Each of these topics is highly controversial, and each raises multiple ethical questions. The intent is not to bring ready answers to these problems but to encourage openness to others' ways of thinking about them. Because we are now a global community, it is increasingly necessary to respect the beliefs of others and recognize how differing opinions can influence the thinking about a dilemma as well as become a major part of their solution.

ACKNOWLEDGMENTS

1

Ethical Principles, Reasoning, and Decision Making

INTRODUCTION

Over the last 50 years, new technologies have emerged that have affected the lives of most people on Earth, and along with the benefits have come increasingly complex moral challenges. Each of these technologies has been associated with ethical issues that are new to humanity, have not been considered before, and have solutions that might have uncertain consequences that are difficult to predict. The issues are varied and the moral consequences are wide-reaching. Examples include the conflicts the new technologies present to basic rights of the individual when the technologies can benefit many, privacy rights in the face of the potential of widespread electronic dissemination of personal information, the conflict of the autonomy of the embryo vs. the rights of the parents, and conflicts over the use of stem cells. Other examples are the thirst for more energy vs. the duty to maintain an uncontaminated and sustainable environment, conflicts over the use of genetically modified foods and organisms, the increasing need for organ transplants vs. limited resources, and the conflict between a corporate goal of increasing profits and a company's responsibilities toward all of its stakeholders.

Globalization has led to the need for ethical decisions to be multicultural because decisions affecting one country or culture might have consequences contrary to the policies or doctrines of another country. Thus, both the unanticipated consequences of emerging technologies and globalization present new ethical challenges that must address differing scientific, political, religious, ethnic, and other beliefs and precedents. To address these challenges requires knowledge of the scientific facts. Moreover, it requires solutions that take into account the moral beliefs and theories that have been a part of decision making for hundreds of years but that often tend to be forgotten in today's fast-paced world. A third element is to learn and practice strategies or tools for assessing and prioritizing solutions to ethical problems. This book is designed to address all of these needs by reviewing technical information about the major new technologies so that the ethical problems can be discussed with the facts in mind by revisiting the major moral, spiritual, and ideological theories and by providing a means of approaching the evaluation and decision making that can be applied to each ethical dilemma.

We begin by presenting a case that exemplifies many aspects of this book; that is, how to identify, address, and work through solutions for the kinds of problems the scientist, engineer, corporation, or government body might encounter.

Case 1.1 Cellclone: Multiple Ethical Problems in Biotechnology

At a press conference held at Cellclone headquarters, it is announced that the company is offering a new service to produce customized tissues and organ replacements that are an identical genetic match for each patient. In addition, the company is offering better engineered viral vectors for the insertion of new genes into cells to restore normal cell function (e.g., gene therapy). This announcement is also made in newspapers as an advertisement, and by e-mail to a list of addresses purchased from Spam, Inc.

Cellclone is a private U.S. company with some collaboration with a university and an associated medical school. To produce the genetically matched tissues, the cell nucleus from a human egg is removed by microsurgery and replaced with the nucleus from a cell of the person for whom the tissues are being produced. Cellclone acquires eggs from female employees and also buys eggs from students with a reimbursement of $10,000. Cellclone replaces the nucleus of these eggs with the nucleus of a cell taken from the individual for whom the tissues are to be generated. This method is known as somatic cell nuclear transfer, or more popularly, cloning (in this case, not cloning to produce living individuals but cloning to produce cells that can replace diseased tissues in an individual). The particular method used for separating the various possible tissues from the growing "artificial embryo" was patented by Chinese scientists, and neither their patent nor the reference to their authorship appears in published technical reports or reports to the investment bankers. Cellclone's technical reports of the success of transplanted tissues do not include the 15% incidence of allergic reactions seen in safety studies in experimental animals. Some of these reactions occurred in nonhuman primates, where it was conjectured they were due to an incompatibility between some material in the unmatched donor egg and the recipient.

The first trials sponsored by Cellclone in human subjects involved muscle replacement. They were conducted by a medical school professor who proceeded without having the protocol methods reviewed by his institution because he was working at a Cellclone facility. He did, however, have a federal grant from the National Institutes of Health to investigate cloning using established and federally approved cell lines previously grown from embryos. The subsequent technical reports and scientific papers were authored by large numbers of individuals, including some who participated in but did not make an essential contribution to the experiments (e.g., a summer research intern, a technician who made substantial measurements).

This case presents a host of potential ethical problems that include

- The ethics of human cloning, rights of an embryo
- Theft of intellectual property (patent infringement)
- Human experimentation
- Animal experimentation
- Responsibilities of a corporation to stockholders and the public
- Professional responsibilities
- Authorship
- The risks of emerging technologies

The case represents many of the conflicts that practitioners in biotechnology face as they go about their daily work. The situations surrounding each aspect of this case have choices behind them that present ethical quandaries for the decision maker:

- There is the dilemma faced by the student who may be improperly induced by a high monetary reward to undergo surgery to remove her eggs.
- There is the unacceptable use of employees for human experimentation when some risk is involved.
- There is the problem of the medical school professor who is receiving federal funding for cloning research but is now interested in participating in research not allowed by the federal government.
- There is the question of the safety of the product being offered, given the allergic reactions that have not been thoroughly evaluated.
- There is the issue of the misrepresentation by the corporation that treats the procedure as its own without giving credit to the Chinese originators.
- There is the situation in which authors of the scientific and engineering publications have given credit inappropriately to nonessential participants.

The situations described in the case are examples of the types of conflicts and moral problems that can arise with emerging technologies. We shall discuss these issues more thoroughly in relevant chapters covering authorship, business ethics, human experimentation, and biotechnology. Before proceeding further, we introduce a strategy used throughout this text for designing solutions to such dilemmas, and review the moral theories and principles that provide guidance to analyzing the right thing to do when encountering dilemmas.

DESIGNING SOLUTIONS TO ETHICAL DILEMMAS

To help in resolving dilemmas such as those described in the above case, we introduce here the Four A's strategy, a systematic approach that can be used by individuals or institutions to design solutions to ethical problems, or to make decisions intended to prevent their occurrence. This strategy assists in organizing one's thinking about a dilemma and in coming to a decision about what action to take when there are two or more possible solutions. Even if all possible actions appear to be morally equivalent, the task of the professional is to determine the optimal solution. The strategy given here was derived from a number of sources, among them Swazey and Bird (1995), Weil (1993), Velasquez (2001), and Slossburger (1993). The Four A's strategy is simply a way to systematically apply guidelines when assessing the various aspects of an ethical dilemma so that alternate solutions become apparent and their consequences can be evaluated. The assessment includes the application of moral theories, the prioritization of stakeholders (e.g., those directly and indirectly affected by a decision), the prioritization of duties, and a formal analysis of risk where appropriate.

The four steps below form a foundation for more specific elaboration on a range of ethical problems, whether business ethics, stem cell research ethics, or considerations of risks and benefits of emerging technologies. The strategy is applicable to problems that might arise for individuals, universities, corporations, governments, or other entities.

Table 1.1   Basic Strategy of the Four A's

Approach a dilemma by a systematic consideration of the four A's (i.e., Acquire facts, Alternatives, Assessment, and Action):

- **Acquire Facts**
  - Define uncertainties, clarify ambiguities
  - Get the facts
- **Alternatives**
  - List alternate solutions
  - Develop alternate plans in parallel
- **Assessment**
  - Assess possible solutions according to the moral theories of virtue, justice, duty, rights, and utilitarianism
  - Identify and prioritize stakeholders affected by the decision
  - Perform risk analysis when appropriate
- **Action**
  - Decide on a plan or plans for action
  - Keep alternate action plans under consideration should they be needed
  - Adjust and adapt, recognizing that the process is a dynamic one and that an initial solution may require revision
  - Be open to new options

Frequently, ethical problems can be characterized by referring to conflicting moral theories. The codification of ethical behavior seldom guides us to a clear universal solution. However, through examples and case studies, the application of the Four A's strategy is a useful decision-making guide, even when no clear "best action" appears evident at the outset.

Case 1.1 contains a number of actions whose ethical basis should have been questioned. We have selected one example of the many ethical questions apparent in this case to demonstrate the applicability of the Four A's strategy outlined in Table 1.1, that is, the act of buying eggs from students.

The ethical question here is whether buying eggs violated the autonomy or rights of the students. One problem is that, because the large monetary offering of $10,000 might overly tempt students to donate their eggs, this could be considered a form of coercion. Another ethical question that might be raised is whether the donor has violated a duty not to sell body parts, but for the present, we will address the dilemma of improper coercion and the violation of the individual's autonomy. We proceed as follows:

Acquire facts:

The corporation scientists can learn from asking others what precedents have been established for egg buying. What is the experience of others in terms of price and method of acquisition? What prices are being offered in local university newspaper

advertisements? What rules have been established regarding this type of human research by the National Institutes of Health (NIH) or by the Federal Drug Administration (FDA)? Does it appear that the FDA will allow this project to proceed in the absence of its approval to proceed? Does the university have any rules barring this type of activity since it represents a form of selling of body parts that may be illegal? What will the university's Institutional Review Board (IRB, an ethics board that reviews protocols and ensures that study participants are fully informed of all aspects of the study) require in order to clear the protocol to begin? Could non-human primate eggs be used? Are there medical risks to the product that result from the manner of acquiring the eggs?

Alternatives:

There being no other alternative but to use human eggs, the corporation might consider establishing its own ethics board. One of its functions might be to establish a policy on the method of advertising and the amount of remuneration. What method of seeking volunteers for egg donation would be most feasible? Are there other procedures that need to be followed to perform the proposed research activities? Has this project been sufficiently evaluated for the company to allow it to proceed? Are there sufficient company quality assurance and clinical guidelines in place to carefully evaluate the project for early warning signs of possible problems?

