Chapter 5

The Prime Responsibility of Safety

Chapter Objectives

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

- with reference to the case of Hurricane Katrina, explain the value of and difficulty in studying disasters, identify and apply the basic ethical principles for global engineering, and identify competing claims made on engineering and engineers from the perspective of safety;
- describe the ways engineering can be understood as a kind of "social experimentation" and the responsibilities of engineers that follow from this analogy;
- explain the natures of and criteria for assessments of objective and subjective safety and how these present challenges to engineers, especially in cross-cultural contexts;
- with reference to the case of the Uber Rape Scandal, explain some responsibilities that engineering and technology firms could be claimed to have to the safety of their users.

CASE STUDY ONE—HOW SAFE IS SAFE?: THE CASE OF HURRICANE KATRINA[78]

When large-scale disasters occur, a common response consists in looking for the causes of such catastrophes—whether human or natural—to assign blame. As in the case of the Überlingen midair collision, more often than not, no single cause is solely responsible. This makes the assessments of such disasters fraught with uncertainty and, at times, can result in scapegoating—finding one party on which to unfairly place all the blame. In retrospect, technologies, decisions, organizations, etc., will be described as "unsafe." A more positive response would be to acknowledge there is always "enough blame to go around," focusing instead on assessments of safety and the future, so that similar events can be prevented.

78. Materials in this case study previously appeared in Luegenbiehl (2007).

Global Engineering Ethics. http://dx.doi.org/10.1016/B978-0-12-811218-2.00005-9

Both responses were parts of the public discourse surrounding Hurricane Katrina in 2005, one often to the exclusion of the other. Obviously, however, neither is incompatible with the other and, in fact, both should play a role in forming a total assessment of the situation: without understanding why events occur, it is difficult to learn from them. Generally, if suspicions exist with regard to assigning responsibilities, then they concern the motives of those seeking to blame—diverting attention away from themselves, wanting to beat their opponents, or exhibiting moral superiority against others.

Complexity is a second issue. Given the confluence of various causal conditions, it is difficult and, perhaps, unfair to place all the responsibility on individual actors or institutions. The Independent Levee Investigation Team report on Hurricane Katrina, for example, states the following: "In the end, it is concluded that many things went wrong with the New Orleans flood protection system during Hurricane Katrina, and that the resulting catastrophe had it[s] roots in three main causes: (1) a major natural disaster (the hurricane itself); (2) the poor performance of the flood protection system due to localized engineering failures, questionable judgments, errors, etc., involved in the detailed design, construction, operation and maintenance of the system; and (3) more global "organizational" and institutional problems associated with the governmental and local organizations responsible for the design, construction, operation, maintenance, and funding of the overall flood protection system" (Seed et al., 2005, xviii). While this list explicitly identifies three major causes for the disaster, it implicitly invokes a myriad of individual sources, many of which can only be properly assessed in conjunction with other underlying factors. The task of assigning responsibility would, therefore, be incomplete and somewhat subjective.

In cases of large-scale disasters—when suspicions of motives are combined with the inherent difficulty of assigning responsibility to individuals or organizations—it might seem as though reasons exist for avoiding the ethical assessment of such cases. In learning about ethics, some might argue, it is better to examine clear-cut situations in which ethical questions arise, where it is easier to assign responsibility and arrive at conclusions regarding ethical issues. If the goal of ethics education is to learn lessons from the past for the future, then perhaps simpler is better.

In contradistinction to this line of thought, the position taken here is that—given the increasingly complex nature of engineering environments and diverse actors involved—examples like Katrina are robust and appropriate sources for learning about ethics, revealing important lessons not generally learned from other types of cases. Cases about disasters show the dramatic, at times catastrophic nature of consequences that can result from the confluence of relatively minor, seemingly insignificant decisions. Such circumstances highlight the paramount importance of public safety to engineering ethics and standards to address the nature of safety.

Katrina as a Case for Engineering Ethics

Describing the consequences of Hurricane Katrina, the report of the Independent Levee Investigation Team states the following: "This event resulted in the single most costly catastrophic failure of an engineered system in history. Current damage estimates at the time of this writing (May 22, 2006) are on the order of $100–150 billion in the greater New Orleans area, and the official death count in New Orleans and southern Louisiana at the time of this writing stands at 1293, with an additional 306 deaths in nearby southern Mississippi" (Seed et al., 2005, xviii).

