Chapter 6

The Global Business Environment: What Engineers Should Know

Chapter Objectives

Having read this chapter, completed the included exercises, and answered the associated questions, readers should be able to

- with reference to the case of Toshiba Machine Tools, note and explain conflicts in values that can arise when conducting business in global environments and the importance of perceived differences in cultural and social values in these contexts;
- describe the role of and justification for the importance of ethics in business contexts and how these would be different from engineering ethics in general;
- with regard to business environments, list and explain the justifications for the six principles of ethics for organizations and the six principles of ethics for employees, giving examples of where they were or were not followed in the Toshiba Machine Tools case, and why they would be important;
- explain how engineering functions within the context of business environments, noting points of convergence and divergence in business and engineering ethics, as well as potential conflicts between the two;
- describe the importance of ethical engineering to business, noting its relation to brand recognition and national reputation, with regard to the case of the Volkswagen emission scandal.

CASE STUDY ONE—WHEN BUSINESS AND POLITICS COLLIDE: THE CASE OF TOSHIBA MACHINE TOOLS

In 1987, one of the most prominent pictures of the year was US House of Representative members smashing a Toshiba boom box on the steps of the Capitol in Washington, DC. This demonstration was, in part, a display of frustration with long-running US-Japan trade disputes, although its immediate cause was the involvement of a Toshiba subsidiary in the sale of technology to the Soviet Union. As Chapters 4 and 5 explain, certain engineering ethical responsibilities follow from the primacy of public safety. However, contemporary

engineering activities rarely take place in isolation. They almost always occur in broader contexts, where engineers occupy multiple roles and have to navigate competing and—at times—conflicting duties that result from these roles. As with Hurricane Katrina, the Toshiba Machine Tools case continues to introduce readers to these broader contexts, specifically, those of business and politics.

The case of Toshiba Machine Tools had its origins in the work of the now infamous John Walker spy ring. In 1980, Walker alerted Soviets to the fact that the major reason it was easy for the United States to detect Soviet submarines was the noise their propellers made. US listening posts were able to detect the submarines up to 200 mi away, with 90% of the noise produced by the propellers. As a result of the information obtained from Walker, the Soviets explored ways of lowering sounds from the propulsion systems. The solution lay in more accurate and standardized milling of the propellers—grinding the propellers into shape. At the time, this was beyond the technical capabilities of the Soviet tool industry, but not that of the Japanese (Triplett, 1988, pp. 9–10).

After initial contact with Wako Koeki, a Japanese trading firm, on Apr. 24, 1981, a contract was signed between the following parties: C. Itoh & Co., Japan's largest trading firm; Toshiba Machine, 50.2% owned by the Toshiba Corporation; Kongsberg Vaapenfabrikk, a state-owned subsidiary of the Norwegian Ministry of Industries; the Soviet Technological Machinery Corporation; and a number of KGB agents (Triplett, 1988, p. 8). The contract called for the delivery of eight computer-controlled milling machines, four 9-axis machines, and four 5-axis machines. Toshiba Machine was to provide the hardware and Kongsberg the controllers for the 9-axis machines, with Toshiba Machine supplying its own controllers for the others. The total value of the contract was $17 million (Cook, 1987, p. 42; Kapstein, 1987, p. 65).

Although this appeared to be an ordinary business arrangement, it was illegal under both Japanese and Norwegian law. Both countries were signatories to the Coordinating Committee for Multilateral Export Controls (CoCom), which was established to control the sales of strategically important western technology to the Eastern-Bloc countries—countries allied in various ways with the Soviet Union. The membership of CoCom consisted of all of the NATO countries, with the exception of Iceland, and the addition of Japan. Under CoCom regulations, it was illegal to export any milling machines with more than two axes to Soviet-bloc countries (Goldman, 1987, p. 20).

The 9-axis machines were huge, standing three stories tall and weighing approximately 250 tons each. They were capable of grinding in nine different directions at the same time, with a tolerance of less than 0.01 mm. The machines could do so on propellers of up to 40 ft in diameter. They had a special feature that allowed them to grind both faces of a propeller blade simultaneously, thus decreasing the deformation caused by pressure from the grinding process and producing a much thinner blade than would otherwise be the case (Triplett, 1988, p. 9).

At the time, all machine tool exports from Japan to the Soviet Union required an export permit. For this reason, instead of permits for the 9- and 5-axis machines actually shipped in 1983 and 1984, C. Itoh & Co. applied for a permit to send a set of TDP 70/110 model two-axis machines, thereby circumventing CoCom regulations (Goldman, 1987, p. 20). Kongsberg also falsified its export papers. The claimed destination for the machines was an electric power plant in Leningrad, but to "install and demonstrate the machinery, Toshiba and Konesberg (sic) technicians traveled not to an electric power plant, but to Leningrad's highly secret Baltic shipyards" (Goldman, 1987, p. 20). As a result of the sales, Soviet submarines reduced their noise-detection levels from the previous 200 to 10 mi (Triplett, 1988, p. 10).

In Dec. 1985, details of the sale began to emerge when Hitori Kumagai, a "disgruntled" employee and Moscow manager of Wako Koeki at the time of the sale, wrote a "whistle-blowing" letter to the chairperson of CoCom (Koepp, 1987, p. 53). "Kumagai named names and dates, identified equipment by model number and destination, and described the intended Soviet use. He signed the letter including his address and even his telephone number. His letter included copies of all the secret contracts and an inch-thick technical attachment of engineering drawings" (Triplett, 1988, p. 10). CoCom forwarded the information to the Japanese Ministry of International Trade and Industry (MITI), an agency responsible for export controls. It replied that Kumagai's charges were groundless (Triplett, 1988, p. 10). In 1986 and 1987, the Japanese MITI continued to deny the charges after being approached on a number of occasions by US officials.

On Apr. 28, 1987, *The Detroit News* published an investigative report based on leaked information, finally bringing the case to public attention. Within days, police raided sites of the Japanese companies involved. Initially, the president of Toshiba Machine denied the charges. Later, it was reported that, inside "the company, a full-scale cover-up was under way, in which employees incinerated documents by tossing them into factory furnaces" (Koepp, 1987, p. 53). By the end of May, two executives from Toshiba Machine had been arrested, and on Jul. 1, Sugiichiro Watari, the president of Toshiba Corporation, and Shoichi Saba, its chairman, both resigned ("Hard Pounding," 1987, p. 64).