Assessment:

Assess the possibilities with regard to the moral theories: Is the student egg donor being unduly coerced by the high fee you are willing to pay? Is the donor being informed of the risks of ovarian stimulation and egg retrieval? The bioethics board might be seen as a rubber stamp committee, paid by the corporation and a target for criticism. Would this board be objective in determining whether the risks to student egg donors were fully disclosed and that there was not undue monetary inducement or coercion violating the autonomy of students? Thus, in order to reduce bias in the ethics board's decision making, the board could decide to reduce reimbursement to the board members to that normally paid scientific review panels, as was done by another company doing the first therapeutic cloning (Green et al. 2002).

Reevaluate the safety of the project and whether everything has been done to assure the best interests of the egg donors and those to receive the product.

Action:

Establish the bioethics board and heed its advice. Contact the NIH to determine the accepted procedure. In evaluating the safety of the procedure to the egg donor, the bioethics board also should investigate the safety of the product itself. The bioethics board should monitor animal experiments that must be done to detect unanticipated consequences of the procedures. In the actual initial experiments, it was the bioethics board's vigilance that led to methods to avoid allergic reactions (Green et al. 2002). Thinking through the strategy of the Four A's systematically has the advantage of identifying other areas of concern, and perhaps preventing events that could be disastrous for the company.

Other ethical issues in this text are approached through similar examples and solutions. The Four A's strategy brings decision makers' thought processes to bear on a seemingly unsolvable dilemma by providing a framework for a systematic, thorough analysis. Case studies, discussions, debates, and the problem sets will help hone these problem-solving skills.

Another approach to ethical engineering practices, described by Pinkus and coauthors (1997a), can also be applied to scientific innovations as discussed in Chapter 12. The framework for evaluation of ethical aspects of new projects utilizes three core concepts described in Table 1.2. These core concepts were the common themes that evolved from analyses of large engineering projects. The ethics of good engineering goes beyond the individual and includes the responsibilities of the organization and responsibilities to the public.

EVOLUTION OF ETHICAL PRINCIPLES

To design a solution to an ethical problem requires knowledge of the principal moral theories. The major ethical theories (i.e., virtue, justice, duty, rights, and utilitarianism), as well as the concepts they have in common (autonomy, beneficence, non-malfeasance, and justice), are fundamental to evaluating alternative approaches to ethical problems. Selecting the appropriate alternative solutions is basic to selecting the right course of action. While these topics may seem abstract and even dry, they enter into our everyday decision making along with other sources of guidance. These other sources (such as legal, religious, scientific, cultural, ideological, and historical precedents) are sometimes helpful but often have less relevance than the basic moral theories when resolving difficult ethical problems. Frequently, the moral theories are in direct conflict with one another, and no simple codification can show the way to a solution.

Historically, the ethical thinking of the Judeo-Christian/Islamic religions contained religious and moral philosophies similar to Buddhism, such as the dictum of doing to others as you would want done to you (Golden Rule). The concepts of virtue and the creation of personal values, which led to doing the "right thing," underpin the philosophy of Plato and Aristotle. However, cultures around the world developed quite different definitions of acceptable and unacceptable individual and governmental behavior. As we shall see, a

Table 1.2   Engineering Ethics Framework

1. Competence — Recognition that the engineer is a knowledge expert within an organization of other knowledge experts. Together, they must be competent to estimate the risks and failure potentials of a new technology.

2. Responsibility — Recognition that knowledge has power and must be used wisely and safely by both the engineer and the organization.

3. Cicero's Creed II — Recognition that it is the responsibility of the individual and the organization to insure the safety of the public.

virtuous person from the East might have different ideas about political, medical, environmental, and business ethics than a virtuous person from the West. The theories and principles of ethics can be understood based on their definitions, but engineers and scientists in the modern world must also understand the conflicts between these principles and the differences in allowed ethical behavior for individuals from different social, religious, and geographical cultures. Personal, religious, and cultural values can be the determining factors underlying individual or corporate behavior in a situation demanding an ethical decision.

The material below is divided into sections showing how various moral theories arose and how they present useful ideas for many ethical dilemmas. It is imperative to keep in mind the importance of global differences in cultures and value systems while we categorize the five major moral theories of virtue, justice, rights, duty, and utilitarianism. We will also outline some prevailing ideologies and modifications of moral theories (such as rules ethics, rights ethics, and cultural relativism), as they also play some role in the logical consideration of problems associated with the new technologies. Table 1.3 gives a listing of the moral theories, principles, religions, and ideologies, one or several of which may arise in the consideration of a particular ethical dilemma.

Virtue Ethics

Aristotle advocated the ethics of virtue, defining a good person as someone with qualities such as courage, wisdom, loyalty, and fairness. However, the Greeks were also elitist, seeing themselves as superior to others. They saw eugenics (from the Greek meaning good birth) as a virtue, and even Plato wanted to improve society by creating better children through arranged breeding (Pence 2004a).

Table 1.3   Summary of Moral Theories, Principles, Religions, and Ideologies

THEORIES	PRINCIPLES	RELIGIONS	IDEOLOGIES
Virtue	Autonomy	Judaism	Anthropocentrism
Justice	Beneficence	Hinduism	Biocentrism
Rights	Non-malfeasance	Islam	Ecocentrism
Duty	Justice (medical)	Buddhism	Deep Ecology
Utilitarianism		Daoism	Ecofeminism
(Consequentialism)		Confucianism	Pantheism
Pragmatism		Christianity	Pluralism
Cultural Relativism			Transcendentalism
Subjectivism			
Pluralism			
Minimum Conception of Morality			

In Athens in about 350 B.C., when there were only around 300,000 citizens and no competing religious doctrines or theologies, Aristotle taught the importance of attaining moral virtues. These virtues were attributes to be acquired through habit formation in order to reach a proper balance between extremes in conduct, emotion, desire, and attitude (Pence 2004b). For example, Aristotle considered truthfulness a virtue, not in the context of either telling or not telling a lie, but in terms of finding a medium between the extremes of excessive truth and insufficient truth. Thus, the virtue of truthfulness according to Aristotle is the Golden Mean between revealing too much information and giving inadequate information about a situation. For example, it is not virtuous to make negative comments about the appearance of an individual even though the comments might be truthful. Nor is it virtuous to remain silent when there is some information a person deserves to have for his or her success, or to hide fraudulent activities of a corporation.

Another example of virtue ethics dictates that it is better to achieve happiness or self-fulfillment through a life of internal good (e.g., good behavior and virtuous acts) rather than through a life of pleasure or mere contentment. The good in engineering is exemplified by the creation of useful products or technologies while respecting the autonomy of clients and the public. The internal good of science is found in discovering the truths of the physical, biological, and cognitive world. The internal good of teaching is learning, and the internal good of medicine is the promotion of health while respecting the autonomy of others.

Judeo-Christian philosophies emphasize virtue and justice under the just authority of a god or supreme being responsible for the welfare of the faithful. The associated moral thinking resisted ideas of eugenics, insisting that human beings are made in the image of God and should evolve naturally. Over time, the ideas of the early philosophers became intertwined with religious teachings. The influence of early Christian and Jewish teachings spread through the Bible and Torah to the far reaches of the Roman Empire. Teachings of Islam also emphasized the importance of virtue in the life of the individual.

As we learn about the other moral theories that have evolved since virtue was espoused by Greek, Chinese, and other philosophers, it is important to appreciate that virtue is a theory about self and the consequences of actions relative to an individual's personal values. Other theories we discuss below address how one's actions affect others rather than self. As virtue includes the personal attribute of loyalty to other persons, institutions, and corporations, we will see that virtue may be in conflict with duty, particularly in business ethics (Chapter 4). The moral theories of virtue, duty, and utilitarianism come into conflict as a result of the evolution of institutions in our modern society. These conflicts will be pointed out and discussed frequently in this text. The Four A's strategy will be used as the basic tool for evaluating and resolving these conflicts.

Justice Ethics

Justice ethics addresses the need to treat everyone equally without favoritism or bias. Justice dictates the need for equal burden or equal benefit, an impartiality that must be maintained so that multiple individuals are treated fairly. For example, justice becomes an issue in assigning tax benefits or burdens, and when distributing limited resources such as flu vaccines. However, as we will appreciate throughout this text, treating everyone equally becomes a challenge. In many cases a dilemma arises because treating one person based on what is due or owed will often come in conflict with what is due or owed to another person. That is, execution of the minimum principle, which requires that similar people be treated alike, requires a definition of "similar" for each situation. How are the relevant characteristics of a diverse population to be evaluated in terms of equality? When relevant dissimilarities are found to exist, how should the treatment differ? Additional definitions of various aspects of justice are provided below to show the range of situations to which the basic tenets of justice are applied.

- *Procedural justice* refers to social processes (most familiarly, in the judicial system).
- *Retributive justice* applies to issues of correction and punishment.
- *Distributive justice* refers to the fair distribution of social benefits and burdens.
- *Egalitarian justice* refers to theories of justice that stress equal access to primary social goods; libertarian theories of justice give primacy to social and economic freedom; Marxist theories emphasize need ("to each according to his needs; from each according to his abilities").

Justice often sits at the intersection of the moral theory of duty to respect the rights of each individual and the moral theory of doing that which will make the most people happy. We will discuss each of these moral theories later, but for the present, it is helpful to see how justice can be a valuable tool for making decisions about the rights and duties of the individual. The six points listed in Table 1.4 are part of the method used to design solutions to the ethical dilemma of distributing benefits or burdens. It is helpful to consider these six points in reference to real life situations such as awarding salary increases, assigning grades in school, and awarding research or engineering contracts. Consider these points also in the context of assigning burdens, such as in punishment for plagiarizing. Philosophers and others (e.g., the Belmont Report discussed in Chapter 8) have proposed these axioms.

Table 1.4   Justice Axioms

1. Give an equal share.
2. Give a share according to need.
3. Give according to effort.
4. Give according to merit.
5. Give according to free market value, e.g., according to the market value of the individual, the competition, and/or how much another would pay for the same service.
6. Give according to contribution of the individuals.

