Unit IV

Making Ethical Decisions in Engineering (Part II)

Multi-dimensional obligation of engineers

- As indicated in the code of ethics, engineers have many obligations when performing their duties. For example,
  - Engineers shall be objective and truthful in making professional reports, statements, or testimony
    - They shall include all relevant and pertinent information in such reports, statements, or testimony
  - Engineers shall hold paramount the safety, health, and welfare of the public
  - Engineers shall act for each employer or client as faithful agents or trustees – means loyal to the company and its clients
- However, in many situations, such obligations may not align well with each other
- Ethical problems require us to balance our responsibilities to the profession, our client, our employer, society, and ourselves
  - Similar to a design engineering project that requires making a balanced solution
- As there is more than one design solution to an engineering project, ethical problems also have more than one solution in most cases – should exercise our creativity to look for a better solution

Michael Davis, Ethics and the University (New York: Routledge), 1999

Obligation and sacrifice

- Ethical obligations may require us to sacrifice our self-interest
  - Like in the Challenger accident case, Lund should sacrifice his personal interest to insist on disapproving the launch, since it is related to the safety of the crew
- But it does not mean that we have to sacrifice everything irrespective of the harmfulness of the ethical problem
- There are limits to what we are expected to sacrifice in order to meet our obligations, and the limits are adjusted according to the seriousness of the ethical problem
  - What if there were no human crew members but just robots in the Challenger? What if the whole Challenger launch program was a computer simulation? Would the choice of Lund sound better?
- Since such a judgment problem is often multi-dimensional, a systematic approach, such as the seven-step guide in ethical decision-making, is needed to consider the problem

Michael Davis, Ethics and the University (New York: Routledge), 1999

Case study: Testing Water… and Ethics

- The video "Testing water… and ethics" presents a hypothetic case that shows how one organization designed an ethically acceptable solution to the problem it faced
- Produced by the Institute for Professional Practice (IPP) in 1998. IPP was a private, non-profit human service and educational organization serving people with developmental and other disabilities in the US. Renamed as Aspire Living & Learning in 2020
- Story background
  - Ed Anderson (EA), an estate developer, agrees to sell a piece of land to a company that will build a new shopping center on it. The site was previously occupied by a large service station with two underground gasoline storage tanks. One of them is known to be leaking. State environmental regulations require an assessment of the groundwater before the land can be transferred. Porter Rodman Engineering Company (PREC), a consulting firm, is employed to take samples of groundwater. PREC will file a report to the State Environmental Protection Agency. If the samples show that the level of contamination in the groundwater exceeds state standards, EA will have to undertake an expensive remediation program before the property can be sold.

Case study: Testing Water… and Ethics

- Story background (Cont)
  - In this project PREC is asked to drill 5 wells for taking water samples under the ground. The requirement of the State is only the samples from 3 wells, but EA wants to have the samples from 2 more wells to better understand the water quality. PREC has agreed with EA that the data of these 2 wells do not need to be sent to the State Environmental Protection Agency (SEPA) but only to EA.
  - After the examination of the samples, it is found that the water quality of the 3 wells that need to be sent to SEPA is well better than the standard. However, the water quality of the 2 wells that do not need to be sent to SEPA is just better than the standard. It means there is a large variation. The responsible engineer **Jim** has much concern if he will violate the code of ethics if he produces an incomplete report by covering the results of these 2 wells.

Case study: Testing Water … and Ethics (Part I)

https://www.youtube.com/watch?v=LLhdrbTjl30

Step 1 – State the problem

- Jim is facing a dilemma because hiding parts of the results is not ethical, particularly since they are conflicting with each other
- To meet the ethical obligations, he needs to write a report including “all of the pertinent information”
- However, PREC has agreed with EA before that the result of the 2 wells will not be made public
- The company does not want to report all the results. The boss of Jim (called Frank) asked Jim to give what the client asked for
- Reporting the results to the State will make the company unable to honor the commitment to the client – thus disloyal to the client

Jun Fudano, Daniel Schwarz, and John Gayed, *TokyoTechX: Science, Engineering, AI & Data Ethics*, edX Online course

