Ethical Responsibility of Engineers
- Recognizing and Resolving Ethical Dilemmas

Senior Design II
for Electrical and Computer Engineering Students
Howard University

Review → Forward

- **Engineers' role (or responsibility):** represents society (or the public) and ensures their safety and well-being.
- **The rules** of engineers' roles for public good: established as ethical codes.
  - Previously,
    - We discussed about the **NSPE**'s Code of Ethics
    - We focused on the consequences of unethical behavior → Ethics Essay
- This semester:
  - **The same NSPE** Code of Ethics
  - We focus on Ethical Responsibility – Recognition and Resolution of Ethical Dilemma

NSPE NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Champion | Guide | Advance | Unite

Code of Ethics

- Fundamentals of Canons

  While fulfilling professional duties, engineers shall

  1. Hold paramount the safety, health, and welfare of the Public
  2. Perform services only in the areas of their competence
  3. Issue public statements only in an objective and truthful manner
  4. Act for each employer or client as faithful agents or trustees
  5. Avoid deceptive acts
  6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession

Recognition of Ethical Dilemma

- Some ethical situations: clear courses of action for their resolution.

If engineers know that a contact lens they designs will harm the user's eyes

If a software engineer is asked to design a bridge and he has no experience or education qualifying him to do so.

Recognition of Ethical Dilemma

- However, most ethical situations: <u>difficult to resolve</u> – ethical dilemma

A software engineer used weak security techniques to protect customer information at a bank in order to reduce cost and meet budget.

Your company got the big contract but, in order to close the deal, the management had to claim you could perform certain analysis that you don't have the expertise to do. At the same time, the future of your company and its 40 employees ride on this one contract.

Recognition of Ethical Dilemma

- However, most ethical situations: <u>difficult to resolve</u> – ethical dilemma

An engineer runs some "extra" tests that go beyond those specified by the design requirements of the software she has designed. In doing so, she finds a major flaw that she would never find using only the agreed-upon tests.

Recognition of Ethical Dilemma

- However, most ethical situations: <u>difficult to resolve</u> – ethical dilemma

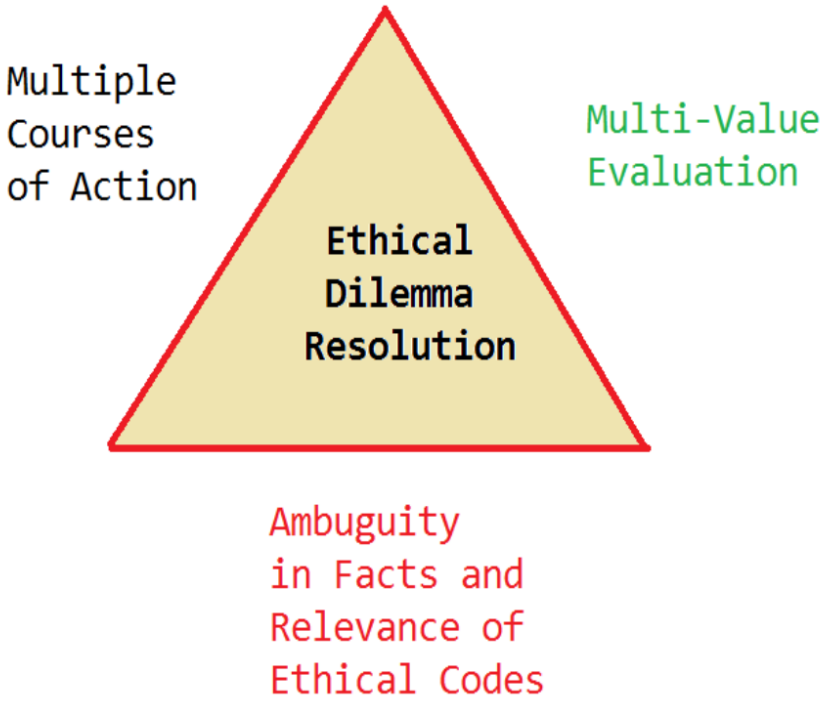
A salesperson offers to take an engineer to lunch.

Recognition of Ethical Dilemma

- If you find yourself saying or thinking one of the following, you're probably facing an ethical dilemma:
  - "Well, maybe just this one ..."
  - "No one will ever know ..."
  - "It doesn't matter how it gets done as long as it gets done."
  - "Everyone does it."
  - "No one will get hurt."
  - "It's legal, so who cares?"

