EE101FZ
Engineering Ethics Case Studies

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Core Values

- Health, safety, and welfare of the public;
- Environmental and social impacts;
- Responsibility to your employer;
- Responsibility to your colleagues and clients.

How the Discussion is Organized

- There were five case studies given in the assignment.
- A total of 64 submissions were received. Thanks for all the submissions.
- The submissions focus on cases 1, 3, and 4. The other two cases have too little response to form the base for a meaningful discussion.
- We will discuss these three cases today. Some exemplary answers will be listed (anonymously). The instructor will then explain some key points one needs to pay attention to while considering these questions and give some suggestions on what actions one may take.

Case 1

- Andrew is a young engineer working for a mobile phone design company. When doing a bit of off the job research he reads the latest report about the susceptibility of the brain to radiation. The next day he reviewed the calculations of the radiation given off by the antenna of his company's hottest selling cellular phone and it was a little high.
- Later that afternoon he visited his boss (Diane, head engineer) with a suggestion to modify the antennas on the phones and perhaps doing a recall on the ones already sold. "Andrew," screamed Diane, "what you're suggesting would cost us hundreds of thousands of dollars! You can't possibly be serious. That's our fastest seller. Recalling them would be a disaster and there are more important things to be done. You don't even know that this is dangerous!". "But what about our obligation to the public?" Andrew said. Diane said: "What about your obligation to the company? Look, I don't want to make a big issue out of this. We're within IEEE standards and unless we have further word from them then we're in the clear."
- What would you do if you were in Andrew's shoes? Would you talk to someone above Diane or try to convince her?
- Can you think of options that would be fair both to the company and to the public, especially in the light of the uncertainty about the health risks?
- Assume that Andrew asks Diane for paid time to research the matter further and Diane refuses his request. Now what should Andrew do?

Case 1: Exemplary Answer 1

- “If I were Andrew, I would try to convince Diane. Since Diane is the chief engineer, she is in charge of this project. If she could stop the sales of mobile phones and recycle them, it would be more effective to prevent the deterioration of the situation.”
- “In the case of unclear health risks, I would suggest suspending sales, but not recycling, and immediately sending the phone to a professional department for testing. If there is a real danger, take the phone back and pay for it. If there is no danger, let the company issue an announcement declaring it is safe and publish the test results.”

Case 1: Exemplary Answer 2

- “If I were Andrew, I would stick to my opinion and put people's lives first. I'll try to convince Diane. Because if an order is to be carried out effectively it must be satisfied by everyone involved.”
- “I can think of a way to be fair to both the company and the public. Because the health risks are variable, there is no need to recall these phones on the grounds of harm. First of all, it will cause a huge loss to the company's reputation, and also cause panic among the public. We can provide these phones with new hardware for free to accommodate the upgraded system and only charge replacement fees. This not only saves the cost of a recall, but also the cost of reducing radiation exposure. And make a good impression in public. Kill three birds with one stone.”

Case 1: Exemplary Answer 3

- “Andrew and Diane are standing on different sides, so they have different points of view. As the boss of the company, Diane is more concerned about the interests and reputation of the company. On the other hand, Andrew is focused more on the interests of customers, believing that products produced and sold to customers should be in their interests.”
- “If I were Andrew, I would try to communicate in order to persuade her. If she still refuses Andrew's request, Andrew can communicate with the upper class, or choose to report complaints. The focus of quality control must not be on the post-mortem, but on the manufacturing phase, i.e., the production process.”

Case 1: Discussion & My Own Thoughts

- The public's health, safety, and welfare should be of the highest priority. This is our overriding ethical responsibility.
- As engineers, we have to follow the laws and regulations.
- Respect the views and expertise of others. Be prepared to admit that you may be wrong.
- Pay attention to the correct process and procedure.
- The company, as your employer, has to make informed decisions. This means that we are obliged to discuss potential technical issues with our management, especially when the health and safety of the public are concerned. This is our responsibility to our employer.

Case 1: Key Points

- Pay attention to the fact that Andrew was a junior engineer doing some off the job research. Diane did mention that the product was within IEEE standards (it may be her bias or it may not be). It probably means that some further study is needed.
- Communication is very important at workplace. This includes communication with your colleagues and management in the company and communication with the customers and the public. For the later, one should discuss the strategy with the company.
- The public's health, safety, and welfare should be of the highest priority. Hence, if the product needs to be recalled, one should have the courage to do it. The long-term damage to the company by keeping on selling a defective product is usually much larger than the short-term gain.

Case 3

- You have the choice of using cheaper components that will age quickly and are likely to start failing in about 12 months time, just after the warranty on the product ends. The product is highly compact and is not suitable for repair. Would you go ahead with this choice? How would you balance your responsibility to your employer and the public? This is a situation that happens a lot in real life.
- You are selecting materials for your company's new product. Times are financially tough, and you need to make the cheapest product. You have two choices, one slightly cheaper than the other, but it's slightly more toxic (but still within regulations) than the other. Which should you pick?