Case 1.2 Justice in a Workplace Situation

Mr. A, who works at a plant that uses a toxic material, develops signs of toxicity. The company doctor confirms his toxic exposure and tells Mr. A's manager of the findings. The manager decides not to tell Mr. A but moves him to another job. Ms. C and Mr. B are upset because they feel they have not been treated equally, and come to talk to the manager. What should he tell them? What is just here? It is not a solution to dodge the issue, nor can he tell them Mr. A has a bad disease. Giving them a bribe to let things be is not the best of solutions. In deciding a solution, all six of the above points about justice may apply. For example, Mr. A is in need of keeping his job, but Mr. B and Ms. C feel their efforts and contributions should also be rewarded.

The intent here is not to present a solution to this case, but to lead the reader to the conclusion that the manager should do something to equalize the situation for Mr. B and Ms. C and to not harm Mr. A further. It is also to point out that ethical decisions can go beyond the individual to the institution, to groups of individuals, to the society. All stakeholders are involved in the interpretation of justice.

Rules Ethics

In the sixteenth century, there was a thrust for the codification of ethics through rules and laws. Thomas Hobbes (1588–1679) was one who saw life in a natural state as ". . . solitary, poor, nasty, brutish and short" (Hobbes 1962a). He believed that individual liberties led to selfish decisions. From his perspective, a society governed by rules that regulated conduct was preferred to a society where individual rights and liberties were of prime importance. He felt that civilization was based on the fear of death and a desire for power such that a society could not be trusted to govern itself; instead, there must be the construction of a commonwealth with a sovereign who would have absolute rule and keep peace by having the final word on matters of law, morality, and religion (Hobbes 1962b). This moral theory is deemed archaic and unacceptable by many cultures. However, the concept of sovereign rule is still viewed as acceptable governance in many countries as well as families, and in some situations (such as the need for martial law after a natural disaster).

Rights Ethics

In contrast to Hobbes, John Locke (1632–1704) believed that people are essentially good, rational, and able to act for the common good. He insisted that

. . . men being, by nature, all free, equal, and independent, no one can be put out of this estate, and subjected to the political power of another, without his own consent. The only way whereby any one divests himself of his natural liberty, and puts on the bonds of civil society, is by agreeing with other men to join and unite into a community for their comfortable, safe, and peaceable living one amongst another, in a secure enjoyment of their properties, and a greater security against any, that are not of it (Locke 1690a).

In short, citizens join in a social contract whereby they exchange some of their rights in order to protect society. He further believed that individual liberty and other basic rights should prevail over government, which should not intervene unless by consent of the people (Locke 1690b).

Locke's influence on the formation of a modern ethical basis for liberty and democracy can be seen in the parallelisms between his writings and the U.S. Declaration of Independence and Bill of Rights. Universal rules of behavior became codified as laws, as exemplified in these documents. Locke's thinking along these lines is evident in the passage below:

. . . all men equally have the right to punish transgressors: civil society originates when, for the better administration of the law, men agree to delegate this function to certain officers. Thus . . . government is instituted by a "social contract"; its powers are limited, and they involve reciprocal obligations; moreover, they can be modified or rescinded by the authority which conferred them. It is a rendering of the facts of constitutional government in terms of thought, and it served its purpose as a justification of the Revolution settlement in accordance with the ideas of the time (*Internet Encyclopedia of Philosophy* 2005, no date, www.iep.utm.edu/l/locke.htm, accessed January 2, 2005).

The constructive doctrines elaborated in his *Second Treatise* became the basis of social and political philosophy for generations. Rights ethics provides the basis for the moral thinking behind many of the contemporary ethical debates we will discuss later, including the right to life of the fetus vs. the rights of the mother, the contested right of physician-assisted suicide, and the rights of astronauts to be told all the facts that might affect their survival. The rights of the individual are also of paramount importance in the Kantian theory of duty presented below.

Duty Ethics

While the rights of the individual and the concepts of equality were being asserted and tested in the American colonies, the German philosopher Immanuel Kant (1724–1804) was espousing another doctrine or theory known as the ethics of duty, or deontological ethics. He held that the motivation for an action should not come from feelings or desires, because these emotions may be irrational due to the influence of previous experiences. Rather, an action should be thought through according to one's duty, or according to the universal maxim for doing good: what is right, what is appropriate, what is obligatory, what is moral in and of itself. In his *Foundations of the Metaphysics of Morals,* written in 1785, Kant states: "Act only according to that maxim by which you can at the same time will that it should become a universal law" (Kant 1785a).

This statement defines what is known as the Categorical Imperative. According to Kant, the worth of an act does not lie in the effect of the act but rather in the moral motive. As we shall see below, duty ethics does not look to the consequences of actions as the determinants for what is right or wrong, but instead emphasizes the duty of the individual or institution to act based on a maxim of doing good. Humans should not be treated as

means to an end but as ends unto themselves (for example, a patient's well-being must never be jeopardized in a clinical trial, even though the new treatment might benefit society as a whole). To act rationally and freely, to seek what is right and to act accordingly, this is to act morally. Kant calls this capacity "autonomy," meaning the freedom of an individual to decide rationally on the right act (Pence 2004c; also Shannon 1993).

Three major imperatives embody the moral thinking of Kant, paraphrased below from an English translation of his German text (Kant 1785b):

1. To have genuine moral worth, an action must be done out of duty or for the sake of duty. (A distinction must be drawn between duty meaning an action one is obligated to perform and duty referring to the motive for the act, which might best be called dutifulness.) If one chooses a course of action based on what one feels is the *right thing to do*, the act is of moral worth. However, Kant asserts that the same act, motivated solely by the need to comply with a law or a rule, is a morally worthless act. We note here that this imperative is closely related to the moral theory of virtue.

2. An action performed out of duty accrues moral worth from the motive of dutifulness and not from the consequences of the action. As already noted, Kant's ethics is an ethics of motive, and *not an ethics of consequences*. Though this ethics of duty is contrary to consequentialism or utilitarianism ethics, as we will see below, it does not mean that acts in accord with utilitarianism cannot be acts motivated by an individual's sense of the moral worth of the action.

3. Duty (in the sense of dutifulness) is the binding obligation to perform an act (a duty) out of respect for a moral law. The individual motivated by a desire to be seen as a good person acts out of a sense of what one is compelled to do and not necessarily out of a sense of what is a right action. The third imperative of Kant is that the act must be motivated by a duty to moral acts and *not by an obligation*.

The imperatives presume that the individual must know what is morally right and does not act merely in obedience to rules or laws but through the individual's own sense of "the right thing." But how can Kant assume that individuals have an innate sense of what is the right act? How does the individual know what is an act of moral worth, unless the values of acts are learned through nurturing, taught principles, observation, and experience? Can an individual from one culture be expected to know which acts are accepted in another culture as acts in accord with a moral law if the two cultures have differing notions of duty? The universal notion of "doing to others as you would have them do to you," known as the Golden Rule, and the duty to respect the rights of others seem to have a common morality, yet they are not always practiced between families, tribes, societies, or governments.

Recall that about 100 years before Kant, the English philosopher John Locke challenged the concept of a monarchy on the basis that people have fundamental rights that others must respect. Both duty ethics and rights ethics achieve the same end: individuals must be respected and actions that are ethical maintain this respect for the individual. Difficulties arise when attempting to prioritize the basic rights of one person that are in conflict with the basic rights of another, and in balancing the good of an individual vs. the good of a society. These difficulties will become more apparent when we present the theory of utilitarianism below.

The philosophies of virtue, justice, duty, and rights have many common threads, especially with regard to loyalty and the dictum to respect the rights of others. Loyalty dictated by virtue ethics has a natural alignment with duty to respect the rights of others. The importance of duty ethics in professional activities will be seen throughout this book. But duties and loyalties of the professional to respect the autonomy of others are frequently in conflict with the theory of utilitarianism, where consequences of acts rather that the inherent worth of an act become important. Indeed, it is extremely difficult to resolve problems when the rights of one individual are at odds with those of another individual or a group of individuals, or when one duty to perform an act is in direct conflict with another duty. We will attempt to put these theories into a coherent framework and present methods and guidance that allow a rational approach to making the right ethical decision.

Before going further, let us consider a case where two duties are in conflict: the professional duty to preserve life and the duty to respect the autonomy or right of a patient to die.

Case 1.3 Professional Duty vs. Rights

Consider the dilemma of a physician when the duty to preserve the life of a patient is in conflict with the wishes of the patient to be left alone to die. The case of a severely burned patient illustrates this ethical dilemma, as well as the ethical dilemmas regarding issues of informed consent, competency, and autonomy vs. medical paternalism (Kliever 1989).

In 1973, Dax Cowart was severely burned following a propane-gas explosion that killed his father (Burton 1989). Sixty-seven percent of his body sustained severe burns, including his ears, eyes, and hands. As an experienced pilot, he recognized the severity of his situation at the scene of the accident, and asked the farmer who first arrived at the scene for a gun to shoot himself. The farmer refused, and he was transported to the burn center at the University of Texas Medical Center, where he refused treatment. However, despite his insistence, and despite the fact that he was fully competent to make this decision, the staff instead received consent from his mother to proceed. He endured excruciatingly painful treatment that kept him alive, but in the end, when discharged after 232 days in the hospital, he was horribly disfigured, blind, and had only limited use of one hand.

He is now married, a 1986 graduate of Baylor law school, and is a successful attorney. After winning a lawsuit against the oil company responsible for the gas leak, he is financially comfortable. Nevertheless, he insists that he had the right to refuse treatment and to die. He does not argue that every burn patient should be allowed to die, but that every competent burn patient should be allowed to make that decision.

Rachels considers his desire to die a rational reaction, justified because his concept of self was transfigured by the accident:

What his injury had done, from his point of view, was to destroy his ability to lead the life that made him the distinctive individual that he was. There could be no more rodeos, no more aeroplanes, no more dancing with the ladies, and a lot more. [His] position was that if he could not lead that life, he didn't want to live (Rachels 1986).

The procedures and problems surrounding issues of the right to die, autonomy, paternalism, and futile medical care are subjects further discussed in Chapter 7.