These rather drastic actions by Toshiba Corporation executives were, in large part, the result of US reactions to publicity surrounding the case. Just prior to these resignations, the US Senate passed a bill—with a 92–5 vote—preventing the Toshiba Corporation and Kongsberg from selling any products in the United States for 2–5 years. Estimates placed Toshiba losses in US sales at $2.3 billion per year, and losses in Toshiba US operation jobs at 4000 ("Making Amends," 1987, p. 49). Estimates placed costs associated with the United States regaining the technological edge it had lost to the Soviet Union due to the sales of these technologies at $8–40 billion (Triplett, 1988, p. 8; "Toshiba Bans," 1987, p. 27; Copeland, 1987, p. 40).

Toshiba Corporation responded to the Senate bill with a $100 million advertising campaign in the United States, including full-page apologies in

60 newspapers, with the headline "*Toshiba Corporation Extends its Deepest Regrets to the American People*" (Chandler, 1987, p. 11). It also rallied the support of Toshiba-related suppliers and customers in the United States and the support of officials in states with US plants (Dryden, 1987, p. 58). In response to the crisis, the Norwegian government broke up Kongsberg, selling off its assets to 13 other companies ("Norway Is," 1987, p. 32). For its part, the Japanese government promised to tighten its export control system, adding new inspectors, extending the statute of limitations on export violations, and punishing the Japanese companies involved (Triplett, 1988, p. 12). By the fall of 1987, in the United States, as a consequence of these actions, the possibility of sanctions and retaliation faded from public consciousness (Dryden, 1987, p. 58). In Japan, however, the effects were longer lasting, demonstrating a different perspective on the case: "The sledgehammer scene, which was largely ignored by the American media, was shown over and over again in Japan, to the point where it now lodges uneasily in the collective national consciousness" (Packard, 1987, p. 348).

While many in the United States viewed the sale of the milling machines as an issue of international security and another instance of Japanese companies putting profit above all else, most in Japan saw it as another in a long series of occasions by trade competitors to bash Japan. To the Japanese, the US response ignored widespread violations of export regulations by countries other than Japan. Even in this particular case, the role of the Norwegians seemed to be largely ignored. A US writer reflected this sentiment: "The Soviet Union and Norway played key roles in the intrigue, too. But no one in Washington suggested banning wheat sales to Russia—and no one was smashing cans of Norwegian sardines outside the Capitol" (Copeland, 1987, p. 40).

The Japanese were particularly upset that Toshiba Corporation was being held responsible for the actions of an only partially owned affiliate: "It's terrifying to think that we could be held responsible for an affiliate's wrongdoings" (Armstrong et al., 1987, p. 86). Indeed, many of the articles referred to here abbreviate "Toshiba Machine" as "Toshiba," such that confusion among the US public and political establishment could be expected. Perhaps, most crucially, however, was the fact that Toshiba Corporation's top two officials resigned as an act of responsibility for the illegal sale. "In American terms, the resignations of the top two executives amount to an admission of guilt on the part of Toshiba. But it is difficult to agree that the responsibility extends to the parent company, Toshiba" ("Toshiba vs.," 1987, p. 18). In taking the typical Japanese action of resigning as an apology for the entire organization, Japanese commentators felt that Toshiba had opened the way for Americans to vent their anger over trade relations: "Meanwhile, back in Japan, commentators were suggesting—with almost no dissenting opinion—that the United States had made Toshiba a scapegoat for its own economic problems" (Chandler, 1987, p. 11).

Economic issues certainly played a major role in the case. Even while the US Department of Defense argued for making an example of Toshiba, the US

Department of Commerce was concerned about the economic effects of potential sanctions. These concerns eventually won out (Dryden, 1987, p. 58). This undermined the arguments of those who sought to blame the Japanese government for the entire matter, focusing on the role of the MITI in trade transactions. They alleged that the MITI not only stalled any serious investigation of the sale but also advised Toshiba Machine on how to circumvent CoCom restrictions, according to *Yomiuri Shimbun*, a leading Japanese newspaper (Chandler, 1987, p. 12). This case also initiated a wider discussion regarding the role of international trade restrictions on transfers of technologies. As one commentator mused, "technology now moves so fast that what is exotic and strategically important today is likely to be mundane and easily accessible tomorrow" (Goldman, 1987, p. 73):

- Discuss the function of apologies in different cultures. What lessons about the internationalization of engineering can we learn from this?
- Do you believe Toshiba Corporation shared in the responsibility for what happened with Toshiba Machine? Why or why not?

EXERCISE ONE—THE CASE OF TOSHIBA MACHINE TOOLS (PART ONE)

Complete the case-study procedure with regard to information given in the case of Toshiba Machine Tools above.

6.1 ENGINEERING AND BUSINESS ENVIRONMENTS

This chapter examines business environments. Since a great deal of engineering activities occur in such environments, it is important for engineers to take into account principles of business ethics in making ethical engineering decisions. Again, this reflects the somewhat atypical approach taken here: considering engineering ethics in a contextual fashion. Acting as though engineering occurs in isolation—apart from other aspects of social and economic life—is unreasonable. In this regard, the most important and influential factor to consider is the nature of the working lives of engineers, most of whom are employees of companies. Before being able to discuss engineering ethics in business contexts, however, clarification regarding the nature of business is necessary.

6.2 THE NATURE OF BUSINESS

Business exists to produce and develop goods and services for exchange, exchanging these for other goods, services, and money. Socially determined criteria form the specific basis in terms of which business is organized—in other words, business need not exist in any one form. Questions concerning the forms business should take to maximally benefit human existence have given rise to

historical conflicts. Thus, to further explore business environments in a general sense—as with a global approach to engineering ethics—several assumptions are necessary.

From a theoretical and prescriptive perspective, significant debates exist regarding the ethics of different types of business practices. From a practical and descriptive perspective, however, worldwide business currently exists in one dominant form: private enterprise aimed at profits. This is the first assumption, as most global business occurs or is moving in this direction. This includes both China and India, the world's two most populous countries, which previously emphasized state-owned and state-controlled business institutions. Although considering business in terms of privately owned and capitalistically motivated enterprise is by no means a necessary assumption, given its relevance from a global perspective, this is a useful assumption.

