



Case Study 04: Is This Ethical?

When Bad Behavior Has Real-World Consequences

INTRODUCTION

We have been discussing engineering ethics. Why? Because as engineers, the work you'll do will have impact and consequences far beyond just yourself. The apps you program will be run on millions of phones; millions of cars and trucks will cross the bridges you build; millions of consumers will covet the groundbreaking gadget you design. It's a lot of responsibility.

And make no mistake, it is your responsibility. [The NSPE Code of Ethics](#) provides guidelines for your professional conduct. None of these tenets should surprise you, and many of them are common sense. But just because they seem obvious doesn't mean they don't need to be made explicit. Sometimes the temptation to cut corners is strong, and the pressure to skip steps is powerful.

OBJECTIVES

Specific goals for this exercise are:

- **Learn** the fundamental tenets of the [NSPE Code of Ethics](#)
- **Identify** the potential ethical issues in an engineering-related scenario
- **Apply** the NSPE Code to the situation and identify specific sections relevant to the case
- **Consider** the consequences of the scenario and determine the appropriate next steps to take
- **Create** a well-designed presentation to clearly and succinctly communicate your case in a way that will promote comprehension in your audience
- **Present** your case analysis to a group of your peers



STEP 1: SELECT YOUR CASE

1. **Choose your team.** For this Case Study, you will be self-selecting your team partners. The deadline to sign up on [the shared Google spreadsheet](#) is no later than **6:00 PM on Friday, 23 February 2024**.
2. **Select your case.** Choose one of the cases below to analyze in detail. Case selection is first come/first served, and only one group will analyze each case. Don't forget to record your group's selection in [the shared Google spreadsheet](#)!
3. **Identify the major players** involved in the situation and their specific role in the case.
4. **Summarize the situation briefly** and without copying the provided text. Provide only the most important details which directly affect the case.

STEP 2: EXAMINE THE ETHICAL ISSUES

5. **Explain the ethical issues.** There will be more than one! Use the Questions to help guide your thinking—but **do not list and answer each one**.
6. **Use the NSPE Code of Ethics** to help determine whether and/or where the major players acted unethically. [Cite specific sections of the code to support your case](#).

STEP 3: EXPLORE THE POSSIBLE OUTCOMES

7. **What unanswered questions** do you have about the case? Is there additional information that, if you had it, might affect your judgment of the situation?
8. **What consequences** should there be? You are not a legal expert (you're not, right?), so you might not know the extent of the legal ramifications. In fact, no laws may have been broken. So, what do you think should happen now? Is there a way to resolve the situation that makes everyone happy? *Should* there be?

STEP 4: CREATE YOUR PRESENTATION

You have already experienced creating and delivering content with your previous case study presentation. Now it's time to take the feedback you received and use it to improve your performance.

How you choose to organize and present your case is up to your team, but your slides must explicitly address each of the numbered points 3 through 8 above.

Revisit the slides for [Creating a Presentation](#) to review the instructions and tips for putting together a high-quality, professional presentation.

STEP 5: PRACTICE, PRESENT, AND SUBMIT



Your team must sign up for a presentation time slot using the [shared Google spreadsheet](#). The sign-up deadline is **6:00 PM on Tuesday, 26 March 2024**. If your team does not sign up for a time slot, one will be assigned to you.

You and your team will make your presentation in class on **Monday, 08 April 2024**. Please be prepared to complete your presentation within **10 minutes**. Two additional minutes have been allocated for audience questions, and there is a three-minute buffer for transitions between presentations.

Be sure to complete a dress rehearsal (or several) in advance. Make sure that you can share your slides using the technology in CCCS 112. The projector has both VGA and HDMI cables; do you have or need an adapter? Do you know how to connect your laptop (just ask, it's not hard or anything).

Please export your slideshow to a .pdf document. **No other file formats will be accepted.** You must submit the .pdf of your slides electronically via the Blackboard assignment no later than **6:00 PM on Friday, 12 April 2024**.

PERFORMANCE ASSESSMENT

You will find the scoring rubric provided in a separate document. Look in all the usual places: Blackboard, [the course web](#), and [the shared Google drive](#).