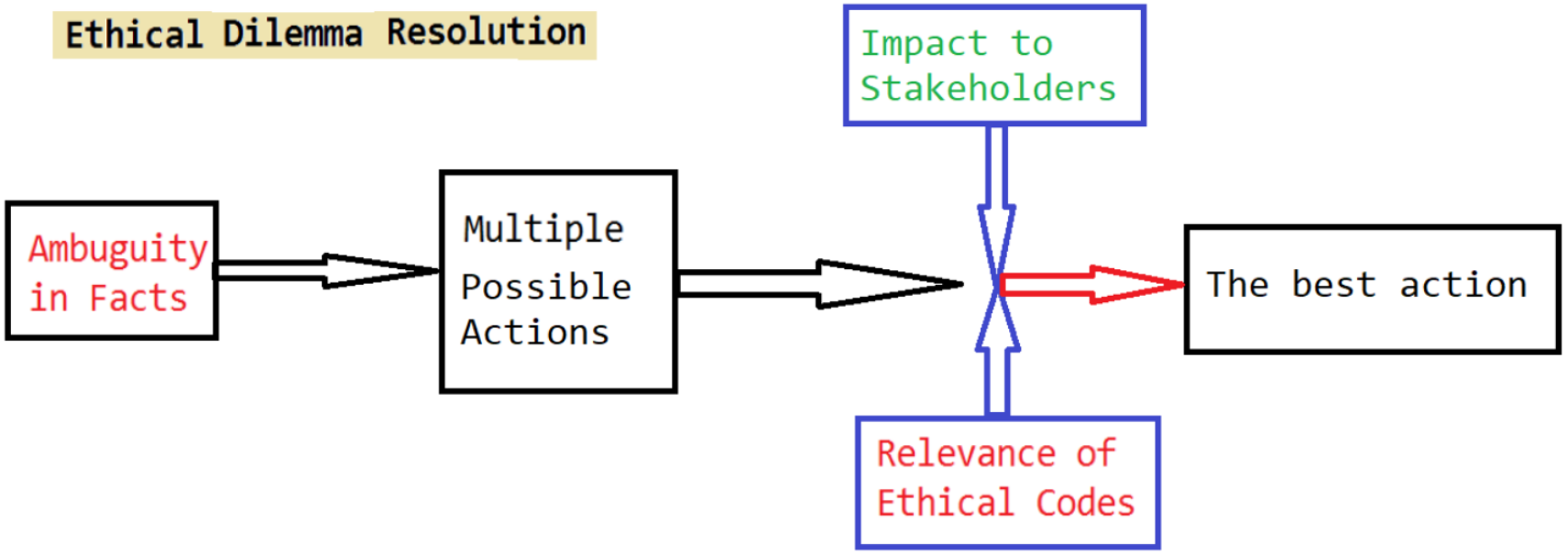
Ethical Dilemmas – Why difficult to resolve?

- Multiple courses of actions to take when faced with an ethical dilemma.
- Facts are often ambiguous
- Some possible actions are ethical and legal, others unethical but legal
- Some actions make higher ill-impacts to the stakeholders



How to resolve ethical dilemma - process

- Situation with unclear ethical course of action → need of a reliable process to guide decisions → find the action that best meets the responsibilities.
- Focus: (a) Impact to stakeholders and (b) Upholding the ethical codes



How to resolve ethical dilemma - process

- 6 Steps for Resolving Ethical Dilemmas
  - step 1: Gather information and determine the facts (removing as much bias as possible)
  - step 2: Determine multiple possible actions to take
  - step 3: Identify stakeholders (those who will be ill-impacted by the possible actions) and the consequences (impact) on them by the possible actions
  - step 4: Identify the relevant ethical values
  - step 5: Analyze the multiple possible actions by (a) the impact to stake holders and
  - Step 6: Do the same for (b) upholding the ethical values
  - step 7: Select the most ethical and least ill-impacting action.

Sample Case

- A sample Case
  - **You** were working on a team designing a new glucose-level monitor for diabetics. The new monitor was similar to previous models in that a user pricks finger, puts a drop of blood on a test strip, and then inserts the test strip into the monitor for results.
  - The advantage of the new monitor is that it uses a specially coated test strip to significantly speed up the process. The product had been designed, prototypes had been built and tested, a manufacturing facility had been prepared, and 10,000 monitors were ready to be shipped.
  - The team finished their final set of testing, which involves having test subjects use the monitor in the field (not in a lab setting). This final test was not required by the FDA, but it was performed because the company took pride in the quality of its products. Going beyond minimum standards was a norm for this company.