The next case emphasizes the conflict between three duties: duty to assure safety, the duty to accomplish an engineering goal, and the duty to respect the rights of individuals.

Case 1.4 The Challenger Catastrophe

This case underscores the serious decisions facing engineers who work on projects where human lives are at risk. On January 28, 1986, the launch of the space shuttle Challenger went ahead despite concerns voiced by project engineers that it was not safe. At issue was the possibility that the extremely cold temperature at the time of launch might interfere with the function of the O-rings in the solid rocket booster, causing the escape of hot gases formed by the combustion of solid rocket propellant. The O-rings had been problematic in the past. During testing in January 1985 at 53°F, there were signs that hot gases had escaped through the O-ring seals. Because of concerns that the cold temperature increased the rigidity of the seals and made them ineffective, the engineers redesigned them, but they were not ready at the time of the launch in January. On the scheduled launch day in January 1986, temperatures were in the low 20s. Since this was the coldest temperature for any launch and no data existed to ensure the function of the O-rings at this temperature, the engineers most familiar with the problem recommended that the launch be delayed until warmer conditions prevailed. Overruled by management, the launch proceeded and the resulting explosion killed all on board. The post-explosion investigation indicated the failure of the O-rings in the rocket booster, which allowed the escape of hot gases formed by combustion of the solid rocket propellant. The resulting flames from these gases burned through the external tank, ignited the liquid propellant, and caused the spacecraft to explode.

What are the proper procedures to be followed in such a situation? Who should make the go/no go decision? What if there are insufficient data to make a decision? Should the astronauts have been informed and allowed to participate in the go/no go decision? What was the duty of the concerned engineers in this situation and how far should they have gone to stop the launch? At what point do budgetary concerns or political implications undermine decision making and exacerbate the pressure to "go"?

The types of issues raised here are similar to those that may arise during other projects. Ethical decisions may be required on a day-to-day basis and may have far-reaching consequences. Those making the decisions have the responsibility to make the best possible choices. This catastrophe highlights the importance of recognizing that modern engineering involves multiple competencies, an understanding of respective responsibilities, and an overriding acceptance of Cicero's Creed II (i.e., the priority of public safety). Pinkus et al. (1997b) provide further discussion of the ethical issues raised by this catastrophe.

Modern Duty Ethics and Ross's Prima Facie Duties

A major problem with Kantianism involves the resolution of problems when there are conflicting duties. That is, if one duty is performed, an equally important duty would be neglected.

The major problem with the Kantian philosophy is that it does not provide a method to resolve dilemmas wherein the subjective principles of action (called maxims) come into

conflict with the categorical imperatives. The test of a maxim as a genuinely universal moral principle involves a test against three criteria:

1. Is the maxim one that should become a universal law?
2. Does the maxim involve treating yourself or another as *an end* in contrast to *a means to an end*?
3. Does the maxim respect the autonomy of others?

A simple example often mentioned in the literature on ethical dilemmas is that a maxim about lying to save another cannot pass all three categories. For example, if you have hidden a child in a house that is being invaded by thieves, and you are asked if there are others in the house, you might lie to protect your child. The maxim might be: Lying is acceptable if it is done to protect a child. Many other similar dilemmas can be cited.

However, Kant's moral theory does not allow a means of deciding between two possible actions that are both one's duty and in conflict with one another. To resolve these problems, W. D. Ross, a twentieth century philosopher, proposed a modification of Kant's moral theory. He suggests that there are seven prima facie duties (see Table 1.5), each of which is an obligatory duty unless there is a conflict with a greater prima facie duty (Ross 1930). Over the past eight decades, during which the development of technologies, including global communications, has brought about new ethical dilemmas, it can be shown that these seven prima facie duties cover practically all situations. For a given situation, the moral action depends on which of the seven duties apply, and of those that apply, which has priority over the others.

According to Ross, the selection of which prima facie duty overrides another comes from an individual's intuition. Thus, a soldier's duty to prevent harm to others might override the duty to prevent harm to himself. The duty to increase general happiness by giving to the poor might be overridden by the duty of fidelity. The duty to prevent harm might override other prima facie duties when considering the benefits and risks of many new technologies. An example would be the duty to define as far as possible the risks of genetic technologies.

Table 1.5 Prima Facie Priorities

1. **Fidelity:** Duty to keep commitments. This includes the duty to honor one's professional code.
2. **Reparation:** Duty to correct past wrongs.
3. **Gratitude:** Duty to repay.
4. **Justice:** Duty to prevent unfair distribution of benefits. This includes limited resources such as organs for transplantation.
5. **Beneficence:** Duty to increase general happiness.
6. **Self-improvement:** Duty to better oneself. This includes a professional's duty to continuing education.
7. **Non-malfeasance:** Duty to prevent harm. This includes duty to make risk assessments of the consequences of emerging technologies.

modification of plants and animals for future generations. Another example is the duty to evaluate the long-term consequences of deep brain stimulation.

One can argue that the intuitive weighing of our various duties is how we practically work out choices of action in everyday life. A summary statement by Feldman (1978a) rephrases the Ross philosophy, which can help in deriving a strategy for each case:

> An act is morally right if and only if it is a prima facie duty and no alternative is a more stringent prima facie duty.

But Feldman's statement raises the question: what is meant by stringent? The concept of an obligatory act rises above others in the attempts to define stringent. If two conflicting acts are prima facie duties, then the one which is more obligatory should be that on which the act is based. As will be shown throughout this text, in most cases the confusion and debate regarding Kantianism and Ross's theory can be lifted if one applies the design strategy to each ethical dilemma (i.e., engaging a problem by resolving ambiguities, getting advice, developing alternative solutions, and taking action while recognizing the dynamics of the selected acts). One duty that seems universal and encompasses or underlies most of Ross's seven priorities is the duty to be kind, which is a priority of two great philosophers:

> There is no duty more obligatory than the repayment of kindness (Cicero 106–43 B.C.).
> Forget injuries, never forget kindnesses (Confucius 551–479 B.C.).

The next case exemplifies a situation involving conflicting duties. The dilemma for FBI agent Mark Felt was between doing the virtuous or right thing regarding truths of importance to the American people, or adhering to the responsibilities of an FBI agent to keep secrets. While it may never be known what reasoning he used when he decided to leak the FBI's most sensitive information to the press during the Watergate scandal, he may have used a strategy along the lines of the Four A's in his decision making.

Case 1.5 Duty vs. Loyalty: The Morality of Deep Throat

In 1972, a felonious break-in occurred at the Democratic National Committee headquarters in the Washington, DC, apartment complex known as Watergate. An anonymous tipster known only as Deep Throat provided secret insider information to investigative reporters Bob Woodward and Carl Bernstein of the *Washington Post*, information that enabled them to trace the break-in directly to top officials in the White House, and ultimately to then-President Nixon himself. The *Washington Post* story, along with other damning information, including Senate hearings and secret White House tape recordings, led to the threat of impeachment and Nixon's resignation in 1974.

Over the years, there has been much speculation about the identity of Deep Throat. Only three people knew his name and steadfastly kept his name a secret for over 30 years until May 2005 when Felt, at age 91, revealed his identity. At the time of the Watergate scandal, Felt was a staunch, loyal member of the FBI and was considered to be next in line to take over the FBI after J. Edgar Hoover, but the job went to outsider (and Nixon supporter) L. Patrick Gray III instead, who became Felt's supervisor. Gray had agreed to keep the White House informed of all FBI findings in the Watergate case, which infuriated Felt, who felt the FBI's integrity had been compromised. When Felt began to learn of information that led to Nixon and others in the administration, he could not go to Gray with his concerns. He

turned instead to *Washington Post* reporter Bob Woodward, someone who could reveal to the public the truth and at the same time minimize his own vulnerability as the source of the information. Felt's ongoing supply of information and encouragement allowed Woodward and his co-investigator, reporter Carl Bernstein, to stick to their position despite vicious and desperate attacks from the White House to discredit them. Felt's decision to tell the truth forced him to choose between his oath of loyalty to the FBI and his duty to protect the country from the criminal activities at the highest levels of the White House.

The above case represents the conflicts between virtue and the duty to keep a secret or to be loyal to the professional organization's policy. Next, we introduce the moral theory of doing good for the most. This moral theory also comes into conflict with both virtue and duty.

UTILITARIANISM

Originating in the late eighteenth and early nineteenth centuries, the theory of utilitarianism was espoused by Jeremy Bentham (1748–1832) and later by James Mill (1773–1836) and his son, John Stuart Mill (1806–1873). An often quoted or paraphrased statement of the fundamental principle or morality proposed by J. S. Mill is the basis for discussion of utilitarianism:

> . . . actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness. By happiness is intended pleasure and the absence of pain; by unhappiness, pain and the privation of pleasure (Mill 2001).

Happiness might be hedonistic (e.g., physical pleasure) or intellectual, thus the categories of hedonistic utilitarianism or ideal utilitarianism, respectively. Utilitarianism originally was a movement away from outmoded Christian ethics and the injustices of English aristocracy that favored the few, toward changes that favored the majority. The reforms encouraged by utilitarianism were precipitated by slavery, poor factory conditions, child labor abuse, the poor treatment of prisoners, and other inequalities.

Consequentialism is defined as ". . . the doctrine that the moral value of any action always lies in its consequences and that it is by reference to the consequences that actions, and indeed such things as institutions, laws and practices, are to be justified if they can be justified at all" (Smart and Williams 1998a). The specification of a happy consequence is the major connector between a theory of consequences and utilitarianism.

As summarized by Pence (2004d), the four basic tenets of utilitarianism are:

- **Consequentialism:** Consequences count, not motives or intentions.
- **The maximization principle:** The number of people affected by consequences matters; the more people affected, the more important the effect.
- **A theory of value (or of good):** Good consequences are defined by pleasure (hedonic utilitarianism) or what people prefer (preference utilitarianism).
- **A scope-of-morality premise:** Each being's happiness is to count as one and no more.

