial support, or affection, or amusing company? In short, you and your spouse are allies only as long as you remain useful to each other in acquiring your own private goodies. The moment you become a net liability in your spouse's search for goods, your spouse will leave you. After all, you are merely a tool. Why keep a tool that no longer works? Thus, you are basically alone in life, no matter how many friends you seem to have.

The consumer is necessarily unhappy, since the consumer life is by nature a losing game. Once a "goodie" is obtained it loses its allure, and so the consumer is always restlessly moving on to the next "goodie." Success does not last, since goodies do not last and there are always more goodies to be gotten. Perhaps you worked hard through college, hoping to earn enough money in your career after graduation to buy an expensive sports car. Finally you earn **$60,000** a year. You buy the sports car, and every morning you walk out on the driveway and say, with a thrill in your voice, "This baby is mine." You feel great—for a week. But before long, you take the sports car for granted: it is just your car. You need a new kick. If only you earned $100,000 a year, you could buy that new house. **So** you work hard, and finally you buy the house. You wake up in the morning, look around you, and say, "This house is mine.'' You feel

great—for a month. But before long, you need a new kick. If only you earned $150,000, you could buy an Olympic-sized swimming pool.

The cycle is endless because a commodity, once enjoyed, is gone, and you must start over from scratch. The more you have, the more it takes to produce the thrill. Your first car gives you more of a thrill than your tenth. (The life of the consumer, though more respectable, in many ways resembles that of the drug addict.) So you will be forever dissatisfied, no matter what you have, unless you have everything, in which case you will be bored. Either you never have enough, or you have so much that you are desperately looking for something else to want.

The point is that the consumer life lacks structure and so shows no progress. For example, if my goal is to further knowledge for its own sake, then each small step I take has meaning in a larger enterprise, and later in life I could find satisfaction in knowing that I had played some part in expanding the horizons of knowledge. The consumer life does not allow for this: buying two sports cars brings one no closer to a goal, for the only goal of the consumer life is having more goodies, and the number of goodies is endless. The consumer life, thus, is a barren life. Either the consumer is either dissatisfied, always hungry for more no matter how much he has, or he feels jaded and bored when there is nothing left to hunger for. There is simply no way to win at this game.

The alternative is to lead the life of values. Instead of seeking ''kicks,'' one may be driven by a recognition of value, committed to things that are good for their own sake, independent of one's having them. I might, for example,

value understanding as a good thing—worthwhile for its own sake—and dedicate my life to understanding. If I do **so,** I become immediately invested in other people's lives. After all, if I value understanding for its own sake, then what I want is not just for me to understand many things, but also for this world to be full of understanding. Then my goals and projects mean that I care about other people's understanding, about the frontiers of human knowledge. I have a stake in other people's education. I am happy and satisfied to the extent that I learn something, because I view learning Spanish or quantum physics as a step in a larger process. Moreover, I am happy and satisfied to the extent that others learn, since I value understanding itself, quite apart from anything that happens inside my own head. It means something to me if scientists I will never meet learn something about the structure of the atom that I will never understand.

Similarly, if I value excellence at tennis for its own sake, I appreciate excellence in other tennis players and have a stake in their becoming good at the sport. Put another way, **I** see myself not as an isolated player playing my own game but as part of a communal project, a joint human enterprise pushing toward the unknown, or pushing toward new heights of excellence at tennis. **My** fellow citizens and I are mutually invested in each other, because we are dedicated to a common goal and because we all see the knowledge and tennis skills each of us gains as good things in their own right.

This is why it is so important for the engineer to see engineering as a calling, to embrace the values of the engineering profession. The engineer who does **so** is not

alone, for she is part of the engineering community. Every engineering advance, no matter who makes it, is a personal victory. Because she values human excellence for its own sake, the engineer takes pleasure in every form of human excellence and sees her own life not as a collection of meaningless events but as progress toward a worthwhile goal, the search for excellence. And every other engineer who values excellence wants her to succeed, because they are all part of the same team, striving for a common goal. Her life is meaningful and happy.

I suggest, then, that the only life not doomed to misery and failure is the life of commitment to value, a life that gives us a stake in each other because we are committed to a common enterprise. If I lead a life committed to value, I care about things like injustice. ***So*** **I** will care about what Smith proposes to do to Jones.

What Should I Do?

To avoid being lonely and frustrated and to avoid working in a cut-throat workplace, you have to care about justice and fairness, and you have to care about the corporate environment. These things affect you and are morally important. To the extent that you commit to these things, Smith's plan is your enemy. ***So*** in a very real sense, this ***is*** your problem.

That you recognize Smith's plan as your problem does not necessarily mean you ought to *do* anything. Part of being an ethical engineer is knowing which battles to fight and which to sit out. In some cases, doing nothing may be the ethically appropriate choice.