CASE STUDY A: A SINGLE-AUTHOR PAPER

Source: Online Ethics Center for Engineering and Science
Updated: 21 October 2015

Authoring Institution: Brian Schrag, Association for Practical and Professional Ethics

Mike Sanchez is a bright, young post-doc working in a big research group in the physics department at State University. His life-long career goal is to conduct research in a leading research university as a professor. During one of his job interviews, he discussed a particular problem in his field of expertise with the interviewer. In the course of the interview, he could not satisfactorily prove his point because his theoretical arguments did not convince the interviewer. Upon returning to his lab, Mike decided to pursue the matter further and conduct an experiment to verify his argument. Mike's experimental background was not sufficient to obtain the desired results.

Lisa Chen, Mike's friend, is a fourth-year graduate student working on her PhD in the same lab. She volunteered to help Mike with the experiment. Lisa is a talented experimentalist, and she successfully completed the experiment. Mike sent the results to the interviewer, thereby proving his point.

While working on this small experiment, Mike got an idea for an exciting study, which, if done correctly, could yield a good publication in an influential journal. But Mike got discouraged because he knew he couldn't handle the complicated experiment alone. Lisa encouraged him to proceed with the idea and promised to design and complete the experimental aspect of the project. Mike agreed, and while he worked on the theory, Lisa designed and built the experiment. Mike was very excited about his theoretical results and shared them with his adviser, Professor David Danson. Dr. Danson liked Mike's ideas and told him that it was time for Mike to get his name noticed in the scientific community. He encouraged Mike to publish the results in a well-respected, top-tier journal. The adviser also suggested that it would be better for Mike's career if he published the work in a single-author paper. He said, "You worked on it exclusively, and it would be a wonderful opportunity to write a paper by yourself. It would be a stronger paper if you could validate your theory with experimental data."

Mike liked the suggestion, and he didn't mention that Lisa had already done a significant amount of work on the project. He told Lisa that his adviser recommended that he publish results in a single-author paper and said, "I really think that this would help my career, plus that's what our adviser wants. How cheated will you feel if I publish this paper alone using all the data that your experiment provides?"

Lisa and Mike were good friends, and she felt obligated to help him. Even though Lisa was disappointed, she told Mike to do whatever he felt was right. Mike decided to submit the paper as the sole author.

After this conversation, Lisa stopped working on the experiment, and Mike took over. He did not design the experiment; therefore, he couldn't manage to get it to work and did not make any progress. Lisa did not offer any more help, and Mike didn't ask her for any. Finally, Mike decided to submit the paper without the experimental part. It would be an interesting theoretical investigation, but it would not have the scientific impact that it could have had with the experimental validation.

Questions

These guide your thinking; they're not meant to be listed on a sheet of paper and answered individually. As you prepare your case study, you will no doubt end up responding to some of them organically.

1. Would Dr. Danson's advice be appropriate if he knew about Lisa's contribution to Mike's project? Was Mike responsible for informing his adviser about Lisa's contribution?
2. Should Mike have followed Dr. Danson's recommendation concerning authorship?
3. Did Mike ask a reasonable favor from Lisa?
4. What were Lisa's options when Mike first approached her with his experimental problem? During the experimental process? When Mike stated his wishes to publish as a single author?
5. Should Lisa have continued to help Mike with the experiment after their conversation? Should she have gone to Dr. Danson with her concerns?
6. Why do you think authorship credit can be such a divisive issue among researchers?

CASE STUDY B: CHEMICAL A OR B?

Source: Online Ethics Center for Engineering and Science
Updated: 08 January 2016

Authoring Institution: Center for Ethics in the Professions
University of Puerto Rico Mayagüez

For the past six months, chemical engineering student D'Neisha Smith has been working with a local manufacturing firm as a part of her university's co-op program. For several years the firm has been using Chemical A as a catalyst in its manufacturing process. Chemical A is carcinogenic, although studies supporting this claim have only recently been published. Without taking elaborate safety precautions, workers handling Chemical A will be exposed to sufficient amounts to risk cancer. Moreover, the disease can take up to 20 years to manifest itself. The company implemented safety procedures and controls, but workers routinely ignored them. The safety procedures slow down the manufacturing process, and the workers frequently cut corners to meet quotas.

D'Neisha knows of another chemical, B, which also serves as a catalyst in this manufacturing process but is not carcinogenic. However, Chemical B is considerably more expensive.