Two important parts of utilitarianism known as act utilitarianism and rule utilitarianism are introduced here to help the reader understand that the consequentialism explanation of utilitarianism is only part of the theory. That is, utilitarianism goes beyond the doctrine of preferring an act or decision that produces the greatest happiness for the greatest number. As we will see through our examples, this simplification leads to an erroneous analysis when considering alternative solutions. An additional problem is that utilitarianism can lead to conflicts with Kantian philosophy of the moral worth of an act based on duty. An action in accordance with utilitarianism can still have as its motivation moral worth in addition to duty. For example, an engineer decides to check and recheck the calculations to ensure the safety of a structure. His sense of duty motivates this extensive rechecking. The consequences of this rechecking to prevent harm would also lead the engineer, bound by duty, to follow the professional code of engineers, to go to these extremes of rechecking, but if the professional code is the motivation, then the action of the engineer has not the same moral value, according to Kant.

Case 1.6 Taxation

Suppose a population taxation goal is to be achieved by either taxing all citizens equally or by taxation in proportion to the wealth of each citizen. In the first alternative, the happiness of the wealthy would be enhanced and this would be the greatest happiness for those individuals, but the poor would suffer. The second alternative would achieve some happiness for the poor whose tax bill would be reduced but would achieve less happiness for the wealthy. Clearly, without a quantification of the value of the happiness times the number of wealthy people minus the quantification of the unhappiness times the number of poor citizens, we cannot know how well taxation according to wealth supersedes the alternative of equal taxation where we also have no measure of the value of happiness for all citizens. The notion of "greatest happiness for the greatest number of people" is difficult to apply in a situation when there are no data to evaluate the balance between benefits to all citizens. In dealing with this problem, Feldman (1978b) proposes a definition of act utilitarianism that brings to the fore the notion of utility:

> An act is right if and only if there is no other act the agent could have done instead that has higher utility than it has.

This definition emphasizes an equivalence between act utilitarianism and consequentialism. It helps us understand how to make decisions when consideration of the six points of justice does not lead to a clear selection of the right decision in a particular dilemma. From this, we can conclude that utilitarianism is understood by evaluating the consequences of one's actions. However, the examples below show why utilitarianism ethics required a modification, and why rule utilitarianism is needed for the defense of utilitarianism as a moral theory. The first is the application of utilitarianism (consequentialism) to fulfilling promises. This is a category of human behavior that presents serious problems to act utilitarianism. The second is the conflict between punishment and simple application of consequentialism (act utilitarianism).

Case 1.7 Promise to a Dying Person

A father and his son sailing around the world find themselves stranded on an island in the South Pacific following a storm. The father has been seriously injured, is near death, and asks his son to promise to bury him with his dead wife's wedding ring, which the father wears around his neck in a gold locket. The son promises. After his father's death, the utilitarian son is faced with two decisions about what he should do. What is the utility of burying his father? It is difficult to dig a grave in the rocky soil and much easier to cast him into the ocean on the outgoing tide. Secondly, he might need the gold locket, chain, and ring to trade for his safe return to civilization. What is the utility of keeping the promise to bury the father's keepsake?

One can argue that the consequence of not burying his father will be feelings of having treated his father callously, but the utilitarian son concludes the difficulty of burial is a consequence worse than the seeming callousness of casting his father into the sea. With respect to the jewelry, the son applies act utilitarianism and concludes the act of keeping his promise is of less moral value that that of taking the jewelry, which will have the consequence of securing the son's safe passage and, therefore, his happiness. How can there be any pain in this act? The decision between keeping the promise and breaking the promise is clearly dictated by the moral theory of consequentialism. But would we conclude the decision to break the promise was ethically correct? Thus, the category of human behavior known as keeping promises presents serious problems to utilitarianism because breaking the promise in this case would be consistent with utilitarianism, but to most, this is the wrong thing to do. A form of utilitarianism known as rule utilitarianism is needed for the defense of utilitarianism as a moral theory.

Examples of the type described in Case 1.7 led to rule utilitarianism wherein the correct moral action is *to keep promises*. Rule utilitarianism deems that rules of behavior are derived by a determination of whether particular acts are right or wrong. Rules are justified by their general utilitarian consequences, and the overall utility is maximized by a system of rules, compared to the alternative of having individuals decide on conduct in particular circumstances based on their own judgment. Human beings may find it impossible to always be impartial about utility in matters involving their self-interest. Rules have the value of imposing a degree of "objectivity." Consistency requires that rules be applied in the same way to relevantly similar circumstances. Rule utilitarianism would guide the son to decisions regarding the act of burial and the separate act of keeping the promise to bury the father with the jewelry. The next example emphasizes further problems with utilitarianism.

Case 1.8 Punishment Conflicts with Utilitarianism

A student writes a project paper and uses material copied electronically from the Web. His act of plagiarism is discovered by the scanning systems used by many university professors. His punishment is to receive an F in the course. What utility does this act have and to what extent is there any happiness for anyone in the act? Have the basic tenets of utilitarianism been refuted by this example?

The subject of punishing a wrongdoer has been a major problem for the theory of utilitarianism because it is an act which causes pain and does not necessarily give happiness

or pleasure. As Feldman (1978c) states: "How can we be justified in producing something intrinsically bad as a response to those whose main fault is that they produced something intrinsically bad? Can two evils make a good?" The utility of some punishments can be rehabilitation or possibly a deterrent to potential future offenders, but the more general concept of retributive punishment seems the norm and this concept is at odds with act utilitarianism.

In answer to this conflict, as well as the previously mentioned cases where the moral theory of justice and act utilitarianism oppose each other, rule utilitarianism is used to guide decisions regarding the preferred acts. Arguments for and against utilitarianism are found in the analysis by Feldman (1978d) and a debate between Smart and Williams (Smart and Williams 1998b).

Analysis of Duty Ethics vs. Utilitarianism

Kant's moral theory of duty (deontology) prescribes the correctness of an act is based on moral duty and not on a judgment of its consequences. Religious revelation ("divine command") provides the historically common foundation for deontological moral principles: things are right or wrong if, and only if, commanded or forbidden by God. The concepts of natural law and human reason are cited as sources for what is right or wrong, but in modern societies throughout the world, these same concepts seldom lead to similar conclusions by individuals dealing with ethical dilemmas. This is because these concepts are too general and too distant for consistent use in formulating methods for approaching ethical problems in various cultures and everyday situations.

It is hard to imagine that an abandoned child raised by wolves, a tribeswoman from New Zealand, and a youth from an affluent European family would all have the same moral basis for action under a given circumstance, or that they would act similarly in a situation requiring acts that require consideration of the rights of other individuals. The Problem Set at the end of this chapter will allow practice with how some moral principles can override others. But for the present, we consider some reconciliation of differences between duty ethics and utilitarianism.

Some philosophers (and many sociobiologists) take the position that deontological principles are simply those shown to have consistently favorable consequences over a long period of experience; that is, they have evolved as accepted duties through the test of time. Accordingly, these have been sanctioned by custom, religious practice, and in many cases, have led to laws.

Though situations that seem to pit duty ethics against utilitarian ethics arise throughout the world, the two theories do share the aspect of valuing individual rights. Kant argues for the supremacy of individual rights, and in fact his philosophy, as well as Locke's, strongly influenced the Declaration of Independence and the Bill of Rights of the United States. John Stuart Mill, a major proponent of act utilitarianism, also felt that individuality was an important component of happiness and necessary for individual and social progress. He believed in the freedom to have and express one's own opinions without reserve, and to act upon them at one's own risk or peril, as long as it does not harm another.

As long as ". . . he refrains from molesting others in what concerns them, and merely acts according to his own inclination and judgment in things which concern himself, the same reasons which show that opinion should be free, prove also that he should be allowed, without molestation, to carry his opinions into practice at his own cost" (Mill 1859). But the utilitarianism theory gives far less priority to the individual's rights than does the Kantian theory of duty.

As we have seen, utilitarianism is related to consequentialism, where the correctness of an act or ethical decision is based on whether the consequences will lead to the greatest happiness. The consequence usually sought is a state or situation wherein happiness or maximum utility of the individuals is reached, but not necessarily all of the individuals will benefit and some might be harmed. That leads to a major conflict between the theory of utilitarianism and individual autonomy, as doing the best for the most will often violate the rights or autonomy of a few. We present the arguments between utilitarianism and duty through examples of situations that are perplexing to the utilitarian. That is, we consider the role of injustice in utilitarianism, and the role of doing the best for the most in deontology. The first situation is presented is a case against utilitarianism.

Case 1.9 Individual Rights vs. Utilitarianism

A sheriff concludes that if he falsifies some documents he will cause the death of an innocent man but thereby save the lives of 100 citizens who are facing a horrible and painful death.

The issue here is that although the sheriff's act is unjust, by committing it he will minimize pain (McClosky 1963). J. C. C. Smart, in arguing for utilitarianism, admits that the utilitarian is forced by logic to accept the unjust act (Smart and Williams 1998c). This would be a situation of the lesser of two evils, and an example of the end justifying the means. This case exemplifies negative utilitarianism, wherein one is considering minimization of pain rather than maximization of happiness. The reader will note that the act here is judged solely on the end consequence and not on the virtue of the act itself. Recall that duty ethics would deem this act outside the rules of behavior commonly accepted by society.

These examples lead to the chief persuasive argument for utilitarianism: ". . . the dictates of any deontological ethics (duty ethics) will always, on some occasions, lead to the existence of misery that could, on utilitarian principles, have been prevented" (Smart and Williams 1998d).

Autonomy vs. Utilitarianism

The conclusion that action based on consequence might violate our duty to respect the rights or autonomy of a particular individual is overruled by the utilitarian rule of the greatest happiness for the most. But as we formulated earlier, the rule that should be considered is that of the act that gives the greatest *utility*. This rule is applied when a decision is made to improve the quality of life (such as water supply, hydroelectric power, or roads) for many individuals at the expense or violation of the autonomy of one or a few individuals. The

Golden Rule of doing to others as you would have them do to you takes a lower priority than the rule of doing that which gives the greatest utility, generally interpreted as the greatest happiness for the majority.