Even within the framework of capitalism, however, a further distinction is necessary: businesses where the owners also run the company and enterprises where ownership is separate from management. The latter generally relies on investors who hope to profit, having taken on financial risk by investing and potentially losing their money. This is especially true of public companies, which raise money by issuing and selling stocks in the company through initial public offerings (IPOs).

Especially early in their careers, engineers typically work in enterprises run by management in large-scale corporations. Thus, the second assumption is as follows: ethical issues related to employees and managers in such corporations are the most appropriate focus. Making this assumption regarding the form of business to use as a foundation for analysis does not, however, imply a judgment about this form being right or any other form being wrong. This decision simply reflects the current state of affairs and anticipated trends in the near future.

The final necessary assumption is as follows: an individual corporation is itself a legal entity apart from its employees. In US law, for example, corporations have the status of "persons." Corporate managers thus act as agents for this entity and are bound to represent its interests, even though, in reality, corporations are owned by thousands, if not millions, of individuals. This fact often raises questions regarding in whose interests a business is actually being run, those of investors or managers.

Although this may be in dispute, on the "agency theory" businesses should be run in the interests of investors.[80] Given the assumption about human nature from Chapter 1, these investors are primarily interested in gain for themselves in return for their investments. Investors are interested in profits. The question then arises concerning the extent to which ethical considerations should limit the pursuit of profits.

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80. Regarding agency theory and the nature and history of corporations, see, for example, Shapiro (2005), Eisenhardt (1989), Davis (2013), and Chandler (1990).

6.3 THE ROLE OF ETHICS IN BUSINESS

Some have argued that ethics does not apply in the realm of business, perhaps most prominently Albert Carr. They claim that business is like a game with its own separate set of rules, the laws according to which businesses operate. An analogy to this situation would be the following: in normal life, one person punching another for no reason would be unethical. In the boxing ring, by contrast, that would be expected and not unethical.[81] In a similar vein, the analogy runs, although taking advantage of someone is generally considered unethical, in business, this would be expected, assuming no laws are broken.[82]

The claim that business can be separated from other aspects of life, however, seems suspect. In business, the same kinds of ethical rules are needed as in life in general. Otherwise, institutions fail to function. Physically harming a competitor to eliminate competition is just as wrong in business as physically harming a rival for a love interest—aside from any laws regulating behaviors. Furthermore, the effects of business activities are not limited to the realm of business. Business activities clearly have serious consequences in all other aspects of life. Business actions thus have ethical import. To an individual harmed, the source is irrelevant; the harm still exists. Finally, when looking at the world, people obviously make ethical judgments about the actions of people in business, a trend gaining in momentum.[83]

In business contexts, another question concerns to what or whom ethical responsibilities should be assigned. If corporations are persons, then they are persons in rather unusual ways, specifically, ones that only act through other actual persons. Thus, should corporations be held accountable for their actions? Should managers be held responsible—since they act on behalf of corporations but are not actually corporations themselves?

In terms of ethical responsibilities, answers to these questions have clear implications for determining and assigning degrees of praise and blame. If only corporations should be held responsible, then this undermines moral justifications for laws punishing corporate managers and other forms of ethical judgments. Additionally, on this view, corporate managers should only be responsible for actions that run counter to the wills of corporations. This result seems unsatisfactory, however, since actions are ultimately only ever decided by actual persons. For these reasons, ethical responsibilities should govern the actions of managers, even when they are acting on behalf of corporations.

A final question concerns toward whom or what managers have ethical responsibilities. A common form of framing this debate is the "shareholders" versus "stakeholders" perspectives. The shareholders view asserts that managers are only responsible to the interests of investors—to seek profits as long as

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81. See especially Carr (1968) concerning this view.
82. On this perspective, see Hasnas (1998).
83. This has been especially true since the 2007–09 financial crisis and Great Recession.

ethical rules are maintained. The stakeholders view asserts that managers are ethically accountable to all of the stakeholders of corporations—all those affected by the actions of corporations. Typical stakeholders would include employees, suppliers, customers, governments, local communities, and so on. Against the traditional dominance of the stockholders view, the stakeholders perspective is becoming ever more prevalent.[84] This view is clearly more in line with the claim that ethics is about actions that have the potential to seriously impact the lives of others—as opposed to simply considering the effects of actions on a few, as does the stockholders view. If one grants that ethics should have a role in business, then balancing the effects of business actions on various constituencies should be considered:

- Can you think of actions or practices that would be ethical in business environments but unethical outside of business environments? If so, then list and explain these.
- Why do you think the role of a manager is important when considering stakeholders and stockholders?

6.4 ETHICAL PRINCIPLES FOR BUSINESS: THEIR DIFFERENCES FROM ENGINEERING ETHICS

Once the claim is accepted that ethics should have a role in business, the next step consists in determining the nature of ethical actions in this context. Developing a few basic principles for ethical business is possible, although this development is not as complete as it should be in relation to engineering. These principles will be established on a foundation different from that of engineering ethics: a combination of role responsibilities and the broad ethical duties that follow from being human in general, rather than an engineer specifically.

This difference is based on the fact that expertise is typically not required to engage in business—with the exception of certain business functions, such as accounting—unlike the expertise required to be an engineer. To run a business well, it might be argued that special training is helpful, for example, completing an MBA degree. However, expertise is clearly not a requirement, as can be seen in counterexamples: Bill Gates and Mark Zuckerberg both amassed fortunes after dropping out of university. By contrast, education in engineering is a minimal requirement to be an engineer. Business ethics is, thus, a form of more traditional applied ethics, where general ethical principles are applied to specific contexts, rather than one where special responsibilities follow from the specialized nature of business itself.

As was mentioned above, businesses can be considered in two ways: from the perspective of organizations and from the perspective of individuals. In the case of the second, a further distinction is necessary: managers—those who

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84. For an overview of these two positions, see Smith (2003).

make decisions on behalf of the organization—and other types of employees who follow directives. Managers are simultaneously both agents and employees of corporations.[85] The applications of these ethical principles are different for corporations and employees. The following examination takes place along the lines of this division, in terms of organizational ethical principles and ethical principles for employees.