Before assessing this case as one appropriate for engineering ethics, however, the possibility that it would fall outside the scope of engineering ethics should be considered. One might argue, for example, that, as a disaster, Katrina was an "act of God," due primarily to forces of nature rather than human actions, and, thus, that it was ultimately unpreventable. Or one might claim that the origins of the situation lie so far in the past that assignment of responsibility is a fruitless enterprise. Further, one might point to the limited power and authority engineers exercised in the creation and maintenance of the flood prevention system, or that those in New Orleans were responsible for their own fates, having made the decision to reside there. All of these points have been debated, and considering them all in detail would be beyond the present scope. For the purposes here, establishing an engineering ethics dimension with regard to this disaster is enough.

Speaking to this point, Raymond Seed, the head of the Independent Levee Investigation Team and professor of civil engineering, asserted the following on the PBS NewsHour: "The levee system failed in large part because of embedded deficiencies and because safety and reliability were put at risk; they were traded for economic efficiencies" (PBS, 2006). The report on Katrina mentioned the following specifically engineering-related failures:

Inadequate margins of safety. The factor of safety used for the design of the levee system was inappropriately low to protect an urban population. It would have been more suitable for agricultural farmland (Seed et al., 2005, xxiv, pp. 15–10).

An incomplete system. At the time of Hurricane Katrina, sections of the New Orleans levee system were incomplete, leaving gaps in the system (Seed et al., 2005, pp. 8–16). Also, sections were below their design height specifications (US Army, 2006, I.1–2).

A fragmented system. Various local organizations controlled different parts of the levee system. This resulted in incompatible structures with inherent weaknesses at points of transition (Select Bipartisan Committee, 2006, pp. 91–92).

Inadequate design. Failures of some levees could have been prevented with relatively simple measures, such as installing concrete splash pads at the base of the levees to prevent erosion or using T- rather than I-shaped walls (Seed et al., 2005, pp. 8–7). Floodgates could have been installed at the entrance of the New Orleans drainage canals, which did not occur because of the infighting of local agencies (Seed et al., 2005, pp. 8–15).

Failure to learn from others. The Corps of Engineers commissioned studies for the improvement of the levee system, but the results of these studies were ignored in subsequent design decisions (Seed et al., 2005, pp. 8-13). In the Netherlands, a flood control system is used with the ability to protect against a Category 5 hurricane. At landfall, Katrina was a Category 3, and by the time it hit New Orleans, it was even weaker (Seed et al., 2005, pp. 8–13; Graumann et al., 2005, pp. 1–2).

Lack of central control. The fact that no one had overall oversight of the levee system was part of the reason for the failure of the system. Different local agencies were responsible for various sectors, without adequate coordination among them (Seed et al., 2005, pp. 8–5).

The above is by no means a complete list of possible engineering issues related to Hurricane Katrina, but it is sufficient to show that this case is suitable for analysis in terms of engineering ethics. The engineering failures discussed above reflect a general consensus among different reports on Katrina, although differences exist among these regarding assessments of specific responsibilities:

- In which ways is a leadership model based on central control more effective than one in which numerous agencies work on a project? What are some potential downfalls of a central control model?

Studying Katrina

Making the claim that Katrina is a case appropriate for study within engineering ethics is, of course, not the same as making judgments that engineers are—in part or whole—to blame for the consequences of Katrina. However, that is a conclusion at which some might arrive, based on statements such as those made by Carl Strock, lieutenant general and member of the US Army Corps of Engineers, on the PBS NewsHour: "At the end of the day, we have accumulated a level of risk and I don't think we truly understood that. So I think what you'll see is that, before we defer to others on elements that involve engineering decision-making and our ethical responsibilities to ensure what we build is going to serve its purpose, I think you'll see a greater propensity on the part of the Corps of Engineers to stand up and say 'No' " (PBS, 2006).

Instead of simply blaming engineers, using a disaster like Hurricane Katrina as a case from which to learn points to the complexity characteristic of sophisticated ethical analysis. Simply because engineers "put at risk" safety or failed to exercise professional autonomy does not automatically mean they should be blamed for what happened. Precisely because they are not susceptible to simplistic conclusions, large-scale disasters provide perfect cases from which to learn more about engineering ethics. Incidences like Hurricane Katrina should be used to consider a variety of possible interpretations and conclusions, with the understanding that no one conclusion is necessarily the only right one or even the best. Hence, the point of examining disasters in engineering ethics is not to assign blame but to discuss issues. Both the natures of the disaster and sources about Katrina make it a case that provides rich opportunities for discussions.