Sample Case

- A sample Case (-continued)
  - During the final field test, some test subjects somehow used old test strips and used them in the new monitor. When the old test strips were used, the resulting glucose level shown on the new monitor was consistently lower than the new strips were used.
  - Upon further testing, you found that a person could have dangerously high glucose levels when the monitor would indicate that the results were only moderately high (when old test strips were used). Moderately high glucose levels showed as normal levels.
  - **What should you do?**

Step 1: Determine the Facts

- Distill the facts from the complex reality
- Some of the facts (from the example case)
  - 1.
  - 2.
  - 3.
  - 4.

Step 2: Multiple Possible Actions to be taken

- Generate a wide range of actions for you to take
- Action 1:

- Action 2:

- Action 3:

- Action 4:

Step 3: Stakeholders and Impacts (of the new monitor)

- Stakeholders and Consequences:

Stakeholder	**Impact/Consequence**

Step 4: Identify relevant ethical values (NSPE Canons)

- What parts of ethical codes are involved ?

1. Hold paramount the safety, health, and welfare of the Public
2. Perform services only in the areas of their competence
3. Issue public statements only in an objective and truthful manner
4. Act for each employer or client as faithful agents or trustees
5. Avoid deceptive acts
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession

Step 5:Analyze the proposed actions by ethical codes

- **(1) How well is each alternative action with behaving <u>according to ethical codes</u>?**
- Option 1: Record the data internally, but never tell your supervisor, customers, or the FDA
- Option 2: Putting a warning label that only certain test strips should be used
- Option 3: Change the monitor so that only new test strips can fit in the monitor
- Option 4: Destroy all data from the extra tests

- Does each action satisfy the relevant ethical value (NSPE canon)?

	Action 1	Action 2	Action 3	Action 4
Canon 1: the health and the safety of the public				
Canon 4: acting as a faithful agent for your employer				
Canon 3: Issue statement in objective and truthful manner				
Canon 5: Avoid deceptive action				

Step 6:Analyze the proposal solutions by the impact

- **(2) What are the consequences (and impact level) on all of the stakeholders of taking each action?**
  - **Action 1: Record the data internally, but never tell your supervisor, customers, or the FDA**
  - **Action 2: Putting a warning label that only certain test strips should be used**
  - **Action 3: Change the monitor so that only new test strips can fit in the monitor**
  - **Action 4: Destroy all data from the extra tests**

Consequence	Action 1	Action 2	Action 3	Action 4
Customers will use old test strips with the new monitor				
Customers will be injured as a result of the flaw				
Company will lose money in the short term				
Engineers involved will lose their jobs				
Company's stock price would be lower due to the bad reputation				

Step 7: Select the most preferred Course of Action

- A decision must be made for the best action which satisfies the code of ethics and minimizes the impact to the stakeholders
- A final check before taking the selected course of action – consider the following questions
  - Are my actions legal?
  - Am I being fair and honest?
  - Will my action stand the test of time?
  - How will I feel about myself afterward?
  - How would it look in the newspaper?
  - Will I sleep soundly tonight?
  - How would I feel if my family, friends, and neighbors knew what I was doing?

Individual Assignment

- Ethical Responsibility - Ethical Dilemma Recognition and Resolution – following the 6 step framework: What would you do?
  - Find the facts and list them
  - List at least 3 possible actions for you to take
  - List at least 3 stakeholders
  - State at least 3 consequences on the stakeholders by the actions
  - List at least 3 ethical values (canons)
  - Analyze the possible actions with the ethical values
  - Analyze the possible actions with the stakeholder consequences
  - Select the best action which satisfies the code of ethics and minimizes the bad consequences to the stakeholders

Individual Assignment Details

- Write a report (by similarly following the steps taken for the example case) for the following scenario (see next page). There is no fixed form or format for the report, but it should include all 7 steps.
- The scenario is fictional even though it resembles a past event.
- Read the assignment itself from the class webpage for scoring rubrics, submission, and submission due (and penalty for late submission).
- Work independently upholding the Howard University Students Code of Conduct

Assignment (Scenario)

- The Takata-Tijuana plant is one of the three airbag manufacturing plants of Takata corporation, a Japanese company. The Takata airbags are so dominant and popular that they are installed in most cars in North America and Europe.
- The inflator chemical used in the airbag to deploy the bag has been 5-aminotetrazole (HN_4CNH_2), an organic compound. Recently, the plant starts to use ammonium nitrate (NH_4NO_3) which is cheaper but less stable.
- You are an airbag test engineer for the plant. One day in your airbag deployment test, you notice that, under hot condition, the airbag does not deploy but explode with shrapnel projectiles, which could be damaging or fatal to drivers and passengers. This explosive deployment of the new airbag is found to occur also under moderate moisture conditions.
- Hundreds of thousand new airbags are shipped and being equipped in to new cars . The Takata-Tijuana plant produces no other product than the new airbag.
- What are **you** going to do?