Professionalism and Ethical Behavior in Engineering Practice

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Case Study 1

Our firm was hired by one of our clients to perform a wetland delineation on a property on which they wanted to build apartments. In helping us to price our efforts, our client provided an approximate sketch of the locations of the wetlands on the property.

Upon arriving at the property to complete the delineation our delineator found the extent of the wetlands was much greater than indicated on the sketch provided by the client. They also found the property owner in a bulldozer actively filling in wetlands as we were attempting to delineate them.

Our delineator left the property, notified others in the firm and refused to continue with the delineation and wanted to notify regulatory authorities. As such we immediately notified our client of the situation.

The decision was very difficult because the client became very angry at our firm, threatened to blacklist us from ever working for them or any other developer again and insisted that we simply ignore the situation and continue with our work.

After checking with legal counsel, we confirmed there was not a legal obligation to report someone filling a wetland in the jurisdiction in which we were working. Although we did not report the incident we walked away from the project and did not complete our work as we were not willing to prepare and submit a delineation that was not accurate.

Yes, our firm made the right decision, but it was difficult. Our decision severed our relationship with that particular client for several years and cost the firm a great amount of business. Our client was interested in generating a profit at any price, even if it meant being dishonest and violating environmental regulations.

Discussion Questions
1. Do you think this person behaved ethically? Why or why not?
2. Do you think this organization behaved ethically? Why or why not?

Ethics and the Law: Where Do These Belong?

A. Falsifying a safety report on a new bridge in order to protect a colleague who will otherwise be blamed for cracks in the pavement.

B. Refusing to divulge confidential information to a friend who could use the information to further his business interests.

C. Refusing to obey a law that discriminates against people based on race.

D. Reading a coworker's poorly written email to colleagues because you know they'll think it's funny.

E. Driving way over the speed limit in order to get an extremely sick friend to the hospital.

F. Refusing to speak to a coworker because you dislike her political views.

G. Exaggerating profits to people who have invested in your company in order to keep them happy until you finally do start making money.

H. Taking every possible tax deduction on your federal income tax return.
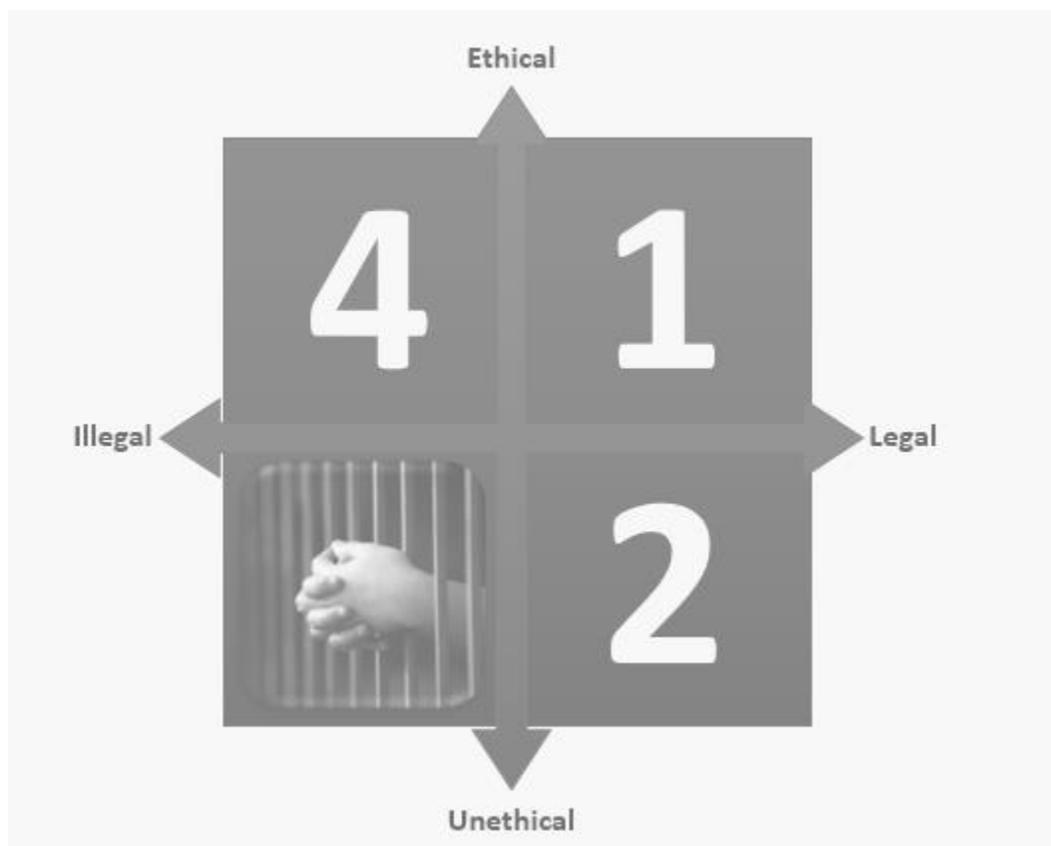
Case Study 2