When Henry Petroski entitled his popular *To Engineer Is Human*, he surely had in mind the saying "to err is human, to forgive divine." Like all other human beings, engineers are far from perfect. However, most strive to do their best. To do so, they must learn from the past. In itself, this is an important lesson to be learned from ethical analysis. As Petroski rightly says, "no disaster need be repeated, for by talking and writing about the mistakes that escape us we learn from them, and by learning from them we can obviate their recurrence" (Petroski, 1985, p. 227).

EXERCISE ONE—HOW SAFE IS SAFE? (PART ONE)

Listed below are sets of ethical issues regarding/questions about the case of Hurricane Katrina. For each set of issues, complete the following steps of the case-study procedure:

1. Three—listing facts from the case relevant to resolving the issues under consideration and any important missing facts.
2. Four—writing out reasonable assumptions one can make regarding these missing facts.
3. Five—clarifying the use of terminology, in the ethical issues, relevant facts, missing facts, or reasonable assumptions.
4. Six—referring back to the basic ethical principles for global engineering described in Chapter 4, list the ones that apply to the issues under consideration here. If apparent conflicts exist between the principles you have listed, then rank them, indicating which principles you think should take precedence and providing short justifications for the hierarchy. Additionally, if you think there are other important principles that should apply—from your personal life or in general—then list these as well, again, providing brief justifications for the relevance of these principles.
5. Seven—going back through the previous steps, see if there are other issues or facts that have been overlooked, concepts that can be clarified, or principles applied.
6. Eight—resolving the issue under consideration/answering the question, provide a brief justification.
7. Nine—looking over the case again, identify and list any constraints that could reasonably excuse either individuals or organizations from the resolution/answer given.

8. Ten—outlining how ethical problems might have been avoided in the first place.
   - Given General Strock's description above, was the Corps of Engineers sufficiently autonomous in its decision-making processes? To what extent should engineers be able to exercise their professional autonomy—the right to make decisions based on their specialized, professional knowledge?
   - Was preparing for a Category 3 hurricane adequate for a densely populated area prone to hurricanes? What level of risk is acceptable in different kinds of situations?
   - Should the issue of "whistle blowing"—bypassing a hierarchical chain of command or exposing information to outside bodies—have arisen for engineers involved in the building of the levee system? Do engineers have specific professional and ethical responsibilities that go beyond ordinary ethical duties?
   - Should those warned about the state of the levee system prior to the hurricane have taken greater actions? What is the role of professional organizations and outside parties?
   - Did the levee designers have a responsibility to consider the ways different social strata in New Orleans would be affected by major flooding? Should engineers consider the differential consequences of their design decisions on different groups?
   - At what point do the risks involved in levee construction outweigh the potential benefits to the local population? Do engineers have a positive duty to do good—beyond the simple duty of avoiding harm?
   - Is a military organizational structure suitable for constructing urban civil works that involve the safety of large numbers of people? Can engineers be expected to answer to several different "masters"?

5.1 SAFETY: A SPECIAL CONCERN FOR ENGINEERS—ENGINEERING AS "SOCIAL EXPERIMENTATION"

As the case of Hurricane Katrina shows, modern technology has the incredible power to affect human lives. What might, at times, seem like minor design decisions can bring harms or benefits to millions or even billions of people. Even the powers of contemporary dictators are small compared with the powers of engineers. These powers carry with them a great deal of responsibility. However, this often goes unrecognized, even by the holders of the powers themselves. While the powers of engineers can bring great benefits to the public, they can also bring great harms.

Neglecting appropriate safety considerations in the design of a nuclear reactor, for example, could destroy lives and make areas of land uninhabitable for decades. An emphasis on safety highlights the centrality of ethics in engineering. It means engineers are responsible for not only the technical adequacy of their activities but also the consequences that result from the intended and unintended—but foreseeable—effects of these activities, insofar as they have the potential to harm the public.

To discuss duties of safety engineers have to the public, Mike Martin and Roland Schinzinger introduce and develop—what has come to be—a well-known analogy between engineers and social experimenters. The authors frame engineering as a kind of social experimentation, showing that specific responsibilities follow for engineers, as they do for scientists performing experiments on human subjects. As with scientific experiments on human subjects, the activities of engineers are carried out—at least in part—in ignorance, where the outcomes of experiments are uncertain: the introduction of new technologies into society can have unknown consequences. Unlike with scientific experiments, however, as experiments, engineering activities lack controls that would act as protections—that is, no control group is established or alternative reality developed—and are carried out on much larger scales. The responsibilities of engineers would, therefore, be even greater than those of scientific experimenters.