The ultimate aim of profits within business does not eliminate general ethical obligations. Those ethical principles that apply in everyday life should also apply in the realm of business, with the addition of special role-related obligations: for managers, the primary role is based on the relation between superior and subordinate; a position of authority creates special obligations on behalf of the organization. Likewise, a position of subordination creates special— although different—duties for employees. Thus, the following is a list of organizational ethical principles that seem important to highlight in the contexts of business, along with justifications for their importance.

6.5 ORGANIZATIONAL ETHICAL PRINCIPLES

The following list of ethical principles for organizations is not the same as those generally included in the now common "value statements" of organizations. These value statements embody the ideals toward which the organizations and their members should strive—what particular organizations stand for. These value statements embody attempts to go beyond the minimal level of ethics expected from all corporations in general; in other words, they represent superior sets of values.

6.5.1 Corporations and Harms: Through Their Actions, Corporations Should Endeavor to Avoid Producing Unnecessary Harms to Those in and Outside of Their Organizations

The basis for this principle is the more general claim that human life should be respected, discussed in previous chapters. As was noted before, however, the interdiction against "harm" is not absolute, especially the potential for financial harms resulting from business operations. If such harms were to be avoided altogether, then businesses would cease to operate. Thus, it is necessary to balance the potentially positive and negative effects that follow from such operations.

Additionally, unlike in engineering, in the realm of business, people can be expected to take responsibility for their own actions; they are capable of

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85. The term "manager" frequently evokes images of middle-level managers, hapless and browbeat, sandwiched between lower-level employees who detest them and upper-level executives on whose behalf they carry out directives. Here, however, the term "manager" is meant to refer to an employee entrusted with carrying out and taking responsibility for the actions of corporations.

rational decisions. Therefore, the responsibility of corporations is not to protect against harms but only not to cause unnecessary harms. According to the role responsibilities of corporations, their duties are limited, in terms of this injunction against producing harms. An exception to this limitation is the workplace itself.

In these environments, corporations have positive duties to protect workers, providing safe and healthy working environments. These duties follow from the fact that employees do not themselves create these environments. Rather, employees are placed in these circumstances. The responsibility to protect employees follows from the decision-making powers of corporations.

6.5.2 Corporations and Fairness: Corporations Should Endeavor to Ensure That All Stakeholders of Their Organizations are Treated Fairly and Justly

Again, the foundation for this claim is a more general ethical principle: justice is a precondition for people to live together in harmony. This is an especially important principle in business, given the previous assumption regarding the dominance of capitalism and the essential role that competition plays in capitalism: competition only produces results beneficial to society when carried out on a fair basis. Bribery, to gain advantage, or bid rigging, to undercut fairness, for example, result in advantages for those involved that are not based on competition, undermining the very foundations of capitalist enterprises. In other words, as established by society, capitalism can only benefit society if it is based on ethical norms.[86]

6.5.3 Corporations and Laws: Corporations Should Endeavor to Ensure That All Relevant Laws and Regulations are Followed Within Their Organizations

In any particular society, laws and regulations establish a framework for business conduct. As was mentioned previously, depending on the society, laws can vary greatly. Businesses have a duty to obey laws, as do all citizens; otherwise, society would cease to function. They are also responsible for the actions of their employees. Since laws are political instruments, as was discussed before, they can run against ethical responsibilities and, for this reason, cannot act as the final arbiters of appropriate ethical actions. For example, corporations are not obliged to follow laws that require discriminatory behaviors. Thus, corpora-

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86. Although contemporary discourse seems to cast the foundations of capitalism in no-holds-barred terms, even some of the strongest and most well informed proponents of capitalism, such as Adam Smith, Friedrich Hayek, and Milton Friedman, have recognized the necessities of regulating market behaviors. For a discussion along these lines, see, for example, Smith's Words (2013).

tions are required to analyze whether conducting business in societies with such laws is appropriate, balanced against the responsibilities to their investors to seek profits.

6.5.4   Corporations and Discrimination: Corporations Should Endeavor to Protect Members of Their Organizations Against Internal Discrimination and Harassment

This principle is grounded on the more general ethical claim to respect persons, which includes being treated fairly and with respect. Managers have a responsibility to investors to provide the greatest possible financial returns, provided this occurs on an ethical basis. Discrimination based on factors unrelated to work performance results in the waste of talent, thereby decreasing productivity. In the same manner, those exposed to harassment are unable to perform at peak efficiency, thereby decreasing returns on investments.

6.5.5   Corporations and Compensation: Corporations Should Endeavor to Make All Hiring, Compensation, Promotion, and Termination Decisions Based on Merit

At times, managers might have personal likes and prejudices. In acting on these, however, they undermine the interests of investors, for whom managers should act as agents. Managers fail to fulfill their financial responsibilities to investors if they allow personal feelings to interfere with their decisions concerning employees. Additionally, failure to adhere to this principle results in a violation of the more general ethical norm concerning the fair treatment of individuals. It should be noted, however, that this principle would be applied differently depending on the nature of the corporation: if the owners of businesses are the same as their managers, then interests aside from profits can be considered directly. If the owners of businesses are different from their managers—in other words, most corporations—then interests aside from profits are more difficult to determine. Corporate resolutions—such as votes at annual stockholder meetings—allow managers to discover such interests.

6.5.6   Corporations and Contracts: Corporations Should Endeavor to Ensure That All Legitimate Corporate Contracts are Upheld

This principle is based on the more general ethical norm that promises should be kept, which is necessary for people to live and cooperate together in relations of mutual trust. If promises are not kept, then people cannot reach lasting agreements. In business environments, promises generally take the form of contracts,

in relation to employees, suppliers, and customers. Although contracts are un-
derstood in a more flexible fashion in some cultures and societies, on an interna-
tional basis, most would agree that contracts should form binding agreements,
circumventing the needs of contracting parties to rely on cultural interpretations
or tacit understandings:

- Give three examples of how corporations endeavor to keep the public and
  their employees from harm.