As an operations manager, I was approached by a public official for a gift. He called after normal office hours, and suggested a gift valued at about $1,500.

As soon as I got off the phone, I called my direct supervisor who lived in another state and gave him a summary of the discussion and the fact that I had declined to respond to the request.

I asked that Corporate Security get involved, in the event there were any repercussions because this official was the director of an office that had great legal control over our operations.

I found this embarrassing because I worried that I had been too kind and compliant with this official which may have led him to think I would provide this gift.

In retrospect I feel like I absolutely made the right decision. I reflected on this several times and was grateful that I immediately reported this exchange. At first, I was reluctant to reveal this, because it certainly would put this official in a bad light and up to this point he had been well regarded.

Discussion Questions

1. Can you think of situations in which someone else did something unethical, but felt that the situation was somehow your fault? Were such feelings justified?
2. Do you know who to call at your organization to report unethical behavior?

Case Study 3

I've had conflicting feelings about a situation that I've faced as an engineer many times. This usually happens with difficult clients—whether it be their personality, delayed payments, their insistence they knew more about the situation than I did, or a conflict over my interpretation of the geologic or engineering data.

In my early days as an engineer, my reaction to these situations was driven by my personality. I would react by writing a nasty email, giving my side of things. These were usually long, one-sided rants. When I was finished, I would reread it. And by that time all of my anger toward the client would have subsided. I would step back from the situation, look at it from the other side of things, and delete the email I was going to send them I would write an email stating that I understood why they were frustrated or understood how they looked at the data or understood their difficulty making payments, etc. So long story short, I resolved my feelings by typing. It helps to get the feelings out, then delete your first draft and send a better email.

In retrospect, I feel that not sending the first, angry email was always the right decision. The client ended up being very happy with my more friendly response, and then they became less of an issue to deal with in the future. AND, I retained these clients for future work. I think if I had sent my first, angry drafts, I would've got them to see my point and get me payments faster, but it would've looked bad. I resolved my internal conflict--my personality vs. my professionalism—by choosing professionalism, which made me and my company look great.
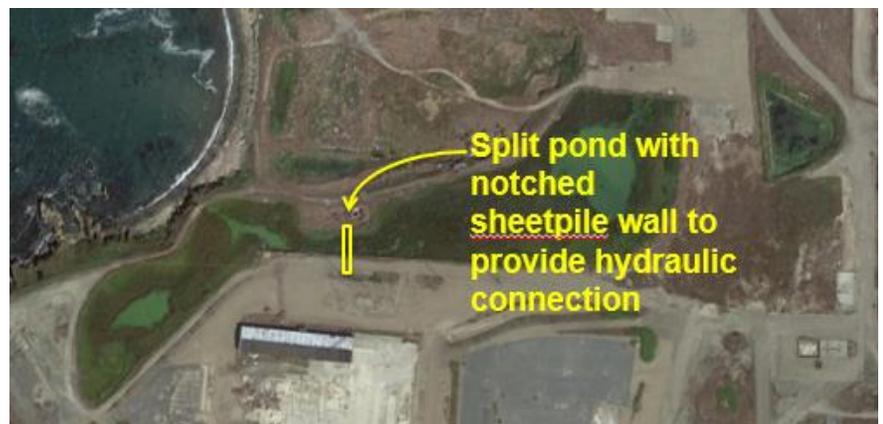
Discussion Questions
1. Do you think behaving professionally necessarily ensures you will behave ethically?
2. Do you think behaving in a way that is true to your personality ensures that you will behave ethically?