In *Introduction to Engineering Ethics*, Martin and Schinzinger define these responsibilities as follows: "(1) A primary obligation to protect the safety of human subjects and respect their right of consent. (2) A constant awareness of the experimental nature of any project, imaginative forecasting of its possible side effects, and a reasonable effort to monitor them. (3) Autonomous, personal involvement in all steps of a project. (4) Accepting accountability for the results of a project" (Martin & Schinzinger, 2010, p. 86). Thus, according to Martin and Schinzinger, the responsibilities of engineers for safety cover the full range of engineering activities. Additionally, they believe these are responsibilities applicable to each individual engineer involved in processes of engineering activities:

- How can the Hurricane Katrina disaster be conceived as a social experiment in relation to engineering, and why is this example particularly important in considering future safety measures?

5.2 THE NATURE OF SAFETY: OBJECTIVE AND SUBJECTIVE

All human beings are concerned with safety. This concern probably stems from universally evolved biological instincts that protect against death and serious injury. One of the easiest ways to keep members of the public from engaging in activities is to convince them that these activities are unsafe. However, it is unclear precisely what "being safe" means.

Safety is strongly associated with freedom from harm, although harm can take many forms. Harm can be physical, psychological, emotional, financial, and so on in nature. Holding engineers responsible for all the potential harms that can result from introducing technologies into society would, clearly, be unjustifiable, although engineers might have contributory responsibilities.

Due to their expertise, however, a strong connection exists between engineers/engineering activities and the potential for resulting physical harm; although, even here, no absolute standard is possible. The claim that engineers have a responsibility for the physical safety of the public requires clarification.

Again, despite being a term often taken to have a clear meaning, "safety" is a rather complicated phenomenon. Safety can be understood in terms of its subjective and objective dimensions. Subjective safety consists in the *feeling* of not being in danger. Objective safety consists in the *fact* of not being in danger. Although one can *feel* perfectly safe, no one can ever *be* perfectly safe.

From an engineering perspective, the first thing to realize is that no product can ever be made perfectly safe—in an objective sense—and be economically viable. Second, not all possible consequences can be foreseen. This means there will always be *degrees* of safety associated with engineering activities. Objectively, safety is a concept that operates on a sliding scale: things can be more or less safe, so being objectively safe does not have any one, clearly defined state. Third, for members of the public, the feeling of safety is influenced by knowledge, since a feeling of subjective safety may not correspond to a high degree of objective safety or vice versa. Although many are afraid of and feel unsafe flying in airplanes, for example, statistically speaking and objectively, air travel is one of the safest forms of transportation. As responsible experimenters, engineers should consider both the objective and subjective dimensions of safety.

Objectively, safety is a matter of "risk," which can be defined as the potential that something unwanted and harmful could occur—the likelihood of failure multiplied by the severity of the consequences of failure. As with harms, there are different types of risks: bodily, psychological, economic, environmental, and so on. Again, as responsible experimenters, engineers should be concerned with all of these. However, there are clearly limits to engineers' abilities to assess the extent of all risks or even to discover them. Imagine, for example, that you are designing a new four-wheel drive vehicle—a model of the Ford Explorer, for instance—and try to think about all the risk factors you would have to consider in your design. To carry out a risk-benefit analysis, you would need to consider the following:

1. What kinds of damages are possible?
2. What are the potential severities of these damages?
3. What are the probabilities that human beings would be exposed to these damages?
4. What are the technical feasibilities of the alternatives?
5. What are the economic feasibilities of these alternatives?
6. What are the potential adverse effects of these alternatives?[79]

79. For an extended treatment of risk analysis in public engineering projects, see Thompson and Perry (1992), Ayyub (2014), and Millar and Lessard (2001). Treatments of considerations of risk also vary within different domains of engineering. For an example concerning technological design, see Star (1969). For an example from civil engineering, see Faber and Stewart (2003).

Further, while safety is a central feature of the design process, engineers should also be concerned with other factors that influence design, such as efficiency, costs, longevity, and manufacturability. All of these factors form parts of larger cost-benefit analyses, only some aspects of which are directly related to engineering responsibilities. Especially since—to a large extent—they deal with the future, analyses of risks and costs are never completed once and for all. In terms of risks, however, engineers are in the best positions to make such judgments, and doing so is part of their professional responsibilities. Making these judgments concerning risks requires a broad basis of knowledge on the parts of engineers—the study of technical materials alone is insufficient. For this reason, ABET requires that accredited engineering programs and those seeking accreditation can demonstrate that that their students possess "the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context" (Criteria 2016–17).