6.6   ETHICAL PRINCIPLES FOR EMPLOYEES

As was mentioned above, since employees occupy positions of subordination
in relation to corporations—where corporations are understood as persons—a
separate set of ethical principles is necessary for employees. It should be kept
in mind that, despite functioning as decision-makers on behalf of corporations,
managers are also employees. Even presidents of corporations are ultimately
the employees of those who invest in corporations.

6.6.1   Employees and Directives: Corporate Employees Should Endeavor to Obey All Legitimate, Job-Related Directives

Most generally assume that employees enter the employ of corporations
based on freely contracted relations. Employees freely serve corporations in
exchange for wages or salaries. A requirement of obedience thus follows from
the nature of this exchange. Otherwise, hiring individuals would not make
sense for corporations. This does not mean, however, that any and all orders
should be followed and that any and all job-related demands are legitimate.
Directives should be in accordance with the nature of the contracted work.
That is the nature of what has been promised. In recent years, increasing rec-
ognition exists regarding the need to formalize such arrangements in employ-
ment contracts and job descriptions. Requiring employees to perform duties
unspecified in their job descriptions is unethical. Furthermore, only legal
and ethical demands comprise legitimate aspects of work contracts and job
descriptions. For example, employers cannot legitimately demand that their
employees commit murder.

6.6.2   Employees and Performance: Corporate Employees Should Endeavor to Perform Their Contracted Duties on at Least an Industry-Standard Level

As mentioned above, in entering employment contracts, employees make prom-
ises to employers to perform certain jobs. This raises a question concerning the
level at which duties associated with jobs need to be performed to be consid-
ered fulfilling contractual obligations. Employers would, of course, prefer that

employees devote all of their time and energies to their jobs. However, this is an unreasonable demand. Employees have interests aside from those of work, and doing one's best is not an ethical duty. Employees might be more highly appreciated for doing outstanding work, but doing so is not an ethical requirement. Or, employees might seek additional compensation or career advancements and, thus, do more than is required ethically. That would be their decision. An employment contract only establishes minimally required expectations. Obviously, the phrase "industry-standard level" requires interpretation, given the specific circumstances and cultural conditions in which it is used.

6.6.3   Employers and Confidentiality: Corporate Employees Should Uphold the Principle of Confidentiality in Relation to Knowledge Gained in Present and Past Employment

Private ownership lies at the very basis of capitalism. A right to property thus follows from the previous assumption of capitalism as the particular economic system in terms of which to orient a discussion of business and engineering. In this system, knowledge can be a form of property, generally viewed in the corporate world as a form of "proprietary information." This knowledge can take the form of company secrets or, more openly, the form of patents. The former requires active steps to preserve the secret information, such as restricting access to the information to certain members of the organization. Violating a duty of confidentiality with regard to such information is thus, in effect, like taking property that rightly belongs to someone else, stealing. This applies to both past and present employers, since an employee changing employment does not mean the previous employer no longer owns the information gained by the employee. This fact raises another question regarding the extent to which knowledge gained by an engineer can be used later in life.

  Obviously, not everything an engineer learns in the course of employment can be considered confidential. Otherwise, no significant external career advancement would be possible by engineers through changing employers. Requiring that engineers ignore all past on-job learning is obviously unrealistic, although previous employers would like to keep as much information as possible confidential. The use of such knowledge thus requires reasonable judgment on the parts of engineers. Another issue—which will be discussed at length in Chapter 9—is the extent to which engineers might be required to breach confidentiality based on ethical requirements related to public safety.

6.6.4   Employees and Harm: Corporate Employees Should Endeavor to Avoid Actions That Harm the Corporation in Acting on Behalf of the Organization

In working for corporations, employees should benefit those organizations. Otherwise, again, there would be no reason for corporations to employ them.

Additionally, in harming the corporations for which they work, employees, in a sense, also hurt themselves: they violate a more general ethical principle against injuring oneself, acting against their own interests. Finally, employees have a duty of loyalty to their employers.

Again, however, it should be kept in mind that individuals occupy various roles, and the working lives of individuals are not the whole of their lives: individuals also have private lives, and what they do in their private lives has the potential to harm their employers. It is by no means clear, however, that employers are justified in forbidding private actions that run counter to the interests of corporations. For example, should employees of an automobile manufacturer be permitted to drive a car built by a competing manufacturer? Corporations tend to consider all such situations illegitimate conflicts of interests. The extent to which this would be true depends, in part, on other role responsibilities engineers have, which will be further considered later.

6.6.5 Employees and Honesty: Corporate Employees Should Endeavor to be Honest in Their Business Relationships With Others

Workable human relationships require honesty. Without honesty, people are unable to trust each other and, thus, are unable to enter into fully meaningful human relationships. Although largely impersonal, corporate businesses nevertheless involve human relationships and, therefore, require honesty. Furthermore, dishonesty in business relationships undermines productivity—through the inability of dealing effectively with customers and suppliers—and results in the failure of employees to fulfill their duties to corporations.

6.6.6 Employees and Ethics: Corporate Employees Should Endeavor to Ensure That, When in Positions of Authority, They Enforce All Organizational and Employee Ethical Principles

All employees have the responsibility to act ethically, both on practical and ethical grounds. This is an individual responsibility. Those in positions of corporate authority have the additional duty to ensure that the ethical responsibilities of corporations are promulgated and enforced within corporate environments. As has been explained, these responsibilities are directly related to the fiduciary responsibilities of corporate managers, and these responsibilities comprise increasingly significant parts of the roles of modern managers. In many countries, managers can be and are held responsible for the actions of employees. In international environments, future managers should be aware of these responsibilities:

● When should employees uphold the principle of confidentiality with regard to knowledge gained from an employer? Explain your reasoning and give at least one example.

- In the Toshiba Machine Tools case, engineers were closely involved in the sale of the technology. They both demonstrated the technology to the Soviets in secret, after-hour sessions in Japan and installed the milling machines in the Baltic shipyards (Koepp, 1987, p. 53; Triplett, 1988, p. 13). What recommendations do you have for the engineers? Why?
- The Toshiba case relates to strategically important technology, which could be used for military purposes. Does this make any difference in your assessment of the case? If so, how?