The point is that you have to make an ethical choice

here—you must give serious thought to what is right. **A** careful moral decision is called for. **A** wide range of choices confronts you, including doing nothing, sending an anonymous note to Jones, having an informal chat with Jones, speaking with or sending an anonymous note to Garcia telling her that Smith's claim is false, threatening to expose Smith if he carries out his plan, speaking to your own supervisor, and lodging a formal complaint against Smith. What should you do?

To simplify matters, we will consider four options: do nothing, speak to Garcia, speak to Smith, and speak to Jones. There are, of course, many ways you could do each of these. Even if you decide, say, to speak to Jones, you must decide how to play it. Ethical thinking requires creativity in part because of the enormous variety of circumstances and possibilities that engineers confront. In fact, in virtually all of the cases we will look at, there are more options and factors than **I** can discuss. **I** can merely show you some of the relevant factors and possibilities and how they play out.

If the threat to Jones is minor, and if you are not in a position to do much about it, you may decide to sit this one out, since you are not directly involved (it is not your department, you are not being asked to carry out an immoral order, and you are not responsible for overseeing personnel matters). For example, if Garcia is very fair minded, knows what Smith is like, and so is likely to ignore what Smith says, the best course may be to stay out of it. "Don't fix what ain't broke," as the saying goes. (See "When to Fight a Battle" in Chapter 4 for further guidance.)

Suppose, however, that the threat to Jones is serious and you are in a position to do something about it, so you decide that you cannot, in good conscience, do nothing. Which approach is morally best?

There is no simple rule for deciding this, but you can evaluate ethically the options open to you. You could speak directly to Garcia; however, there are four reasons for not choosing this option. First, Garcia will not know what to make of your claim, since it will be your word against Smith's. Second, fairness to Smith requires that you hear his side of things before reporting him. After all, you may not know the whole story: it is always possible that something Smith has to say could change your whole view of things. (See "Treating Others Fairly and Well" in Chapter 4.) Thus, by going directly to Garcia, you are being unfair to Smith. Third, Jones ought to have some voice in what happens, since she is most directly involved; by speaking with Garcia you deprive Jones of the opportunity to take responsibility for her own fate. Thus, going directly to Garcia would violate Jones' autonomy. (See "Autonomy" in Chapter 4.) Fourth, by involving Garcia you disrupt the normal operation of that department and its channels. While it is sometimes necessary to do this, it is always preferable, when feasible, to respect proper channels.

These reasons suggest that you should speak to Smith or Jones before Garcia. Should you go first to Smith or to Jones? If you approach Jones first, you are being unfair to Smith, since you give him no chance to present his side. But if you go to Smith first, you violate Jones' autonomy. Since there is a good reason not to speak first to Smith and

a good reason not to speak first to Jones, we have to weigh these reasons and see which, in this case, is more important.

On the one hand, because Jones is not Smith's peer or superior, talking to Jones first is unlikely to cause severe harm to Smith: usually, fairness to Smith will not be severely compromised by speaking to Jones before Smith. On the other hand, since talking to Smith might have important consequences for Jones' career, it should be Jones, not you, who decides whether and how Smith is confronted. Usually, Jones' autonomy would be severely undermined if you spoke to Smith before you spoke to Jones. However, if you have reason to believe that, if you spoke privately to Smith about the matter, Smith would not "take it out on" Jones, or if you have reason to believe that Smith could be seriously hurt if you tell Jones what you heard, then you might weigh these factors differently. Moreover, if a few informal words reminding Smith of his ethical obligations would deter him, that would be the best solution for all involved.

So, ordinarily, the best course would be to speak to Jones first, telling Jones that you are willing to discuss the situation with Garcia if Jones wants you to. However, in some circumstances it would be better to talk to Smith privately and, if you are not satisfied, then speak to Jones. Although it is generally better to handle this situation informally, in some circumstances using formal channels is preferable. You must ask yourself to what extent there are significant legal ramifications and to what extent using formal channels would protect you, Smith, and Jones.

In general, your decision must be influenced by factors such as these: How responsive to ethical concerns are the

individuals involved? Are there likely to be vindictive repercussions for you, for Jones, for Smith? Are you likely to do more harm than good by taking action? Do you know any of the individuals well? For example, if you know Garcia well and know that she will not jump to conclusions, it might prove best to voice your concern to her, knowing that she will not take any action until she investigates thoroughly, in a way that is fair to both Smith and Jones.

In short, although general considerations can provide guidance, your decision must take into account the character of the corporate setting and the individuals involved. Thus, each case is somewhat different and requires judgment in weighing a variety of factors.[5] No rule book concerning personnel matters can tell you what to do in every case.