Like safety, assessments of risks have subjective components. These components can be framed in terms of the acceptability of risks—the level of risks resulting from the activities of engineering, which the public deems acceptable. The social and cultural values of particular societies play a major role in levels of risk acceptance. For example, questions regarding the value of individual human lives, importance of future generations, how risks should be distributed among the population, comparisons of different risks, circumstances in which risks will occur, etc., all determine the acceptability of risks. The following outlines general criteria of risk assessment within the Western world:

Higher acceptance of risks	Lower acceptance of risks
Voluntary	Involuntary
In control	Not in control
Occupational	Nonoccupational
Common hazard	Dread hazard
Effect later	Effect immediate
Risk known	Risk unknown
Consequences reversible	Consequences irreversible
Statistical risk	Known individual at risk[a]

[a] *Regarding criteria of risk assessment along these lines, see, for example, Renn (1998). Concerning the ways these differ cross culturally, see Renn and Rohrmann (2000).*

Thus, engineers should be concerned with not only the risks but also the acceptability of risks. Given that levels of risk acceptance vary culturally—in ways over which engineers do not have control—to a reasonable extent, they should be aware of cultural conditions in fulfilling their safety obligations. Obviously, however, there are limits beyond which engineers—especially on an individual basis—cannot know all the objective risks associated with courses of actions or the acceptability of these risks. How then can engineers possibly be responsible for the consequences associated with engineering activities?

One possible solution is "informed consent," a doctrine generally accepted within US medical contexts and incorporated into laws. Informed consent requires that physicians inform patients of the known risks of procedures, and that—as reasonable beings—patients understand these risks and voluntarily consent to the procedures. Without informed consent, the procedures will be considered "battery," unlawful touching. In dealing with questions of safety, it has been suggested that engineering adopt a similar model: without its consent, the public has a right not to be harmed. Therefore, engineers would have the obligation of informing the public of possible harms that would result from engineering activities. As physicians generally deal with patients on a one-on-one basis in medical contexts, obtaining this consent is easier. By contrast, in engineering, products or processes are generally introduced on a society-wide basis, where the end users or those affected are not well known.

First, engineers thus seem morally and professionally required to ensure that their designs and products are the safest possible, within the constraints of risk-benefit analyses. This requires the adequate testing of products and processes before being marketed, and perhaps even initial test marketing on small or localized scales. Second, engineers are responsible for informing the public of known risks associated with engineering activities and where the risks associated with these activities cannot be determined. Adequate warning labels and instructions for the use of products and processes are, therefore, required. Third, as experimenters, engineers should be aware of changes in the uses of products and processes they create, as well as changes in the environments in which these take place. This could entail, for example, making changes to the products or processes, or to their instructions. Assuming these conditions are met, members of the public can make voluntary decisions regarding whether or not to use the products or processes engineers have created, formulating their own decisions concerning the acceptability of the risks involved:

- Could there be discrepancies in measurements of safety between cultures? If so, explain how this could affect global engineering and how it might be overcome.
- Levels of risk acceptance often vary from culture to culture. How should engineers measure the acceptability of risks in general? What other factors should be considered when measuring the acceptability of risks in particular countries?
- It is relatively easier for medical practitioners to inform and obtain the consent of their patients. How might larger, engineering organizations inform society?

5.3 THE CONNECTION OF SAFETY WITH OTHER RESPONSIBILITIES

Public safety is generally—although not universally—recognized by the global community as a core ethical responsibility of engineers. Engineers who fail to consider public safety in their engineering activities are incompetent engineers. However, aside from incompetence, engineers might neglect considerations of safety because other factors are allowed to influence their decisions—factors external to the realm of engineering. As explained above, evaluating subjective dimensions of safety can present engineers with potential difficulties, and the expressed desires and wants of the public are important to this evaluative process. Do engineers have the responsibility of preventing the public from fulfilling its desires—thereby acting paternalistically—if they believe the fulfillment of these desires would create an objectively unsafe situation? Whose interpretation of safety should count in this decision-making process, and to what extent?

More significantly, engineers have responsibilities to others, which are not based solely on engineering. As was mentioned in earlier chapters, each human being plays many roles. Two additional, major roles that engineers often play are those of employee and family member. These other primary roles can create "conflicts of interests," situations where the legitimate demands of two or more roles conflict, so that not all of one's duties can be met. Traditional engineering ethics has held that engineering duties—especially that of public safety—should always take priority. Given the implications and consequences of failing to fulfill the duties associated with other roles, however, this seems like a potentially unreasonable expectation.