6.7 ENGINEERING IN THE CONTEXT OF BUSINESS

Businesses are hierarchical organizations. This is an important feature of their structures. The degree of authority—and consequent responsibility—increases as one moves up the organizational ladder. The authority held by corporate managers is, thus, based on their positions within corporate organizations and is called "institutional authority." This authority is not directly related to competence. Rather, some have argued that employees are promoted in organizations until they reach levels at which they are incompetent.[87]

As corporate employees, engineers hold different positions within organizational structures, including positions with managerial responsibilities. As was discussed in Chapter 3, however, all engineers—regardless of their institutional roles—have "expert authority" based on their specialized knowledge and experience. In effect, this means that engineers have two sets of ethical responsibilities: one based on their roles in institutions and one based on their roles as experts. At times, these roles can conflict. Deciding which role should take precedence then becomes an ethical issue. Resolving this question depends on the circumstances of particular situations. Within the literature on engineering ethics, however, the generally accepted position has been that the role of engineer—and corresponding responsibilities based on expert authority—should take precedence, based on the responsibilities of engineers to protect the safety of the public. The most famous example on which this claim is generally based is that of Bob Lund in relation to the Space Shuttle Challenger disaster.

Bob Lund was the engineering vice president of Morton-Thiokol, the contractor responsible for the rocket boosters on the Space Shuttle Challenger. O-ring deterioration within the booster system ultimately led to the disaster. The night before NASA launched the ill-fated Challenger mission, Lund was told by his superior to "take off your engineering hat and put on your management hat," leading Lund to reverse his earlier recommendation not to launch the Challenger (Martin & Schinzinger, 2010, pp. 98–99). From the point of view of Morton-Thiokol as a corporation, institutional or managerial authority ultimately took precedence over expert authority or advice. Morton-Thiokol

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87. This is known as the "Peter principle," named after Laurence Peter, who first proposed it.

assumed that final responsibility for decision-making rested with the organization. Despite the horrific consequences of the Challenger disaster, which view should prevail is not always clear.[88]

Engineers should be prepared to have their decisions challenged, often on the grounds that managers have broader perspectives on particular situations. It might be argued that these perspectives take into account factors from outside the realm of engineering, of which engineers might not even be aware. This is especially a danger for young and relatively inexperienced engineers: they tend to view themselves as merely employees bound to the instructions of their institutional superiors, where failing to follows these instructions puts their livelihood at risk.

Additionally, in many cultures and societies, people are raised to defer to the wishes of their elders, thereby tending to obey perceived authority. When placed in rigid organizational structures, they might perceive their engineering roles in relatively narrow terms, where their responsibilities extend to completing technical assignments within pregiven constraints but no further. As has been mentioned, however, blind adherence to these constraints can result in violations of engineering ethical principles.

For these reasons, engineers should learn how to anticipate and appropriately evaluate costs and benefits associated with obedience to hierarchical authority versus exercise of professional autonomy, which will likely be required of them in their working lives as practicing engineers. This can be difficult and, for that reason, is further discussed in Chapters 8 and 9. If one recognizes the potential for conflicting duties, however—learning how to anticipate, navigate, and mitigate any potential conflicts before they arise—then the associated difficulties decrease:

● In the case of the Space Shuttle Challenger, Bob Lund was told to "take off your engineering hat and put on your management hat," leading Lund to reverse his earlier recommendation not to launch the Challenger. How should engineers resolve conflicts between business and engineering responsibilities? Which role do you think should take precedence? Why?

6.8   BUSINESS AND ENGINEERING ETHICS: POINTS OF CONVERGENCE RATHER THAN CONFLICT

Since engineers typically work in business environments, it makes sense to consider engineering ethics in these contexts. If ethical principles associated with these two domains generally conflicted with each other, however, then attempting to specify the relations between the two would be a fruitless endeavor.

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88. For a fuller treatment of the case of the Space Shuttle Challenger explosion, see Romzek and Dubnick (1987).

Beginning with the reality that most of the time engineers do successfully function in such environments leads to the conclusion that the principles associated with these two domains not only cohere but also strengthen each other. This conclusion seems reasonable. Were this not the case in a more general sense, then responsibilities associated with the various roles people occupy would constantly conflict, and human beings would be largely dysfunctional creatures. Instead, human beings seem generally capable of integrating the different roles they occupy and prioritizing the responsibilities associated with these roles. Establishing a connection of business with engineering ethics is, thus, only one example of processes in which all people are constantly engaged. Any role ethics has to engage in a similar process, integrating and prioritizing responsibilities associated with various roles. Thus, overlap exists between engineering and business ethics.

First, since neither set of principles are applied independently of specific sets of circumstances and particular contexts—including those of culture and society—neither set of principles should be considered independently from the contexts in which they are applied. More generally, this implies that ethical principles are neither applied nor considered apart from real-life constraints. Since both business and engineering ethics principles are understood as flexible, based on the processes of their applications, this provides a point of convergence between different forms of applied ethics. As was mentioned before, this justifies the centrality of studying specific cases.

Next, although business and engineering ethics share common concerns—such as honesty and legality—to a significant extent, they deal with different domains and associated issues. For example, business ethics is not particularly concerned with the implementation of new technologies, and responsibilities within engineering ethics are toward the general public rather than shareholders or stakeholders specifically. If this were not the case, then there would be no need for two sets of ethical principles. For that reason, these two forms of ethics need not conflict; they have their own respective domains of concern.

Finally, different forms of applied ethics relate to each other. The principles of engineering ethics are derived from the nature of engineering itself. Engineering is a human activity and, as such, it is based on human interactions. It shares this fundamental feature with business. That means a set of common norms governing human interactions, in general, stands at the core of both engineering and business. Their application across different realms shows that similar ethical principles function in both. In this regard, even a cursory examination of the ethical principles examined thus far reveals significant overlap between the fields of business and engineering ethics.

The avoidance of harm, for example, is emphasized in both sets of principles. This is unsurprising, since avoiding harm to others is a general ethical concern likely to arise in any field of applied ethics. This is a reminder that, fundamentally, ethics concerns the interests of others rather than simply

self-interests. For this reason, competence is another commonality within activity-based ethics.