Manager Elle Jones has called a meeting to refine and possibly re-engineer the company's manufacturing process. D'Neisha Smith attends with Senior Engineer Marcus Jackson, Industrial Engineer Jenna Ramos, who supervises the manufacturing process, and Marketing Specialist Curt Ames.

D'Neisha decides to bring the issue up at the meeting. She cites the recently discovered dangers of Chemical A and the tendency of the workers to violate safety procedures in using it. She then discusses the research on Chemical B: although B is more expensive than A, it is much safer and is just as effective a catalyst as A in the manufacturing process. Her argument meets with stiff resistance, especially from Manager Elle Jones.

She tells D'Neisha that her job is to make suggestions for streamlining the existing manufacturing process, not to design a new one. Furthermore, she argues, if there were a problem with safety, she would have heard about it by now from the Human Resources or Legal Affairs departments. The two engineers present say very little; they seem intimidated by Jones and apparently intend to follow her lead. Jones asks the two engineers if using Chemical A violates OSHA regulations; they reply that to the best of their knowledge, it does not. Jones concludes by proposing that if there are no further objections, the company will continue using Chemical A. Nobody objects.

Questions

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1. Was it appropriate for D'Neisha to bring the issue up at the meeting? Did she have any other options for voicing her concern?
2. Did the other engineers present have an obligation to support their Manager, Elle Jones? Were they obligated to support D'Neisha?
3. Do these engineers have a responsibility to follow up on D'Neisha's concerns by investigating her claims?
4. Was Elle Jones's response to D'Neisha's concern responsible and/or appropriate? Is there a different way she could have responded?
5. What should D'Neisha do now? Does she have any further ethical responsibilities?

CASE STUDY C: A FREE REPLACEMENT?

Source: Markkula Center for Applied Ethics
Updated: 26 August 2015

Authoring Institution: Jocelyn Tan, Hackworth Engineering
Ethics Fellow, Santa Clara University

Catherine Armstrong recently graduated from the Southern California Institute of Technology with a BS degree in electronic engineering. For her first job, she accepted a position with company, Vision View, that designs and installs LCD display systems for large venues, such as shopping malls. Part of her job required her to troubleshoot malfunctioning displays.

Her first major assignment was as part of a team that designed and installed a system of twelve display kiosks for a large outdoor shopping mall. As part of Vision View's standard contract, the hardware came with a 24-month manufacturer's warranty, as well as a 60-day guarantee on the labor and installation.

Three months after the installation was completed, the mall's maintenance supervisor, Joachim Enzo, reported to Vision View that two of the display had stopped working. Enzo also noted that the serial and revision numbers on the two failed displays were different from the rest of the units.

At the job site, Catherine inspected the displays and found evidence that the two failed units had been un-installed, then re-installed incorrectly. She cross-checked the remaining ten units, none of which appeared to have been altered since their original installation. She used her phone to take photos documenting the differences in the installations. From the original installation notes, she learned that all twelve installations had been performed by the same crew of three technicians, and there were no notes indicating that any of the units had been un-installed and re-installed. She asked Enzo if anyone else had serviced the installation. He claimed that no one had, but Catherine felt that his tone and body language seemed 'off.'

When she returned to the office, she asked her supervisor, Rani Mukherjee, about qualifications of the tech crew. Rani assured her that each member of the crew had at least three years of industry experience and an extremely high Vision View customer satisfaction rating. Next, Catherine checked the serial and revision numbers of the failed units with the manufacturer and discovered that Vision View had received and installed units that were from a bad batch (i.e. a group of displays that did not have over 50% yield during manufacturing).

Catherine didn't know if the failure was due to the tampered installation, or due to the faulty manufacturing. At this point, she realized that there was no way to determine which was the true cause of the failure. If she cited installation tampering as the cause of failure, the shopping mall would be responsible for the cost of replacement. However, if she declared that the monitors failed because they were part of the bad batch, the manufacturer would cover the cost of replacing the equipment under warranty.

The next day, Rani called Catherine into a meeting to discuss her findings. Catherine explained what she had discovered, and asked Rani what she thought the proper response would be. Without hesitating, Rani stated that Vision View would report the faulty units to the manufacturer and have them provide replacements free of charge. Catherine mentioned that, while she could not prove anything, she was suspicious of Enzo's statement that no one had touched the monitors since Vision View's installation. "Well," Rani replied, "if we can't prove that the monitors were tampered with, then we have no choice. It's probably for the best that we don't alienate a customer, and this resolution costs Vision View nothing." Catherine understood her supervisor's position, but left the meeting feeling conflicted about the outcome.