Traditional ethical theories typically hold that any one life is equal to that of any other. Hence, if an engineer could save the lives of *two* persons by fulfilling his or her engineering duty, for instance, versus saving the life of *one* of his or her children, but neglecting the engineering duty, then ethical theories would typically demand that the engineer fulfill his or her engineering duty and save the two lives. However, from the perspective of role responsibilities—discussed before—the situation is less clear, since the duty of a parent is, first and foremost, for the welfare of one's own child or children. Were there only one child, the parental role would be completely destroyed with the death of the child. In this type of situation, for most parents, the choice would be obvious.

Should one be willing to condemn a parent in a situation such as this for acting unethically? If not, then it is necessary to recognize that engineering duties cannot be understood in isolation, simply condemning any action that runs contrary to engineering duties as an illegitimate conflict of interests. This becomes more pressing given the wider contexts of typical engineering practices, since the vast majority of engineers are also employees. For these reasons, it is necessary to examine the roles of engineers in business environments, a task carried out in the next chapter:

- State and explain an actual incident of which you know where engineering or technology companies neglected safety considerations to meet public desires. In this case, what principles of ethical global engineering were violated?
- As an engineer working on the maintenance and safety of the levee system in Louisiana, would it have been ethically correct to warn his or her family and friends but not the general public? As an engineer—versus a friend or family member—which ethical responsibilities might come into conflict? Explain your answers.

EXERCISE TWO—HOW SAFE IS SAFE? (PART TWO)

Returning to the case of Hurricane Katrina, complete steps 3–10 of the case-study procedure on the following sets of ethical issues:

- If engineers believed the design constraints of the levee system to have been inadequate, then should they have built them according to these constraints? To what extent do engineers have a responsibility to ensure the safety of the local population, despite whatever countervailing demands might exist?
- Should the Corps of Engineers have been involved in evacuation planning rather than its having been left to local government agencies? What are the responsibilities of engineers to ensure that people have safe exits if disasters occur in relation to engineered work?
- Was the local population sufficiently aware of the potential risks associated with the levee system? Should engineers think of themselves as "social experimenters," with a corresponding duty to gain the informed consent of populations affected by their actions?
- Even though control of the levee system had been turned over to various local agencies, did the Corps of Engineers have a responsibility for continued follow-up? What is the responsibility of engineers to monitor the ongoing status of completed projects they have designed?
- Should early developers of the levee system have forecast the growth of the New Orleans area and the attendant problems this would create? To what extent can engineers be expected to factor in the long-term consequences of their decisions, even though many of these cannot be known?
- Are the levee designers responsible for factoring in the effects of dredging—removing sediment from the bottom of—the Mississippi and the loss of wetlands? To what extent can engineers be expected to be aware of the interactive nature of such decisions?
- Did the engineers who designed the levees have a responsibility to use the best available model—from the Netherlands—in their decisions? What duties do engineers have to be aware of, and utilize, prior knowledge in their designs?

CASE STUDY TWO—THE UBER RAPE SCANDAL: USER SAFETY AND THE RESPONSIBILITIES OF TECHNOLOGY FIRMS IN GLOBAL CONTEXTS

On Dec. 6, 2014, a 35-year-old female financial analyst working in New Delhi, India, accused Shiv Kumar Yadav, a 32-year-old male Uber driver, of raping her. On Dec. 9, 2014, the Indian government announced a ban on Uber's services in New Delhi—shortly thereafter, governments in Spain, Thailand, and the Netherlands followed suit—and in Jan. 2015, Uber was sued in a US court for "failing to ensure" passenger safety ("India Woman," 2015).

The India case raises questions regarding user safety in the age of digital apps and the "sharing economy," as well as the responsibilities of technology firms in these increasingly decentralized and global contexts—especially given national legal differences.

"According to the victim, she had hailed [a] cab using Uber's mobile-phone-based application about 9:30 p.m. on Dec. 5" (Koutsoukis, 2014). She fell asleep in transit, awaking to find the car stopped and Yadav assaulting her. She "tried to escape," but "the driver threatened to kill her and then raped her" (Koutsoukis, 2014). For Yadav, this was not an isolated incident.