This theory is clearly different from Kantian theory because Kant's major principles ignore the consequences of an act as determinants of right or wrong, and instead emphasize the value of the act in and of itself. However, the right vs. wrong decision for both the moral theories of duty and utilitarianism is guided by whether an action maximizes happiness or does not cause pain. When confronted by dilemmas regarding duty to the rights of a few vs. the happiness of the majority, an analysis of the alternative actions and their dynamics, as guided by the Four A's, will be useful.

Case 1.10 Eminent Domain vs. Rights of the Land Owner

Governments have the power to acquire land (real property) against the will of the owner if the acquisition is necessary for the completion of a road, dam, or other important public project. In the United States this power is known as *eminent domain* and in other countries that follow the principles of English law, the term *compulsory purchase* is used. The Fifth Amendment to the U.S. Constitution stipulates, in addition to just compensation being made to the owner, that "public use" of the property be demonstrated. However, over the years since 1930 the definition of "public use" has expanded to include *economic development.* Thus, the power of eminent domain has allowed property seizures to enable commercial development. A public purpose used to justify this seizure is that the commercial development will generate more jobs and more tax revenue for the local government. In 2005, the issue of eminent domain for commercial interests was argued in the U.S. Supreme Court (*Kelo et al. v. City of New London, CT*, No. 04-108, Decided June 23, 2005). The suit was brought by owners of 15 homes on a desirable 1.54 acres of waterfront property against the town of New London, Connecticut, which planned to turn the area into offices, new housing, and a marina and to allow a $300 million research facility to be built by a pharmaceutical company. In this case of eminent domain vs. Fifth Amendment rights, the Court ruled by a 5 to 4 vote in favor of commercial interests, the majority citing land redevelopment in an economically depressed city qualifying as "public use."

This case establishes a precedent for similar actions on the part of communities around the United States and leaves small property owners vulnerable. The justification for eminent domain intended by the Fifth Amendment was pubic usage and not commercial interests that indirectly might be in the interests of the local community. Clearly, any developer could make a case to the local and state government that they can improve the appearance and utility of a sector of land and in addition bring more tax monies to the local government for the benefit of the public. But is this just? As we shall see in Chapter 5, the global initiatives to improve the environment might use this precedent to seize lands whose current use is judged not to be consistent with initiatives to maintain a sustainable environment. The Supreme Court decision gives local governments wide latitude to decide when a seizure for "public use" is justified.

Utilitarianism vs. Justice: Allocation of Limited Resources

The issue of limited medical resources becomes especially significant when the allocation means life or death for the patient. Important examples are the distribution of penicillin to wounded soldiers in World War II and, more recently, the allocation of organs (e.g., heart, liver, kidney) when the supply of organs or the distribution of kidney dialysis machines is insufficient to meet the need. Further discussion of organ transplantation will be made later in this chapter and in Chapter 7. For the present, we will present the moral considerations behind selecting a method of allocation, whether it be for a drug, organ, or physician's services.

Perhaps the most famous modern philosophical treatment of justice relevant to utilitarianism and other moral theories is that of Rawls (Rawls 1999a). The rationalization that the rights of the individual can be extended to an argument for the rights of the social system is not accepted by Rawls. The essence of the superiority of justice is contained in his words:

> Each person possesses an inviolability founded on justice that even the welfare of society as a whole cannot override. For this reason justice denies that the loss of freedom for some is made right by a greater good shared by others. It does not allow that the sacrifices imposed on a few are outweighed by the larger sum of advantages enjoyed by many (Rawls 1999b).

The two competing moral theories surrounding allocation methods are utilitarianism and justice (as in equity of opportunity and the Rawls concept of equity of liberty). These two opposing doctrines came into focus in 1841 when survivors of a collision with an iceberg found themselves in an overloaded boat.

Case 1.11 Case of the Sinking Lifeboat

After a ship collided with an iceberg and sank in the North Atlantic in March of 1841, a severely overloaded lifeboat was in jeopardy of capsizing in the icy waters, thereby ending the lives of all on board. In order to save the most, 14 unmarried men who were not essential to rowing the boat were forced overboard by the sailors. Shortly thereafter, the survivors in the lifeboat were rescued. One of the seamen, the only one who had not left town after arriving ashore, was arrested and brought to trial (*United States v. Holmes 1842*). His legal defense was that he was doing that which would be best for the most, a utilitarian argument. Justice Oliver Holmes argued that the most just method of deciding who should die was to draw lots. This case is the focus of the argument that it is far better to decide by a method by which all have the same chance to survive than to decide by a method of selection that may be unjust and biased.

How do we reconcile the court's decision with the Rawls theory of justice? What would a student of Rawls say about this situation? We find an answer in the following:

> . . . injustice is tolerable only when it is necessary to avoid an even greater injustice (Rawls 1999c).

The argument for random selection made by Childress below is compelling by comparison to arguments for deliberate selection. Quoting from Ramsey, Childress explains this concept as follows:

> The individual's personal and transcendent dignity, which on the utilitarian approach would be submerged in his social role and function, can be protected and witnessed to by a recognition of his equal right to be saved. Such a right is best preserved by procedures which establish equality of opportunity. Thus, selection by chance more closely approximates the requirements established by human dignity than does utilitarian calculation. It is not infallibly just, but it is preferable to the alternatives of letting all die or saving only those who have the greatest social responsibilities and potential contribution (Childress 1970, Childress 1997).

But the firm rule of random selection cannot be operable in all circumstances. We give some examples, which are somewhat contrary to the general assertion of Childress that exceptions are rare and unlikely in any case. In some situations, the loss of one or a few individuals would be disastrous for the others (e.g., loss of the president in a grave national emergency).

First consider the situation in which penicillin was in short supply in a non-combat-zone hospital during World War II: the two groups needing the drug were soldiers with syphilis and soldiers with wound infections. Should lots have been drawn to give all individuals equal opportunity for a cure regardless of their diagnosis? In another situation, when physician and medical staff personnel are limited at a time of massive causalities, the method of triage is employed to assess whether the wounded can be saved based on the severity and character of their wounds. Those selected for treatment are given the best opportunity for life, while those whom a physician decides would receive only futile care are given comforting care. True, they are not left to die (thus, the situation is different from throwing people out of a boat). Nevertheless, it is far from the doctrine of equal opportunity. Perhaps one could argue it is equal opportunity to life for those who have some chance of living.

OTHER MORAL THEORIES

Cultural Relativism

Cultural relativism takes the position that moral beliefs and principles are relative to individual cultures or, in the extreme, individual persons. Thus, the rightness or wrongness of a situation may vary from place to place (even person to person), and not all absolute or universal moral standards can apply to all at all times. Consequently, concepts of rightness and wrongness are meaningless apart from the specific contexts in which they arise. This theory arose in the twentieth century to justify the correctness of the morality of one culture when rules and accepted behavior of that culture were not acceptable to another culture. For example, Eskimos sometimes kill infants at birth as part of their culture, but this is not acceptable to other cultures. Certain foods accepted by some cultures are considered unethical to consume by other cultures.

This theory has strong objections, not the least of which is the fact that it does not recognize the moral theories of rights, duty, utilitarianism, virtue, and justice. However, in modern business ethics, cultural relativism does become important (e.g., methods of negotiations and bribery are the culture for some but not all). The scientist, engineer, and corporation leadership should study the moral codes of the societies with which they have collaborations and business negotiations.

Pragmatism

Pragmatism is a theory of ethics that developed because of the absence of any one theory or code of behavior that was applicable to the majority of situations. Pragmatism is defined by Schinzinger and Martin (2000) as follows:

> [It is] . . . a theory about morality that emphasizes the limitations of abstract rules. . . . Pragmatists emphasize the importance of particular contexts in which facts and values must be weighed and balanced, including values such as rights, duties, and virtues. Pragmatists also emphasize flexibility in integrating and harmonizing competing values. Rather than applying fixed rules or ideals, moral decision making is essentially a matter of extending moral reasons into new and often uncharted situations. [It] is best understood as a methodological emphasis on sensitivity to moral complexity, reasonable compromise, and close attention to the manifold dimension of cases in their complete context . . . it is not so much an alternative to the search for valid moral principles as it is an insistence on greater flexibility and tolerance in how principles are applied.

The philosophers William James (1842–1910) and John Dewey (1859–1952) espoused this theory as a rejection of the search for general ethical theories. Pragmatism emphasizes maximum good by impartially considering the interests of everyone affected. The concept is to be flexible in integrating competing values rather than applying fixed rules or ideals. Solving an ethical dilemma is a matter of extending moral reasons into new and sometimes unprecedented situations. In later chapters, particularly in Chapter 4 on Business Ethics, we shall give examples of how the professional engineer, scientist, or manager may make a pragmatic decision where the end result would seem to justify the means. What is important is to ensure that the action taken is, in the end, ethical and does not lead to the slippery slope of unwanted consequences.

Pluralism

As we have emphasized, the reader should be aware that there is no single theory or single method for resolving all disagreements. Moral principles can collide and there can be disagreement about how to resolve the collision (e.g., differences between individual rights vs. utilitarianism). The pluralist position is that in a heterogeneous culture there may be many sources of moral value, and consequently, there may exist a multitude of moral points of view on many issues (consider abortion). This applies all the more strongly across cultures, each of which may have significantly different views of principles, or different principles entirely.

Subjectivism

The theory of ethical subjectivism started with the idea that morality is a matter of sentiment rather than fact. In other words, when a person says that something is morally good or bad, this means that he or she approves of that thing, or disapproves of it, and nothing more (Rachels 2003a). Thus, in a classroom debate on abortion, euthanasia, human enhancement, capital punishment, or some other ethics issue, the opponents might argue one side or another based on their feelings, emotions, or personal values and not a higher set of moral rules.

Many arguments launched against simple subjectivism show that this theory is flawed. However, without some knowledge of moral theories to guide the student and professional, there may be little else to guide their reasoning in even rather simple situations requiring ethical decisions.