Case Study 4

One firm faced an ethical challenge when upgrading an aging dam to modern standards. The dam, which was built to create a log pond for a sawmill in the 1800s, was located close to a major fault. By state law, it had to comply with regulations designed to ensure it could withstand strong seismic activity. Its proximity to the ocean meant that it also had to withstand storm surges caused by large waves.
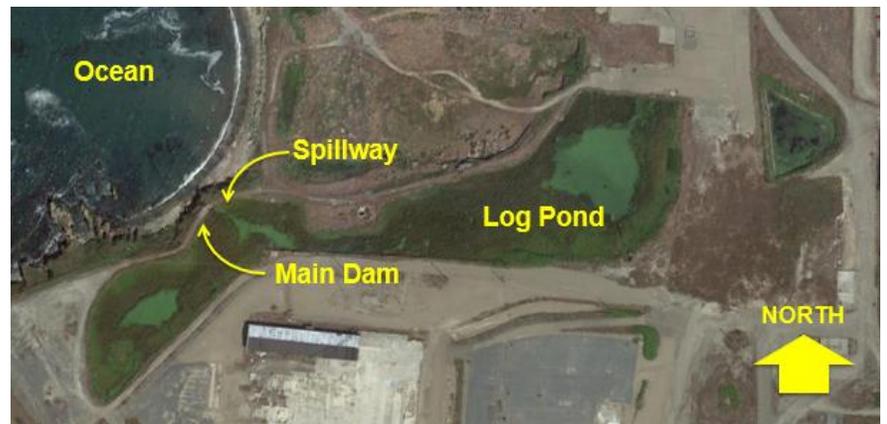
The firm explored the possibility of installing a wall that would effectively split the pond in two. Because the two ponds would be smaller, they would no longer be subject to aggressive safety regulations, which meant the dam upgrade could be completed at a much lower cost. This raised an essential ethical question: did this legal technicality release the engineers from the responsibility for making sure the dam was strong enough to withstand the seismic activity and ocean waves which they knew for a fact would affect the dam over its life cycle?

Discussion Questions

1. Do you think the engineers should be responsible for ensuring that the dam can withstand the predicted seismic activity and ocean waves?
2. What course of action would you choose in this situation?

Case Study 5

An engineering firm was hired to design a seawall for an oceanfront restaurant. The restaurant's owner was well-known in local circles as a climate change denier. Ordinarily, the firm would feel duty bound to factor rising sea levels into the seawall's design, which would in turn increase the cost of the project. But could they discount this issue if the owner himself refused to consider rising sea levels a realistic concern?

The engineers faced a stark choice:
  A. Design a seawall that could withstand rising sea levels, no matter what the owner believed to be true about climate change, and risk getting fired for designing a seawall that the owner considered too expensive.
  B. Design a wall that satisfied the owner's ideas about climate change, but that failed to meet the standard of care.

Discussion Questions
  1. Can you describe a situation in your line of work in which you would advocate for a solution similar to Option A?
  2. Can you describe a situation in your line of work in which you would advocate for a solution similar to Option B?

Case Study 6

A customer asked me to use "surplus funds" from one of his projects to fund a project that was short. This was not a difficult decision, because the customer was deciding how they wanted to spend their money and we complied. In this instance I am still very comfortable with working with the customer and helping them solve their problems.

In a very different case, a construction company owner asked me to solve a problem on a lump sum project with "resources" from a different customer's project. This time, I felt like my job was on the line. I was very tempted to try to make it work, but a very wise subcontractor helped me realize how wrong it was. It turned out to be a situation where I needed to resign—no small decision.

In this instance, there were some extremely stressful times trying to find a new job while keeping the various projects moving forward without compromising my integrity, but it was all worth it in the end. In hindsight there were other questionable practices at play with that particular company.

Discussion Questions
1. Can you list two people you could turn to for advice on ethical questions?
2. Have you ever felt that you might need to resign because of an ethical quandary?

Case Study 7

I started a new job in 1989 in which I moved from the East Coast back to Iowa where I grew up. After I started, I learned that the company's owner had been charged with ethics violations by the State Engineering Board. His PE license was subsequently suspended, but he thought that I could carry on his company by using my PE license to sign engineering documents.