Approximately a month before, in Nov. 2014, Nidhi Shah reported Yadav to Uber. Shah complained that Yadav "kept staring at Nidhi and her partner through the mirror," which made them uncomfortable (Koutsoukis, 2014). Uber sent an email to Nidhi, promising to follow up the complaint and give feedback to Yadav. Those familiar with him were unsurprised.

Yadav was described as a "compulsive sex offender" (Koutsoukis, 2014): "you won't find a single household" in the village in which Yadav was born and raised "whose women he hasn't teased or molested" (Koutsoukis, 2014). The villagers rarely made "any criminal complaint because they" believed it would "bring a bad name to the village" (Koutsoukis, 2014)—despite molestation allegations dating back as far as 2003 (Singh & Jethro, 2014).

Yadav was "previously accused in three more criminal cases," two of rape and one of molestation ("Uber Rape," 2014). In 2011, he "was acquitted of charges of raping a woman at knifepoint due to an apparent lack of evidence," and in 2013, "he was granted bail after another rape case was registered against him" (Koutsoukis, 2014). Despite this background, Yadav was hired as a driver at Uber. During his time as a driver, reportedly, Yadav "was always on the prowl for women traveling late at night, especially those who he thought were vulnerable" ("Uber Rape," 2014).

"Unlike other more traditional taxi services that require drivers to undergo police checks before granting them a taxi permit," Uber in India did not screen its drivers (Koutsoukis, 2014)—despite Uber management in India having claimed that all of its "driver partners are put through a rigorous quality control process" (Koutsoukis, 2014).

After this incident, officials in the Indian government said "top executives" at Uber "could face charges of criminal negligence over the rape for not conducting adequate background checks of its drivers," although this never came to fruition (Koutsoukis, 2014). On Feb. 2, 2015, in the aftermath, Uber promised to "establish clear background checks currently absent in their commercial transportation licensing programs" (Russell, 2015), and Yadav's victim voluntarily dropped her US-based lawsuit against Uber. Although Uber was not ultimately found guilty in either criminal or civil proceedings, it undoubtedly suffered in the court of public opinion, bringing bad PR to the company.

This incident emphasizes the complex nature of safety within engineering, raises questions regarding the ethical responsibilities technology companies have to their users, and highlights important differences between legality and ethicality:

- As a result of traffic accidents and robberies—through user inattention/distraction and thieves luring players to secluded areas—app-based, augmented reality games such as PokémonGo have raised questions about the responsibilities of app developers and technology firms to user safety. How are these concerns similar to and different from those regarding apps such as Uber and services such as Airbnb? Explain your answers.
- Aside from the ethical ramifications, describe how the rape scandal in India might affect Uber's "bottom line," the profits a company makes from the sales of its goods/services. Why?

EXERCISE THREE—THE UBER RAPE SCANDAL

Based on principles and contents discussed so far, complete steps 1–10 of the case-study procedure on the Uber Rape Scandal.

5.4 SUMMARY

Aside from simply identifying individuals or organizations responsible—and on which to lay blame—for engineering-related disasters, studying cases such as these allows one to learn about what went wrong, and how to better prevent disasters from occurring in the future. The case of Hurricane Katrina demonstrates the huge numbers of individuals and organizations involved in large-scale engineering projects and those adversely affected if failures occur. As was discussed in Chapter 4, a number of specific engineering ethical duties follow from the primacy of safety, although safety can itself be an opaque notion. To better understand the nature of safety and its relation to engineering ethical duties, the analogy of engineering to social experimentation highlights the need for—but difficulties involved in—obtaining the informed consent of those affected. Especially in cross-cultural environments, matters become more complicated when considering the fact that safety involves not only objective but also subjective dimensions. Although public safety is generally recognized as a core engineering duty, as human beings, engineers occupy various roles, and, at times, the duties associated with these other roles can conflict with those of engineers. As the case of Uber illustrates, engineering and technology firms have a responsibility to ensure the safety of their users, although the extent of this responsibility and the manner in which they should do so might not always be obvious.

REVIEW QUESTIONS

1. How could one argue that, as a disaster, Hurricane Katrina falls outside the scope of engineering ethics?
2. In what manner did the Corps of Engineers lack autonomy in making decisions regarding the levee system?
3. With reference to the three main causes of the Hurricane Katrina disaster in New Orleans as identified by the Independent Levee Investigation Team, what basic ethical principles of global engineering were violated? Explain your answer.
4. When learning about ethics in engineering, what are two pros and two cons associated with studying large-scale disasters?
5. List and explain three characteristics of engineering in terms of which it could be understood as social experimentation. What responsibilities stem from such an analogy?
6. Explain the difference between objective and subjective safety.
7. What are three conditions engineers should meet to ensure members of the public can make voluntary decisions regarding the designs and products of engineers?
8. Explain one action engineers can take to become responsible for the objective risks associated with their products and/or designs.
9. Give some examples of how particular social and cultural values play roles in levels of risk acceptance.
10. With regard to the second case study, explain how Uber could have been considered negligent or irresponsible.
11. Describe how the case of Uber in India highlights the difference between legality and ethicality, and the need to consider ethics in addition to the law.