Even without philosophical training or the minimum exposure to the theories and principles of this chapter, there is one guiding concept, known as the minimum conception of morality, that calls for reasoning based on facts. This concept is developed further below.

Minimum Conception of Morality

One seeks some guidance or underlying concept that might unite the theories and principles described above. Is there some fundamental construct that would provide a rationalization for moral actions independent of the various theories which, as we have seen, are sometimes in conflict? In this, we are guided by a moral philosophy that defines morality as: ". . . at the very least, the effort to guide one's conduct by reason—that is, to do what there are the best reasons for doing—while giving equal weight to the interests of each individual who will be affected by what one does" (Rachels 2003b).

Deontologists and utilitarianism philosophers would agree with the incorporation of this minimum conception in some form. In fact, this minimum conception of morality can be seen as a statement of justice and also conforms in general with the Aristotelian concept of virtue. Note that the Four A's strategy is a method whereby this principle can be put into practice.

Other Concepts and Ideologies

Above we have summarized the major ethical theories, but there are other concepts around which actions have been justified. We list here seven religious or spiritual philosophies and will use these philosophies in an examination of how human beings have considered their relationships to the environment in Chapter 5. Though there are additional spiritual philosophies, seven of the principal ones are Confucianism, Hinduism, Buddhism, Daoism, Islam, Judaism, and Christianity. Modern thinking in ethics has been influenced by Darwin (1809–1882, evolutionary ethics, survival of the fittest), Freud (1856–1939, behaviorism, decision making defined as the struggle between the ego, superego, and the id), and Pavlov (1869–1936, actions as conditioned responses). Other ideologies include biocentrism (everything in nature has value, nature has its own intrinsic worth independent of its utility for humans), anthropocentrism (human beings have rights superior to the rights of plants, animals, and the environment), right to life (an embryo and fetus have the full rights of an individual human being),

human beings). Communism is an ideology whose proponents might be called utilitarians, and democracy is an ideology whose proponents might be called Kantians.

More recently, four additional ethical concepts have been formulated by a board of philosophers, ethicists, religious leaders, theologians, scientists, physicians, and lawyers to help sort out ethical issues when medical experimentation involves human beings. While designed for, and, therefore, especially applicable to, ethical issues involving human experimentation, they have come to be applied to other situations as well. The four principles are autonomy, beneficence, non-malfeasance, and justice.

PRINCIPLES THAT GUIDE HUMAN EXPERIMENTATION

In the paragraphs above, we have given a synopsis of the major moral theories and illustrated how they can be in conflict. Below we give a synopsis of perhaps the most important set of principles of moral philosophy in the twentieth century. This synopsis, expanded upon in Chapter 8, demonstrates how four principles derived from the major ethical theories were brought together in a codification of accepted methods for human experimentation. The four principles, which are at the basis for evaluating whether a human subject should participate in a research study, are also essential to evaluating and making conclusions about many other moral questions, including those in the practice of medicine (to be discussed in Chapter 7). They are listed with definitions below:

1. **Autonomy:** This principle refers to self-rule; that is, people have the right to make decisions about matters that affect them as individuals, and this right should be respected. The question should be asked whether the issue at hand pertains only to the individual in such a way that the individual's rights should prevail or whether there are consequences to the action that might affect or harm other individuals or society. Often cited examples of violations of autonomy include deception and therapeutic misconception, such as an individual under the false notion that a procedure to which he or she submits will have some personal benefit when it will only benefit a research objective.

2. **Beneficence:** This is the principle of doing good, namely, helping others by protecting them and working to ensure their well-being. Beneficence demands that no subject of research be exposed to risks incommensurate with the potential for benefits to be gained by others. This term is used in medical research and is related to utilitarianism. Research on human subjects with their consent can be done only if the benefits to the patient or others outweigh the risks, an evaluation that is done by an institutional review board as will be discussed in Chapter 8.

3. **Non-malfeasance:** This is the principle of doing no harm, of doing no wrong, of avoiding injury, of not putting anyone at unnecessary risk, and of not intruding on lives unnecessarily. Research designed to obtain scientific information from human subjects often involves medical procedures that can be painful or even put the subject at risk of physical harm. The principle of non-malfeasance is to avoid harm but not necessarily in every situation. If the benefit of the research is great relative to the risks, as determined by a committee of peers, and the subject agrees to

4. **Justice:** The application of justice as a moral theory and as a principle for guidance in human experimentation requires that individuals be selected as subjects fairly without bias to a particular class or group. This requirement is not only to assure equality of treatment but for scientific reasons. For example, experiments done on one ethnic population might not give results applicable to another ethnic group due to a difference in the genetic make-up between the two groups, and experimental results in adults may not be applicable to children.

In considering any experimental situation involving human volunteers, the principles of autonomy, beneficence, non-malfeasance, and justice may provide differing viewpoints and may lead to conflicting conclusions. The person proposing the experiment must show how each principle is served. Key to the evaluation of the ethics of a particular experiment is an evaluation of the risks and benefits. This is so because often there is some risk to the subject, a violation of the principle of non-malfeasance. This risk of harm to the individual must be seen as outweighed by the benefits if the experiment is to be allowed. All other conditions must be met as well.

It seemed at the outset an impossible task to codify methods for ensuring that the four principles described above would be upheld in all human experimentation, yet it was possible to derive a set of guidelines and procedures for the protection of human subjects using the autonomy of the experimental subject as the first principle. The same principles apply to the medical treatment of patients. Chapter 7 on medical ethics and Chapter 8 on human and animal experimentation will expand on these principles.

The example below emphasizes the priority of individual rights (autonomy) whenever medical research or medical procedures are to be performed on humans. Duty ethics, non-malfeasance, beneficence, and utilitarianism are some of the other principles and moral theories that come to bear on almost all research involving humans as well as decisions on the medical care of individuals.

Case 1.12 Promise to Donate an Organ

A patient dying of kidney disease has a cousin who is a good match for a kidney transplant. The cousin volunteered to donate his kidney, a beneficent thing to do. The initial tests were good, but when the cousin found out that he was also to undergo genetic testing, he refused and declined to donate his kidney after all. The patient who had been given false hope sued the cousin. The issues in question have to do with autonomy (the donor's right to make a decision regarding himself), beneficence, and duty. To what extent does the cousin have a duty to proceed to donate the kidney, given he had undergone the initial testing implying he would proceed, then backed out, perhaps harming the patient who had interrupted a further search for a donor? The principle of non-malfeasance with respect to harm to the recipient and to the donor is an issue in this case. The recipient may have been harmed because after the first testing he was no longer continuing the search for a donor. Should the cousin follow through based on virtue ethics? The cousin cannot be required to put himself at risk, yet by first agreeing to the donation he has put the recipient at some risk.

The Four A's strategy can be applied to this dilemma. For example, the acquisition of facts and **advice** might lead to important new perspectives. The **alternatives** do include a continuing search for a donor. The **assessment** should include all of the stakeholders including the

family of the donor and the doctors' responsibilities. **Action** includes a respect for the autonomy of the donor as well as the requirement of the responsible caretakers to find a donor.

Case 1.13 Physician-Assisted Suicide

In this case, the medical dictum of "to do no harm" (i.e., non-malfeasance) and the societal abhorrence toward suicide are in direct conflict with autonomy and the dictum to relieve pain and suffering in a dying patient. A 65-year-old woman with metastatic breast cancer is near death, as evidenced from anemia, weight loss, heart failure, and breathing difficulties due to lung metastases. She asks the physician to help her die by giving her a lethal injection. He is unable to do this, but knows that an increase in the dose of a narcotic to relieve pain will result in death due to respiratory failure. He asks the nurse to increase the dose of morphine, but she notes that the patient's respirations are failing and her personal ethics will not allow her to follow these orders. The method of dealing with this situation is discussed in Chapter 7.

The principles of non-malfeasance, justice, beneficence, and justice came to bear on matters of human experimentation in a study done in a Third World country. As demonstrated in the next case, there was an epidemic of meningitis in children in which the international community tried to help by providing antibiotics. Justice is often at issue in countries lacking the resources to respond in such cases: also at issue is the question of duty when treating a dire disease in children with a high mortality rate when the appropriate dose of a medication, which had been studied only in adults, cannot be predicted.

Case 1.14 Medical Experimentation in Children

Pfizer, a large U.S. pharmaceutical company, was sued in August 2001 by parents of children who died or were injured by participating in a study in Africa of Pfizer's experimental drug for meningitis.

- The parents alleged that they were never told that the treatment was experimental (it had never been tested in children for this indication).

- They were not told that the drug proven to treat the condition and used in the other arm of the study was being given at a lower dose than recommended, or that full doses were available elsewhere (http://www2.warwick.ac.uk/fac/soc/law/elj/lgd/2004_1/ford accessed June 14, 2005).

- They contended that the study was not the humanitarian effort Pfizer claimed, but rather an effort to obtain study data quickly and cheaply in order to license the drug for children.

- It was also alleged that Pfizer never obtained consent from the hospital to conduct the study and later fabricated a letter on letterhead from the hospital Institutional Review Board. However, the hospital did not have an ethics committee or the letterhead on the date shown on the letter (www.washingtonpost.com/ac2/wp-dyn?pagename=article&contentId=A63515-2001Jan15&notFound=true).

Did Pfizer act in its own best interest here? Were these actions driven by profit motives or by utilitarianism? Did they follow the guidelines for informed consent for a clinical trial? Were they breaking international law? Is there justice in what they did? If fewer children died with the new therapy, perhaps it was good. However, there was an epidemic of meningitis underway at the time, and the drug dose had not been properly evaluated in children, whose metabolic pathways may significantly differ from those of adult patients. There may have been earlier data to support the decision to use a lower dose than that stated for use in adults, but how was this decided? Who decided? Did some of the deaths relate to this lower dose? What were the circumstances under which the trial was reviewed and approved? Was there falsification concerning approval for the study by the authorities? Did Pfizer do any harm? They could have. The full facts are not known at the present time, but the case stimulates possible ways to think about an ethical situation involving society (utilitarianism), individual rights (autonomy), justice, and duty (corporate duties to share-holders vs. duty to the children, as is discussed further in Chapter 4). In the meantime, it appears that the case will not come to trial. The U.S. court has declined to hear it, and the African parents have no faith in the corrupt Nigerian courts where the trial has been stalled since 2001 and was adjourned more than 14 times by 2005 (www2.warwick.ac.uk/fac/soc/law/elj/lgd/2004_1/ford/, accessed June 14, 2005).