I told this individual that he should have disclosed the potential license suspension before he hired me. I quit as soon as I could find another job. Was this an unethical job recruitment?

I felt that I made the right decision as it could potentially affect my professional reputation. About six months after I quit this company, the owner was killed in an automobile crash. His license had been suspended shortly after I quit his employment.

Discussion Questions
1. Can you describe any unethical job recruitment situations that you or your colleagues have experienced?
2. How comfortable would you feel confronting a company owner who behaved in this way?

Case Study 8

I once faced a situation where a client wanted to get additional money for a project. The grant-giving agency would only provide the money if an engineer would write a letter stating that specific costs and work were completed with the project. The engineer assigned to the project refused to do this, because the work/costs were not completed with the project. The client could not understand why the engineer would not just write the letter, as that is what the grant agency directed.

This decision was difficult as it resulted in loss of client support. Nevertheless, the decision was right because it was truthful. We do not need to work for clients who want to pressure us to do what is not right.

Discussion Questions

1. What kind of on-the-job pressure do you experience in relation to ethical decisions?
2. Have you ever had to deal with the repercussions of a third party (such as the grant agency in this case study) that was recommending an unethical course of action to a client? If so, what words did the client use to try to pressure you into complying?

Case Study 9

Back in the late-1990's, when I was a WisDOT (WI Dept. of Transportation) engineering supervisor, I was offered free Green Bay Packer tickets to a popular sold-out game by an engineering consultant who I hired to do a substantial amount of engineering work for WisDOT. At that time, the WisDOT supervisor and his/her staff made the selection of which engineering consultants would work on the projects under their control. At the time, I knew of many other WisDOT supervisors who went to Green Bay Packer games and other trips with consultants, including several ones who would later have much higher positions with WisDOT.

I declined the tickets, a difficult decision for two reasons: 1) the culture at the WisDOT, where many other people were accepting gifts like free trips to games and other things of value, and where I was the only one I knew who declined such an offer; and 2) the reaction of the engineering consultant, who appeared stunned and offended that I did not accept the tickets. I got the impression that the firm the consultant worked for expected him to get me to accept the tickets. The conversation about the tickets was awkward, while normally we could communicate very freely and easily.

I feel that I absolutely made the right decision. I did not want it to appear in any way that the engineering company was bribing me to get work, or to maintain a good relationship.

Discussion Questions

1. Have you ever been tempted to do something that feels unethical just to avoid awkwardness with a client or colleague?
2. Can you imagine a situation in your line of work in which you might need to compromise your sense of what is ethical in order to negotiate unfamiliar cultural norms? For example, have you ever had to work in a society in which gift-giving was an accepted business practice?

Three Things You Would Never Do

Studies show that writing a list of things you promise never to do can help keep you on the straight and narrow in the future, when you encounter tricky ethical situations. Take a few minutes now to write down three specific behaviors you promise never to engage in.

1.

2.

3.

Defending Your Decisions Against Cognitive Biases

In their 1974 paper, "Judgment under Uncertainty: Heuristics and Biases," Amos Tversky and Daniel Kahneman upended the prevailing thinking about how people make decisions. This hand-out explains the implications of their work for professionals charged with making important decisions.

Heuristics: Shortcuts That Can Lead You Astray

Before that point, social scientists generally assumed that people were rational, and made sound decisions, except when affected by extreme emotion like anger or fear. Tversky and Kahneman called all of that into question with their focus on the mental shortcuts, or **heuristics**, that we use to make judgements.