REFERENCES

Ayyub, B. (2014). *Risk analysis in engineering and economics*. Boca Raton, FL: CRC Press.

Criteria for Accrediting Engineering Programs. (2016–2017). ABET. http://www.abet.org/accreditation/accreditation-criteria/criteria-for-accrediting-engineering-programs-2016-2017/.

Faber, M., & Stewart, M. (2003). Risk assessment for civil engineering facilities: Critical overview and discussion. *Reliability Engineering & System Safety*, *80*(2), 173–184.

Graumann, A., et al. (2005). *Hurricane Katrina: A climatological perspective*. NOAA National Climatic Center. http://www.ncdc.noaa.gov/oa/reports/tech-report-200501z.pdf. October.

India Woman Sues Uber over Driver Rape Allegation. (2015). *BBC News*. 30 January. http://www.bbc.com/news/world-asia-india-31052849.

Koutsoukis, J. (2014). Uber rape scandal in India grows. *Brisbane Times*, 12 December. http://www.brisbanetimes.com.au/world/uber-rape-scandal-in-india-grows-20141212-125ppz.html.

Luegenbiehl, H. (2007). Disasters as object lessons in ethics: Hurricane Katrina. *IEEE Technology and Society Magazine*, *26*(4), 10–15. http://ieeexplore.ieee.org/document/4408563/?part=1 Winter.

Martin, M., & Schinzinger, R. (2010). *Introduction to engineering ethics*. New York, NY: McGraw Hill.

Millar, R., & Lessard, D. (2001). Understanding and managing risks in large engineering projects. *International Journal of Project Management*, *19*(8), 437–443.

PBS (2006). NewsHour. 12 June http://www.pbs.org/newshour/bb/science/july-dec05/levees_10-20.

Petroski, H. (1985). *To engineer is human*. New York, NY: St. Martin's Press.

Renn, O. (1998). The role of risk perception for risk management. *Reliability Engineering & System Safety*, *59*(1), 49–62.

Renn, O., & Rohrmann, B. (2000). *Cross-cultural risk perception: A survey of empirical studies*. (Vol. 13). New York: Springer Science and Business Media.

Russell, J. (2015). Uber is finally applying more stringent driver background checks in India. *TechCrunch News*, 2 February http://techcrunch.com/2015/02/02/uber-is-finally-applying-more-stringent-driver-background-checks-in-india/?ncid=rss.

Seed, R., et al. (2005). *Investigation of the performance of the New Orleans flood protection systems in hurricane Katrina*Draft Final Report, No. UCB/CCRM-06/01. 29 August. http://www.ce.berkeley.edu/~new_orleans/report.

Select Bipartisan Committee to Investigate the Preparation for and Response to Hurricane Katrina. (2006). *A Failure of Initiative*. 15 February. http://katrina.house.gov.

Singh, H. & Jethro, M. (2014). Police: Indian uber driver accused of rape is awaiting trial in other cases. *CNN*. 11 December http://edition.cnn.com/2014/12/10/world/asia/india-uber-rape-case/.

Star, C. (1969). Social benefit versus technological risk. In T. Glickman & M. Gough (Eds.), *Readings in risk* (pp. 183–194). New York: Johns Hopkins University Press.

Thompson, P., & Perry, J. (1992). *Engineering construction risks: A guide to project risk analysis and assessment implications for project clients and project managers*. London: Thomas Telford.

Uber Rape: Driver Involved in Previous Rape Case. (2014). *SifyNews*. 9 December. http://www.sify.com/news/uber-rape-driver-involved-in-previous-rape-case-news-national-omjvu0ifejgga.html.

US Army Corps of Engineers (2006). Performance evaluation of the New Orleans and Southeast Louisiana hurricane protection system—Final report of the interagency performance evaluation task force. Volume I—Executive summary and overview. 1 June. http://biotech.law.lsu.edu/katrina/ipet/Volume%20I%20FINAL%2023Jun09%20mh.pdf.