Case study: Testing Water … and Ethics (Part II)

https://www.youtube.com/watch?v=LLhdrbTjl30

Step 2 – Check the facts

- The results from the wells required by the state regulation show a low level of pollution; however, the two additional wells show significantly higher levels of pollution
- None of the five samples is over the limit designated in the State's regulations. The samples do meet health and safety requirements which means that there are no public health or legal issues
- Codes of ethics of engineers
  - Engineers shall be objective and truthful in making professional reports, statements, or testimony
  - Engineers shall hold paramount the safety, health, and welfare of the public
  - Engineers shall act for each employer or client as faithful agents or trustees

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Step 3 – Identify relevant factors

- Internal factors:
  - If Jim reports the poor result of the two additional wells to the State, he will be seen as disloyal to the company, particularly because the result does not show the water quality has any harm to the public. He may be fired or discriminated against by his colleagues
  - If he agrees to cover the poor result of the two wells, he will violate the code of ethics of engineers. Should there be any bad consequence due to that, he will be held responsible. E.g., he may be sued
- External stakeholders:
  - EA and its client – Will oppose reporting the poor result of the two additional wells since it may lead to many questions from the State and delay the development of the land
  - PREC – Will want to honor the commitment with EA or it will introduce huge financial loss. However, they may also think that it is not good to have their engineer breaching the code of ethics as it will ruin their reputation
  - Future buyers of the land – Will mistakenly believe that the water quality of the land is very good. May have a problem if the land is used for other purposes
  - The State – Will mistakenly believe that the water quality of the land is very good and may make a wrong policy on the usage of the land
  - Professional bodies – Will penalize Jim and maybe PREC if they breach the code of ethics

Case study: Testing Water … and Ethics (Part III)

https://www.youtube.com/watch?v=LLhdrbTjl30

Step 4 – Develop a list of options

- Withdraw from the contract with EA
- Send a letter to EA and persuade them to fully report all results. It serves as a disclaimer in case there is responsibility for the case (knowing that EA is likely to say no)
- Persuade EA to fully report all results. Agree to pay a part of the costs if the State requires more work after fully reporting the results of the samples (although it is likely that EA will still say no)
- Agree with EA and partially report the results to the State

Jun Fudano, Daniel Schwarz, and John Gayed, *TokyoTechX: Science, Engineering, AI & Data Ethics*, edX Online course

Step 5 – Test the options

- This step involves evaluating each option using ethical tests. The common ones include
  - Harm test: Does this option cause harm to individuals, groups, or society at large?
  - Publicity test: Can the option be justified or defended in the public eyes and does it align with societal values and expectations?
  - Defensibility test: Could I defend my option before a congressional committee or committee of peers?
  - Reversibility test: Would I still think this option was a good choice if I were adversely affected by it?
  - Colleague test: Would the option impact colleagues or fellow employees and does the option align with the values and interests of other team members and promote a healthy work environment?
  - Professional test: Would my profession's governing body for ethics agree with this option?
  - Organization test: Would the option align with the values, mission, and long-term goals of the organization one works in?

Step 5 – Test the options

- Withdraw from the contract with EA

Harm	Pub	Def	Rev	Coll	Pro	Org

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Harm	Pub	Def	Rev	Coll	Pro	Org

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Case study: Testing Water … and Ethics (Part IV)

https://www.youtube.com/watch?v=LLhdrbTjl30

Step 6 – Make a choice

- Jim tries to design an ethical solution that couples loyalty (to the hierarchical superior and to the client) with truthfulness
- As EA does not want to report all results, the solution that Jim and the company choose is an attempt to meet ethical obligations as much as possible. That is,
  - Persuade EA to fully report all results. Agree to pay a part of the costs if the State requires more work after fully reporting the results of the samples
  - Revise the company policy so the same thing will not happen in the future, even though it will lead to financial loss for PREC
- Doing the right thing requires a reasonable sacrifice, which also means that there are limits to what can be sacrificed to meet ethical obligations
- The limit is adjusted according to the seriousness of the harm to the public

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Step 7 – Review and reflect on the previous steps

- The dilemma actually came from the policy of the company that allows reporting untruthful or falsified information if it is not against the law
  - The agreement with EA makes any remedial actions not possible since it will be seen as disloyal to EA, which is also an ethical problem (engineers should honor commitments)
- Such a policy obviously violates the code of ethics of engineers
- Jim successfully persuades the senior management of PREC to revise such a policy, even though it will lead to financial loss in the future
- Can be considered as an appropriate sacrifice to fulfill the obligation of professional engineers