However, although the situation depicted here gives the plaintiffs' objections and infor-mation in published reports, any implication that Pfizer did not act morally is unwarranted without all of the facts. Those involved at Pfizer say that because there was an epidemic underway and the children needed rapid treatment to save lives, they did move rapidly but also they did obtain review and approval of the protocol before proceeding. Without a fair trial, the truth will probably never be known.

To some, the ethics of animal experimentation have become even more controversial than human experimentation. This is generally because of conflicting ideologies about ani-mal rights. The major argument against animal experimentation is that the harm to animals is not justified by the benefits to society of the proposed experiments. The principal ideo-logical conflicts revolve around the status of animals in the moral community and, perhaps more importantly, around virtue issues regarding infliction of suffering. Utilitarianism, with emphasis on minimizing discomfort, provides the arguments that led to rules for eth-ical behavior in animal experimentation (further discussed in Chapter 8).

Dangers of Expediency and the Slippery Slope Theory

The slippery slope concept refers to situations where an act, decision, or allowance might lead to unwanted consequences or events that cannot be controlled. An example is the Supreme Court decision not to allow physician-assisted suicide, even though it was argued that the individual patient had a right to decide on his or her life. The Supreme Court antic-ipated that the varied consequences of allowing physician-assisted suicide were grave, and that such a decision was a step onto a slippery slope, the bottom of which would be far worse than granting individual rights in this case. Where would the line be drawn regarding oth-ers who might be assisted in suicide? The insane? The disabled? The elderly who could not pay for medical or other care? In everyday decisions, the consequences of doing what

might be seen as the right thing could be disastrous. The avoidance of the slippery slope, although not identified with utilitarianism in general, should be high on the list of consid-erations when faced with ethical dilemmas in personal and professional life choices. Case 1.10, the Supreme Court case of Eminent Domain vs. Rights of the Land Owner that allowed property seizures for "public purpose" to promote economic development in a depressed city, is an example of a slippery slope situation.

As will be discussed in more detail in the chapters on business ethics and medical ethics, there are some common prodromal circumstances, seemingly innocent acts that become gateways leading to major ethical errors. The concept of the slippery slope applies to situations where one purposely limits the right of an individual because societal wisdom perceives that the allowance of rights (e.g., physician-assisted suicide) could lead to dire legal and ethical consequences. One of the major goals of this book is to provide informa-tion that will lead the scientist and engineer to alternate paths in order to avoid entering a series of actions that, though seemingly not morally wrong at the time, nevertheless can lead to unethical and even illegal activities.

The most common gateway to unethical behavior is the temptation to resolve a prob-lem or perform an action because it is convenient or expedient. This temptation to adopt an expedient solution occurs frequently in the corporate environment where there are mul-tiple stakeholders. As we shall see, many of the stakeholders' interests may not be consis-tent with the corporate goal of making a maximum profit. Examples in Chapter 4 will show how one corporation became mired in a disastrous situation because of a few expedient acts on the part of seemingly innocent engineers, and how another corporation avoided possible ruin by avoiding the temptation to make an expedient decision.

Successful decision making and principled ethical behavior are closely related to vig-ilance concerning the consequences of expedient acts. Throughout this book, many cases will be presented wherein ethical theories and principles were violated. The intent is to emphasize how easily some early decisions and reckless approaches to problems have led individuals and entire corporations into dire situations. Protection from the negative con-sequences of a pragmatic solution to a problem is afforded by the consideration of how alternative solutions will affect the stakeholders, and by seeking advice.

Learning Values and Cheating in Life

Though we might like to think that all cognitive human beings were born with an innate set of values and a fundamental set of virtues, this is not the case. Clearly, some behaviors are innate to survival in animals of all species, such as avoiding some dangers not necessarily taught by parents, seeking food, and protecting the young. But behaviors such as kindness, loyalty, sharing, telling the truth, and not stealing or cheating are learned. Few would argue that cheating is wrong, but because of its widespread occurrence (Callahan 2004), it seems that the value of honesty is not learned, or if it is learned, is not held as an important virtue. However, this value can be learned and reinforced by the many rewards gleaned from suc-cess without cheating (George 2003; see also Chapter 4). Guidance in behavior that is con-sidered virtuous by the majority appears in the form of codes of professional conduct, credos of business corporations, policies of foundations and universities, religious rules, and

codes of laws. While these codes and laws may fall short of guiding behavior in all circumstances, generally, when considered along with the ethical principles emphasized throughout this text, they are valuable guides that form a basis for working through both personal and professional ethical dilemmas.

SYNOPSIS OF TOOLS FOR RESOLVING ETHICAL DILEMMAS

Here we review the tools for designing solutions to ethical problems or in making decisions to avoid ethical situations that can lead an individual, institution, or corporation into ruin. First recall the Four A's presented in Table 1.1: 1) acquire facts, 2) consider alternatives, 3) assess alternatives relative to moral theories and stakeholders, and 4) act but be prepared to modify the action plan.

Frequently during steps 2 and 3, two or more actions come into conflict where duty is involved. In these cases, the selection of the prima facie duty (Table 1.5) that overrides others involves a logical thought process. Frequently, a decision for the correct action is based on the intuition of the individual faced with the need to select one duty over another. During this stage, it is important to enumerate the stakeholders, particularly in business ethics (see Chapter 4), and to analyze how equity or justice (Table 1.4) to the stakeholders is affected by the consequences of alternative actions.

In step 2 of the design strategy, the decision maker evaluates a number of alternative solutions or courses of action. Selection of the optimum course of action involves not only attention to the conflicting moral theories but a prioritization or ranking of the alternatives using some or all of the following tools:

Consequences to stakeholders: The listing and prioritization of stakeholders involved in an ethical dilemma becomes particularly important in business ethics and this subject will be discussed in Chapter 5 when the design strategy is expanded to facilitate decision making in business or corporate ethical problems.

Justice and equity (Table 1.4): A consideration of an action with respect to the fairness to each affected individual arises in distributing rewards and in situations of limited resources. These situations occur in corporate and medical ethics discussed in Chapters 4 and 7, respectively.

Prima facie priorities (Table 1.5): This philosophical modernization of Kant's deontology when there are conflicting duties will usually apply to actions with respect to one's personal duties.

Risk analysis: The consequences of various alternative solutions can in some cases be quantified using theories of risk assessment. This is a complex area of engineering, public policy, and government regulation settings, which will be discussed from the engineering and public policy viewpoints when we consider the ethics of emerging technologies in Chapter 12. Risk analysis involves an attempt to quantitatively prioritize alternative solutions. Risk assessment asks three questions: What can go wrong? How likely is it to happen? What are

the consequences? These three questions will also help guide the analysis of alternative solutions when at step 2 in the Four A's strategy. We will return to the uses of risk analysis in ethical problems in Chapter 12.

CHAPTER SUMMARY

The theories of virtue, justice, rights, duty, and utilitarianism, together with the principles of autonomy, non-malfeasance, and beneficence, represent guiding concepts when thinking about ethical problems. Strategies for analysis and solutions are presented as the Four A's Strategy for Dilemmas and the Ethical Engineer Framework in Tables 1.1 and 1.2. But without consideration of all ideologies applicable to an ethical problem, one might choose a solution that is not optimal for the situation. Table 1.3 gives a list of the theories and principles defined in this chapter along with many contemporary ideologies that may influence the selection of a solution for major and minor dilemmas. The cases presented in this chapter have illustrated the applications of different moral theories as well as conflicts between the theories of justice, duty, rights, and utilitarianism. Also emphasized is the importance of thinking through the consequences of actions relative to stakeholders and the prioritization of duties. Many of these concepts can come into play within a single case with several "right" or "good" solutions, making it necessary to decide on a solution when there is no "best" solution. Further, ethical concepts may change over time, making it important to keep an open mind about both the solution and the consequences.

No single moral philosophy can be applied to all situations, and even proponents of one philosophy disagree on important details. For example, the maxim of the utilitarian to select that action leading to the greatest happiness (act utilitarianism) will not always lead to an ethically correct act. As a result, it was necessary to incorporate into the theory of utilitarianism a branch called rule utilitarianism. The rules are those that, if followed by society, will maximize happiness. Three examples of these rules are: keep promises, do not lie, and punish individuals for wrong behavior.

The moral theory of duty as espoused by Kant gave moral value for acts based on the motive of doing the right thing and not on motives for the consequences of benefits of the act. This theory required the introduction of the prima facie priorities, a more modern philosophy that allows the selection of an action when multiple duties are in conflict.

Along with knowledge of the major moral theories, the professional engineer or scientist needs a systematic approach to resolving dilemmas. An overview of the approach espoused in this text is given in Tables 1.1–1.5. The use of the Four A's is an effective way to think through a problem. Further protection from making a slippery slope decision is gained if the decision maker also takes into consideration the consequences of an action to all stakeholders, the order of priorities, and the axioms of justice and other moral theories. In some complex situations, the initial fact finding, as well as the evaluation of alternatives, should also include the use of risk analysis (see Chapter 12). But perhaps of greatest importance to the art of decision making when faced with ethical problems is to resolve the facts and ambiguities before considering alternative solutions, to seek help from others, and to avoid expedient decisions.

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ADDITIONAL READING

Below are listed a number of books on engineering ethics and moral philosophies which are particularly relevant to the issues of decision making by the professional scientist and engineer. Additional listings of books relevant to business ethics, medical ethics, computer and Internet ethics, stem cell research, and germline engineering are also provided at the end of the respective chapters.

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