Self-interests might dictate a desire to benefit regardless of the quality of the consequences of activities. Once the interests of others are considered, however, then competent performance is required in a wide range of human activities. As a teacher, for instance, one might wish to be paid regardless of the quality of one's teaching, but if the interests of students are considered, then how much students learn becomes relevant. Honesty is a final example of a commonality between principles of ethics in different domains.

Honesty—the provision of true information—stands at the foundation of all fair human interactions. For this reason, honesty should figure prominently in most forms of applied ethics. If teachers lied to students about the requirements to pass courses, for instance, then students would not be in positions to make informed decisions about their actions. These are only a few examples of points of commonality between the two sets of ethics discussed above. More detailed examinations by readers would reveal many more:

● Do you agree with the claim that the principles associated with the ethical domains of engineering and business "not only cohere but also strengthen each other"? Why or why not?

6.9 POTENTIALS FOR CONFLICTING DUTIES: POINTS OF CONFLICT RATHER THAN CONVERGENCE

Although overlap exists between business and engineering ethics, the potential for conflicting duties should also be recognized. Again, if this were not the case, then there would be little need to examine these two fields of ethics separately; lists of duties applicable to all employees could simply be applied to engineers, and analysis would be complete. In considering potential conflicts, the most important point to keep in mind is that the bases for making decisions in these two domains are different: decisions in business are based primarily on profits, whereas decisions in engineering are based primarily on the implementation of technologies. Based on this distinction, several sources of potential conflict can arise.

As technical experts confronted by a relatively ignorant public, engineers have a positive duty to protect people from physical harm. In business, the assumption is that people are capable of making their own decisions. Therefore, ethical obligations within business are limited to not creating harm. The stronger duty within engineering can, therefore, potentially conflict with the corporate duty of securing profits, since protecting the public generally requires financial resources. Confidentiality with regard to proprietary information is another area in which potential conflicts can arise.

As was discussed previously, on the one hand, corporations have legitimate interests in preserving information for their own uses, thereby increasing the

potentials for profits. On the other hand, in introducing technology into the world—based on the analogy of social experimentation—engineers are committed to openness in obtaining informed consent from the public as far as is possible. A final example of potential differences in emphases between business and engineering ethics concerns the groups to whom ethical responsibilities should ultimately be directed.

On the stakeholders view, although corporations should take into account the interests of all affected parties in making decisions, the interests of all parties should not receive equal weight. On the one hand, from a corporate point of view, the satisfaction of investors and customers is primary. On the other hand, from an engineering point of view, the safety of the public as a whole is primary. In working for corporations, resolving the issue of which parties have priority can become a moral dilemma for engineers.

The purpose of this section is not to resolve potential conflicts. That requires more detailed analyses. The intention is merely to note that engineers should recognize the potential for such conflicts. In addition to direct conflicts, the ranges of duties between business and engineering ethics differ significantly, as does the process of establishing obligational hierarchies between the two.

Finally, although this section has discussed the potential for conflicts between principles from different branches of applied ethics, the potential for conflicts between principles from one domain of applied ethics—within engineering ethics alone, for instance—also exists. Resolving such conflicts cannot be decided in the abstract, based on a more general ethical principle, but should be decided on a case-by-case basis. Once again, this highlights the central importance of the case-study procedure to applied ethics in general, and the importance of students not only learning about but also practicing the application of the case-study procedure.

EXERCISE TWO—THE CASE OF TOSHIBA MACHINE TOOLS (PART TWO)

Return to the second step of the case study procedure in the exercise you completed at the beginning of this chapter, where you identified the most important ethical issue in the case. Using the ethical principles for organizations and employees discussed in Sections 6.6 and 6.7, respectively, complete step 6 of the case-study procedure again. In addition to the basic ethical principles for global engineering you identified before, list any additional principles for ethical organizations and employees that would be relevant to resolving the issue you identified. If conflicts exist between these principles, then establish a hierarchy between these duties, providing a brief justification for the hierarchy you chose. Do you think this ranking in the principles should always apply or only in this case? Again, provide a brief justification for your response.

CASE STUDY TWO—VOLKSWAGEN, INTERNATIONAL BUSINESS, AND THE ENVIRONMENT

Introduction: Consequences and Ethics in Business

On Sep. 18, 2015, the US Environmental Protection Agency (EPA) concluded that the German automobile manufacturer Volkswagen (hereafter VW) violated the Clean Air Act and could be fined as much as $37,500 per vehicle as a result—in the United States alone, "up to $18 billion" (Hotten, 2015; Makortoff, 2015)—although millions of cars were affected worldwide. In Jan. 2016, the US Department of Justice sought close to $48 billion in penalties (Hotten, 2015). Since then, VW has agreed to a number of settlements totaling billions of dollars (Shepardson, 2016).

The charges related to software known as "defeat devices" installed to trick tests measuring nitrogen oxide emissions from VW diesel automobiles. Hazardous emissions from the VW cars with the software were 15–35 times higher than those measured by the fixed emissions tests (Taebi, 2015). In the aftermath, VW's stock dropped by 50%—from Mar. of 2015 to 2016—(Hotten, 2015) and Martin Winterkorn, the CEO of VW, resigned; Matthias Mueller, the President and CEO of Porsche replaced him. As a result of the software, the *Guardian* newspaper estimated that VW cars could be "responsible for nearly 1 million tonnes of air pollution every year, roughly the same as the United Kingdom's combined emissions for all power stations, vehicles, industry and agriculture" (Mathiesen & Neslen, 2015). On Oct. 6, the VW Group of America returned three Cars.com awards it had previously received for clean diesel vehicles (Mays, 2015). This case brings together issues at the center of global engineering, international business, ethics, and the environment.

Despite its origins in National Socialist Germany, VW had enjoyed a reputation for producing reliable vehicles, supporting the national engineering reputation of Germany and Germans as honest and diligent workers. A corporate ethos and reputation such as this undoubtedly contributes to the success of companies in global business, increasing revenues and profits worldwide. From this perspective, ethics makes sound business sense: companies can and do succeed in business precisely by being ethical. As the effects of human behavior on the environment become better understood, corporations that fail to adjust their business accordingly not only risk incurring legal and economic sanctions but also lose out on business that takes seriously these concerns.