Case 3: Exemplary Answer 1

- “Undoubtedly I will choose the more expensive component that ages slowly. If we just use the cheaper component, the fame of our company will fall very soon, then the customers will quickly decrease. To make the company better, we need customers. Although the more expensive component costs more, with time going by, our fame will become better and we’ll have more customers buying our products. Also, choosing the more expensive product is good for taking the responsibility as an engineer.”

Case 3: Exemplary Answer 2

- “I will choose cheaper components if I’m able to ensure that our user-oriented specification parameters will include its expected or average life span based on test data. I made this choice under the consideration that there are users that might need cheaper and disposable after use devices. But I will definitely use the better and more expensive components if ensure the device’s property or the device is used for bearing extreme conditions for high quality required projects like aircraft manufacturing.”

Case 3: Discussion & My Own Thoughts

- Whether to use a high-quality or a low-quality component is, at the end of the day, a business decision not an ethical issue. As long as the component selected does not lead to health, safety, social, and environmental issues, it is for the engineer (and the company) to decide. Different enterprises target very different customers, hence, there should be some freedom for one to make the choice.
- It is understandable that many of us want to achieve excellence as professionals (which is a good thing). We may have the tendency to choose high-quality components to ensure the perfection of our products. However, as engineers, we are also expected to behave with integrity in our relationships with our employers and colleagues. It means that we should respect reasonable business decisions.

Afterthought: Bring your manager in and ask for his/her opinion? It is a business decision.

Case 3: More Thoughts

- The “Right to Repair” Movement:

There is a growing pressure on manufacturers around the world to allow consumers the right to repair their own devices. Manufacturers are expected to allow consumers the ability to repair and modify their own consumer products and reduce both the hardware and software barriers to do so. Many legislations have been proposed in both North America and Europe. At the moment, most of these legislations are only being proposed (so they are not law yet). However, in the long term, these legislations can potentially affect our decision.

It is always a good idea to be forward-looking, e.g., putting more thoughts into the repairability and the environmental impact of your products at the design stage even when these legislations haven’t passed yet.

Case 4

- You are responsible for developing a sensor that warns people of objects behind a reversing car. This is a very important product for your company and if it fails, the company may collapse, and you will likely lose your job. As far as you know, the system works perfectly, and production will start next week. However, your colleague informs you that under certain conditions your sensor will fail to accurately report. You do not have time to verify if this information is correct. How do you balance your responsibility to your employers, colleagues, and customers? As a responsible engineer, what steps would you recommend taking?

Case 4: Exemplary Answer 1

- “As the engineer in charge of development, I will immediately test the operation of the system under special conditions when the sensor I develop may not be able to report accurately. And if there is a real problem with the product, production will be delayed next week.”
- “As for my employers, the reason they hire me is to get a perfect product. If the system is defective, it will be my dereliction of duty and their loss. For my colleagues, although re-testing the system may delay the production date, we should be responsible for the result we have worked so hard together. If we ignore this small possibility and end up with something wrong with the product, it will be our real mistake, so we should work together to make the product perfect. For my customers, if they buy a bad product, it will bring them economic losses, more serious is in the use of safety risks.”

Case 4: Exemplary Answer 2

- “To offer honest criticism of technical work is my basic principle. So firstly, I would report the latest news to my employer, and discuss it with him if it is possible to postpone manufacturing the production for some time, at least let me have time to verify if this information is correct.”
- “Then I would call my team and colleagues right away, try my best to persuade them checking again if there is really something we neglected or forgot in our work. At the same time, I would like to take the defects report of my sensor at first time, and verify if this information is correct.”
- “In order to avoid injuring customer’s property, I would inform them as early as possible after discussing with my employers, tell them the truth and ask for their opinion if they can wait for our checking results. I promise to honestly tell them the result at once when we have the conclusion.”

Case 4: Discussion & My Own Thoughts

- The public's health, safety, and welfare should be of the highest priority. This is our overriding ethical responsibility.
- As engineers, we have to follow the laws and regulations.
- The company, as your employer, has to make informed decisions. This means that we are obliged to discuss potential technical issues with our management, especially when the health and safety of the public are concerned. This is our responsibility to our employer.
- The potential risk of releasing a defective product is usually higher than delaying its production.

Case 4: Possible Actions

- Contact your colleague to find out more about the issue with the sensor. Under what condition does it not respond correctly? How was it tested? Is it likely to be a hardware or a software issue?
- Report honestly to your employer. Outline the issue and provide as much information as possible. Almost as importantly, propose some possible steps to mitigate the issue. Be prepared to take responsibilities and try to be innovative.
- Inform your customers (if any contract has already been signed). However, communication with the customers should be through official channels.

This is the End of EE101FZ

- There are usually ~3 questions on electricity generation, transmission and distribution in the final exam. Their difficulties are similar to that in class test 2. There is always one question on engineering ethics.

- Course materials on communications will not be in the final exam.

- Happy New Year to All of You!

- Be Prepared for the Final Exam.