Questions

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1. Should Catherine pursue her suspicions? How reliable is her feeling that "something was off" with Enzo? Should she reveal the tampering to the LCD manufacturer?
2. Is it possible that Enzo did not know about the tampering?
3. Should Rani be more concerned about the tampering or keeping the client happy?
4. Is there a solution that would be more fair to all parties involved?

CASE STUDY D: AN ALGORITHM DISCRIMINATES

Source: Online Ethics Center for Engineering and Science

Updated: 28 November 2017

Authoring: Jason Ludwig,

Institution: Kendall Darfler

Sandra Pham is a software developer for Emporia, a large retailer that has recently experienced high attrition rates in its sales department. Her boss, department manager Brian Milligan, tasks her with designing software that the company can use to screen candidates' resumés applying for sales positions. Sandra is supposed to ensure that the software awards a higher recommendation score to applicants who are more likely to stay on the job longer.

Sandra begins by applying a Principal Component Analysis (PCA) to data from the resumés of current and past employees to identify the minimal set of features that best correlate with the length of tenure. Based on this data, Sandra designs her software so that it classifies resumés possessing a high number of these features as "recommended candidates" and those lacking them as "non-recommended candidates."

One year after implementing Sandra's software, the company's salesperson attrition rate falls by nearly 15%. While analyzing the results, however, Sandra notices that 92% of the new sales employees hired have been white. Concerned that the company may be violating the legal standards for fair access to employment, she tries to figure out why her software is not recommending more applicants from minority groups. After some research, Sandra thinks she has found the underlying cause. The software only recommends applicants who live in zip codes less than one mile away from Emporia stores. This is because the PCA she applied to employee data identified employee zip codes as the metric best correlated to the length of tenure. She infers that this is because employees living in neighborhoods closest to Emporia stores have much shorter commute times and thus tend to stay on the job longer. These neighborhoods, however, have primarily white, middle-class residents. Black and Latinx applicants, who make up about 80% of the candidates applying for sales jobs, tend to live in areas that are further away from Emporia stores. Because their zip codes are located over a mile away from Emporia stores, the software classifies many of these candidates as "non-recommended candidates."

As a member of the Association for Information Science and Technology (ASIS&T), Sandra feels that it is her ethical and professional responsibility to make sure that the software she has programmed does not have a disparate impact on minority groups. She presents her findings to Brian Milligan and Timothy McGann, the head of human resources. She explains that she thinks the company may inadvertently be violating the disparate impact principle of the Civil Rights Act of 1964. This principle prohibits employers from using any employment practices that have unjustified adverse impacts on members of a protected class, such as lower-income persons, minority groups, or women.

"I'm not only worried that the software is excluding well-qualified applicants," says Sandra. "If Emporia continues to use it to screen resumés, I think that the company will risk facing employment discrimination litigation."

Brian is skeptical about Sandra's claims. "I think it would be a bad idea to change the software in any way," he says. "It has done everything we wanted it to," he continues. "Not only is our attrition rate at the lowest it has been in years, but our sales are up as well. Plus, is it even possible for a computer program to discriminate?"

Timothy thinks that the application test only uses objective criteria to identify best-qualified candidates. Sandra tells him that she feels that there are more appropriate metrics that the software can use to recommend applicants, but Timothy remains unwilling to modify it in any way that might undo its recent success.

Questions

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1. As the software developer, what are Sandra's ethical responsibilities to the people applying for the jobs?
2. What are her professional and legal responsibilities as an employee of Emporia?
3. What would be a more appropriate metric to use in the software to recommend candidates?
4. Does the solution to Emporia's attrition problem necessarily need to be a technical one? What other forms of expertise can the company bring in to analyze why sales employees are leaving their jobs?

CASE STUDY E: AN UNFILTERED SITUATION

Source: Markkula Center for Applied Ethics

Updated: 26 August 2015

Authoring: Nabilah Deen, Hackworth Engineering

Institution: Ethics Fellow, Santa Clara University

Angie Lind is one of four managers working with a nonprofit mechanical engineering firm that aims to develop sustainable mechanized systems for underdeveloped nations or regions. The firm funds numerous small projects and tries to utilize a community's local resources to create the project design deliverables.