Background of the Case: The Software, Vehicles, and Discoveries

Since 2009, VW cars in the United States outfitted with defeat devices "produced doctored results" when tested for nitrogen oxide emissions ("Volkswagen Chief," 2015). Analyzing "the position of the steering wheel, vehicle speed, the duration of the engine's operation and barometric pressure" (Makortoff, 2015),

the software was capable of determining whether the vehicle was in testing conditions, running a "clean program" that would reduce power and resulting emissions (Taebi, 2015). When operating normally however—driving on the road—the cars produced "emissions of nitrogen oxide up to nine times EPA's standard" ("United States," 2016).

The software had been installed in millions of vehicles: "8.5 million cars in Europe, including 2.4 million in Germany and 1.2 million in the UK, and 500,000 in the US" (Hotten, 2015). These were diesel-engine models, including Volkswagen Jettas, Beetles, Golfs, Passats, and Touaregs, as well as Audi A3's, A6's, A7's, A8's, and Q5's, and Porsche Cayennes (Brooks, 2015; Shinkman, 2015). Questions regarding the emissions of VW automobiles began as early as 2012.

From late 2012 to May 2013, supported by a grant from the International Council on Clean Transportation, engineers from West Virginia University determined "Volkswagen was cheating on US vehicle emission tests" (Kim & Pickering, 2015). They did so using on-road emissions tests, rather than those generally used, in which the car is tested while stationary. From May 2014, the California Air Resources Board (henceforth CARB) followed up, also testing VW vehicles. VW was notified of the testing and problems around this time (Lam, 2015).

VW's Response: Disingenuous and International

Once the scandal received public attention, the CEO, Winterkorn, said in a company statement that he was "shocked by the events of the past few days"—although there were indications Winterkorn knew of and ignored issues related to VW emissions going back some time (Makortoff, Boyle, & Tutt, 2015). After being alerted of the test results, VW claimed "higher nitrogen oxide emissions" were caused by "technical glitches" (Boston, Spector, & Harder, 2015), telling CARB the problem was caused by "unexpected in-use conditions" (Brooks, 2015)—in general, dismissing the findings as resulting from "technical issues and 'unexpected' test conditions" (Mays, 2015). Moreover, VW began installing defeat devices in their 2009 models, once Winterkorn was already CEO for 2 years ("Volkswagen Chief," 2015). As a German company, reactions to the VW scandal were different in Germany and the United States.

German VW executives faced less criticism. In response to the revelations, German regulators "made only the briefest of statements on the scandal, preferring to focus on how to fix the problem of the vehicles" (Copley, 2015). The German Association of the Automotive Industry (Verband der Automobilindustrie)—representing Germany's and perhaps the world's foremost car companies—remained relatively silent on the matter. Additionally, the Kraftfahrt-Bundesamt (KBA—Federal Motor Transport Authority of Germany) appeared to publicly support VW, insisting its actions called for no serious penalties: "Spokesman Stephan Immen said the KBA had no precedent of imposing

penalties on car manufacturers for wrongdoing" (Copley, 2015). As with the cases of Ford and Firestone/Bridgestone and Toshiba Machine Tools, reactions in the United States were different. Michael Horn—responsible for VW US operations—bluntly stated that VW "totally screwed up," admitting the fault of VW and promising to fully cooperate with the upcoming investigation and future regulations (Makortoff, 2015):

- Which companies and/or brands with which are you familiar have reputations as being particularly ethical or unethical? Why do they have these reputations? Which characteristics, actions, or events contributed to these reputations?
- Why do you think reactions to the VW scandal were different in Germany and the United States? Describe any potential conflicts of interest you think might have played a role in this difference.

EXERCISE THREE—VOLKSWAGEN, INTERNATIONAL BUSINESS, AND THE ENVIRONMENT

Complete the case-study procedure on Volkswagen, International Business, and the Environment using all the ethical principles introduced and discussed up to this point.

6.10   SUMMARY

As becomes clear by examining the Toshiba Machine Tools case, contemporary engineering practices rarely take place in isolation. For this reason, it is important to examine the environments, corresponding roles, and consequent duties related to contemporary engineering practices. Chief among these are the global business environment and the roles of engineers as employees. As with engineering ethics in global contexts, to better understand the relations between engineering and business, it is necessary to make general descriptive assumptions regarding the natures of contemporary business practices and environments. As with engineering, a number of principles for business ethics follow from these assumptions. These principles can be divided and explained in terms of duties applicable to organizations and those applicable to employees. As would be expected—given their mutual reference to human relations—significant overlap exists between principles of ethical engineering and business. At the same time, however, one should be cognizant of the potential for conflicting duties between these sets of principles. The point here is not to give priority to one set of duties or a particular principle in the abstract, but to be cognizant of specific points at which duties and principles have the potential to conflict. The process of establishing a hierarchy between duties and principles should occur through their application to particular cases, highlighting the importance of case studies. As the case of the Volkswagen emissions scandal exemplifies—albeit in a negative fashion—ethical engineering and the interests of business need not conflict:

ethical practices can contribute to positive corporate and national reputations, facilitating the business objective of increasing profits.

REVIEW QUESTIONS

1. List the parties involved in the contract to deliver the eight computer-controlled milling machines and their associated equipment.
2. The investigative report published by the *Detroit News* had repercussions in both the United States and Japan. How were these different in the two countries?
3. How did the MITI help Toshiba Machine avoid COCOM regulations? What effect did these actions have on the conflict between the United States and Japan?
4. List and explain the three assumptions made regarding the nature of global business.
5. List and explain at least two differences between the ethical obligations of managers and the ethical obligations of their subordinates.
6. Describe the foundations on which business ethical principles are established and their difference from engineering ethics.
7. What are the most important points to keep in mind when considering potential conflicts between engineering and business ethics?
8. Contrary to some claims, why should ethics apply to the realm of business? Provide at least two justifications and relevant examples.
9. Explain the difference between the shareholders and stakeholders perspectives, and why these definitions are significant to business ethics.
10. List the immediate and potentially long-term business consequences to VW of the emissions scandal.
11. Describe the nature of the defeat devices VW installed in their diesel vehicles—how they managed to trick the vehicle emissions tests.

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