Heuristics, they explained, are like "perceptual cues, which generally enable us to perceive the world accurately, but occasionally give rise to misperception and illusion" (Gilovich and Savitsky, 36). The researchers focused on our use of three common heuristics to judge probability:

- **Representativeness**: The misguided tendency to think that "like goes with like." This can cause you to think a stereotype tells you everything you need to know about a specific person. It can also make you think an effect is necessarily similar to its cause. For example, physicians long assumed that stomach ulcers were caused by stress because "the burning feeling of an ulcerated stomach is not unlike the gut-wrenching, stomach-churning feeling of extreme stress" (Gilovich and Savitsky, 36). In fact, ulcers are caused by bacteria and can be cured with antibiotics, but at first scientists refused to believe Barry Marshall (who eventually won the Nobel Prize for this discovery) because it just *seemed* wrong. Among the many errors that arise from the representativeness heuristic is the "gambler's fallacy"—that is, the tendency "to overestimate the reliability of small samples of data," leading us to make inaccurate predictions under conditions of uncertainty (Gilovich and Savitsky, 36).
- **Availability:** The "ease with which instances or occurrences can be brought to mind." This heuristic can make us think something is more prevalent than it really is. For example, a recent, well-publicized plane crash might lead you to think that flying is more dangerous than driving, even though statistics say otherwise. As Daniel Kahneman explains in his book *Thinking, Fast and Slow,* "The world in our heads is not a precise replica of reality; our expectations about the frequency of events are distorted by the prevalence and emotional intensity of the messages to which we are exposed (138)".
- **Anchoring:** Making an estimate by "starting from an initial value," or anchor, that is "adjusted to yield the final answer" (Tversky and Kahneman 1974, 1128). This mental shortcut can cause us to exaggerate the importance of the first piece of information to come our way in a particular situation. For example, once a price is stated in a negotiation, all subsequent conversations tend to circle around that price, whether it is realistic or not. One version of this heuristic, the focusing illusion, can make people compare themselves to standards for income, lifestyle, or other supposed measures of well-being, and judge themselves happy or unhappy accordingly, even though numerous studies have shown that a person's day-to-day subjective sense of contentment shows very little connection to such measures (Kahneman, Krueger, et al. 2006).

On-Guard Against Cognitive Biases

Tversky and Kahneman described many versions of the representativeness, availability, and anchoring heuristics, pointing out that even supposed experts in statistical analysis routinely fall prey to the errors that arise from these mental shortcuts. Since then, other researchers have identified a wide range of heuristics, zeroing in on the related mental errors, known as **cognitive biases**, that affect the decision-making abilities of people in all walks of life.

Take some time to read up on the topic, starting with this overview of well-documented cognitive biases: http://www.businessinsider.com/cognitive-biases-that-affect-decisions-2015-8. A list of the most pernicious would include:

- **Confirmation bias:** Paying attention only to information that confirms your preconceptions.
- **Groupthink:** Adopting a belief because a significant number of people already hold that belief.
- **Conservatism:** Weighting evidence you are already familiar with more heavily than new evidence.
- **Stereotyping:** Assuming an individual will match the qualities widely assumed to be associated with the group to which the individual belongs.

You need to be on guard for particular biases in certain situations. For example, in a negotiation, beware of the following:

- **Anchoring bias:** Attaching unwarranted importance to the first piece of information to arise in a situation. For example, the first price mentioned in a negotiation tends to become a reference point throughout the rest of the negotiation process, even if it is completely unrealistic.
- **Choice-supportive bias:** Feeling positive about a choice you have already made and the thinking that went into it, even if the choice is seriously flawed.

When planning a complicated project, take care not to succumb to these biases:

- **Magical thinking:** Believing a particular outcome is likely based on things that actually have no relation to the outcome. The most common version of this is believing something will happen just because you really want it to happen. Even sophisticated thinkers fall prey to this error. To avoid it, look for hard data to support your decisions.
- **Recency bias:** Evaluating a situation based on the most recent information, without taking historical data into account. Stock market investors are well-known for succumbing to this bias, believing that rising prices will continue to rise, even though the long history of the market says otherwise. The same thing can happen in a complicated project involving many people. Recent reports from one subset of your team might lead you to think that the entire project is going well, even though historical data about the entire team's project makes such a rosy outlook unwarranted.
- **Clustering illusion:** Mistaking random events in a small sample as indicative of a larger trend. Gamblers succumb to this illusion all the time, believing that a few positive outcomes at the roulette wheel actually mean something, when in fact they are just random occurrences. In any situation, you need to look at the broader picture, taking into account a large set of current and historical data before making a decision.
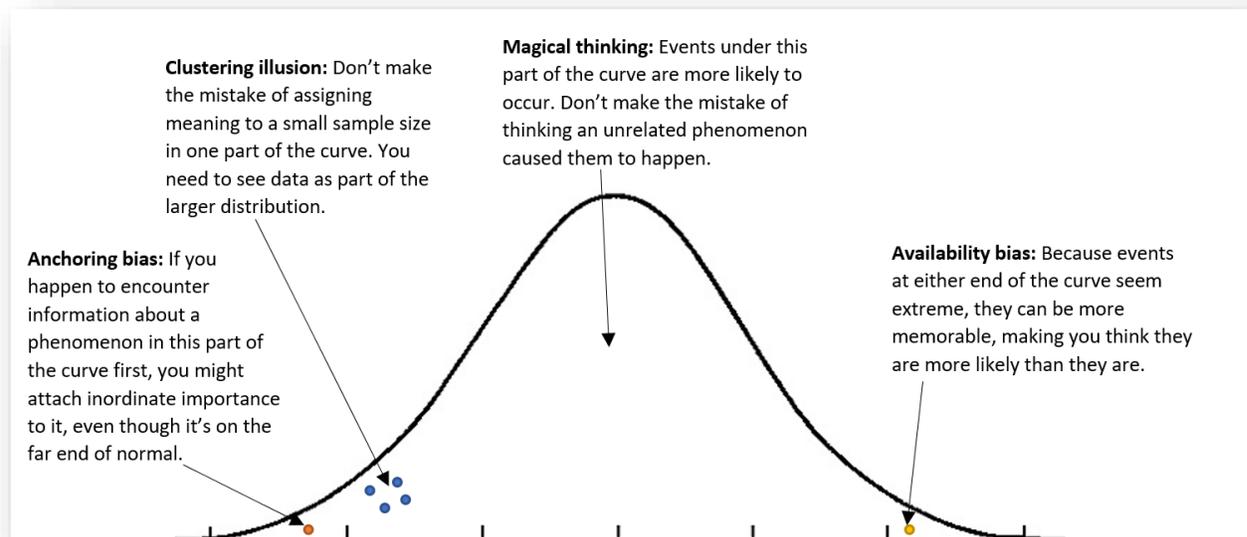
Visualizing Normal

Cognitive biases ultimately come down to a mistaken belief in the value of our own intuition. We think we have an inborn understanding of the nature of reality and the likelihood of certain events. But in fact, we're not very good at intuiting the full range of possibilities in any situation.

How can you improve the chances of perceiving reality accurately? It helps to have a good grasp on the basic rules of probability and statistics—in particular, the bell curve shape of a normal distribution. The term **normal distribution** refers to "the probability distribution that plots all of its values in a symmetrical fashion, and most of the results are situated around the probability's mean. Values are equally likely to plot either above or below the mean. Grouping takes place at values close to the mean and then tails off symmetrically away from the mean" (Investopedia).

When graphed, a huge variety of phenomenon take on the curve of a normal distribution. To protect yourself against cognitive biases, keep in mind the potential errors illustrated here:

Go to this web page for a quick and easy summary of concepts related to the normal distribution: https://www.mathsisfun.com/data/standard-normal-distribution.html.

Clustering illusion: Don't make the mistake of assigning meaning to a small sample size in one part of the curve. You need to see data as part of the larger distribution.

Magical thinking: Events under this part of the curve are more likely to occur. Don't make the mistake of thinking an unrelated phenomenon caused them to happen.

Anchoring bias: If you happen to encounter information about a phenomenon in this part of the curve first, you might attach inordinate importance to it, even though it's on the far end of normal.

Availability bias: Because events at either end of the curve seem extreme, they can be more memorable, making you think they are more likely than they are.

Fighting the Good Fight Against Cognitive Biases

As Tversky and Kahneman pointed out, even expert statisticians fall prey to the most basic cognitive biases, so you can't be too vigilant in protecting yourself against them. Here are few practical tips to keep in mind as you try to root out your own biases:

- Don't let your small sample of personal experience have an outsized effect on your decisions. Whenever possible, seek out advice from experienced practitioners in your field who have practical experience with the types of decisions you need to make.
- In all situations, maintain a sense of humility regarding your own intuitive judgement, which is really, as Daniel Kahneman puts it, "a machine for jumping to conclusions" (Thinking, Fast and Slow, 79).

Making Decisions in Uncertainty

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