Typically, a manager will select a specific project to supervise based on their areas of expertise and personal interest. The manager is then responsible for assembling a team of volunteers with the appropriate experience, balancing engineering and technical aptitude with cultural awareness and social sensitivity.

Several years ago, Angie chose to fund an application from a village in Bolivia. She deployed a team of volunteers to the remote location, a mountain village that lacked a reliable source of drinking water. The engineering team designed and built an inexpensive filtration mechanism that allowed the community to purify the water available in sufficient quantities to supply the entire population of several hundred residents. The project had been a success when delivered to the community, with a measurable decrease in instances of water-borne illnesses.

However, Sylvia Moscoso, a member of the Bolivian village's community council and a healthcare worker, recently contacted Angie. Sylvia informed Angie that the filters had broken down a while ago. The village had failed to restore all the filtration systems, as the cost to fix the filters proved to be too expensive. During this time, the community had reverted to their old practice of drinking unfiltered water.

Sylvia was growing alarmed by the rising number of infants and children suffering from intestinal illnesses caused by drinking contaminated water. She also noted that community members were growing increasingly skeptical of the system and the need for filtration.

Angie is unsure what the firm can do for the community. As part of their routine procedures, her team trained multiple community members in the use and required maintenance of the filters. The engineering team projected that the system should have remained operating efficiently and effectively for at least a decade with regular and proper maintenance.

Questions

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1. Is Angie personally responsible for the filtration failure?
2. To what degree is the firm responsible for the aftereffects of their filtration installation? Does the village itself carry any responsibility?
3. Was the benefit worth the eventual cost of replacing all the filters, especially since many in the community now doubt the efficiency of the filters?
4. Does Angie face any ethical dilemmas if she chooses not to do anything? What about the Bolivian community?

CASE STUDY F: A VIOLATION OF PRIVACY (AND UNFORESEEN CONSEQUENCES)

Source: Markkula Center for Applied Ethics

Updated: 26 August 2015

Authoring: Clare Bartlett, Hackworth Engineering

Institution: Ethics Fellow, Santa Clara University

Zhang Kar-wai, a computer engineering graduate from Stanford University, has recently accepted his first paid position at a start-up company in San Francisco. The company's main product consists of a suite of smartphone applications designed to track individuals' personal health information. The collected data includes their medical records, seasonal illnesses, blood pressure and glucose levels, eating habits, sleep cycles, and even their weight and reproductive health.

The products are designed primarily to help individuals reach health-related goals and enable users to manage their overall health and wellbeing. Information about the user is stored in this app, including what prescriptions they are taking and how frequently they schedule doctor's appointments. As the developers of the app, Zhang and his company have access to this information.

Although Zhang is a relatively new hire, he performed a significant and critical role in developing the app and is justifiably proud of his work. He was excited to tell his father, a professor of epidemiology at Stanford's School of Medicine, about his assignment. However, when Zhang told his father about his responsibilities at his new job, his father's reaction was not what he expected. His father expressed concern about the project's use of personal data and the company's ability to design algorithms that could use data from app users to accurately predict and track disease outbreaks based on their data.

Zhang explained to his father that the data would be aggregated, and the algorithms will undoubtedly sometimes fail, as all models do, but they will be tested continuously and upgraded. So, he assured his father that he was up to the task. His father remained hesitant to share in Zhang's enthusiasm and warned him to think more about the ethical implications of his project and not just about whether his app will succeed or not.

Shortly afterward, the company's marketing department requested Zhang supply them with customer-specific information so they could better target ads and app suggestions to the users. Zhang understands that he is part of a company, but he also feels that the privacy of the app users should be protected. Additionally, he thinks that as an engineer, he should be responsible to those who use his technology.

Questions

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5. Should Zhang take his father's concerns more seriously?
6. Should users of online applications or search engines be notified about the potential use of their personal data (even in aggregated form) for public health measures? Why/why not?
7. How does Zhang determine how much of the user's information should be shared with marketing?
8. Is targeting advertisements to specific consumers inherently unethical? What about when personal medical data is involved?
9. What are some of the ethical risks of the proposed big data analytics or algorithms, which can sometimes lead to false positives in their efforts to identify outbreaks and/or predict outbreak trajectories? What might be done to mitigate such risks?