



Course:
Engineering Ethics
**Lecture 2: Ethical
Decision Making Process**

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Lecture 2: Objectives For Decision Making Model

- Understand the practical problem solving steps to be taken when making ethical evaluations
- Be competent in relating ethical dilemmas to the various aspects of the NSPE
- Be fully aware of the relationship between the practical problem-solving process and the assessment criteria

Lecture 2: Ethical Decision-Making Process

- There are always ethical problems and situations that occur in everyday life and especially in daily working activities.
- There are many complex issues facing business today which create ethical dilemmas that are difficult to resolve.
- In the engineering field, for example, new technology has created new problems or dilemmas for which there are no easy solutions, e.g. downsizing of staff, pollution control, disposal of toxic waste, depletion and allocation of resources, changes in law and technology, employee rights, discrimination against women and minorities, and product safety

Lecture 2: Steps in Process

How does a person go about solving problems by making the right decision/choices?

- 1. Identify the central ethical problem**
- 2. Identify affected parties and their interests**

This answer lies in the problem-solving/ decision making technique

- 3. Search for many possible solutions for the dilemma and evaluate considering interests of those involved**
- 4. Select and justify the solution that best resolves the dilemma (not always easy)**

Lecture 2: Said a little differently...

1. Moral clarity

- Need to know something is wrong! Do not ignore problems!
- Loyalty to employer, responsibilities to public and environment (and complex relations between these)

2. Know the facts

- Get hard, documented facts, discuss with others
- Competence matters in gathering technical facts

3. Consider options

- Diversity of actions to take? Evaluate/discuss.
- Long-term, short-term perspectives, repercussions?
- “Creative middle solution”?

4. Make a reasonable decision

- Weigh all factors, recognize “gray areas”/compromises

Lecture 2: Details of Steps

Step 1 Determine whether there is an ethical issue or dilemma. Is there a conflict of values, or rights, or professional responsibilities? Look NSPE and see which code is affected by the dilemma

- Clearly describe the problem. Before you can start to solve a problem you have to have a clear understanding of what is wrong. This description must be concise, objective, nonjudgmental, and should focus on the process, not speculate about the cause of the problem as this might lead you to jump to the wrong conclusion

STEP 2 Identify affected parties

Who will be affected by any decisions made and the execution of the solution?

- If you have any doubts or questions as to what the proper course of conduct should be in any given situation, consult with relevant stakeholders, the interested and affected parties.
- Instructor shows examples of Step 1 and Step 2 using a very simple everyday case study

Lecture 2: Examples of Steps 1 and 2

Step 1. As a Mechatronics engineer, you evaluated three robotic arms from a range of suppliers, but your friend works for one supplier and you are thinking of giving his company the contract.

- Clearly the problem of preferred personal gain and is unethical because the best supplier for the company is overlooked.

Step 2. The end customer of the robotic manufacture machine will be affected because you know that stakeholder is NOT receiving the best quality solution and the product may wear out sooner, or worse, the supplier you chose may not have the financial health to continue support over the lifetime of the robotic product leaving the customer in a jam!

Lecture 2: Details of Step 3

Step 3. Explore possible solutions

This step involves formulating and devising a full range of alternatives. First solution is not always the right one and creating a range of options help you understand the scope and limitation of the problem.

NOTE: Sometimes it is the least undesirable solution that ends up being chosen as the best solution.

Example: In the Volkswagen case, deceptively written software allowed illegal passing vehicle emission compliance causing considerable danger to the general public via air pollution; the coders could have refused their supervisors orders and possibly faced job termination. Which to select? Ethical good for Public Health or sssshhhh, keep your job?!

In the case of the space shuttle disaster of 1985, engineers chose to stay quiet about the risky outside cold temperature effects on lift-off safety in order to keep public perceptions and continued gov't funding for "on-schedule" flight. The NASA Management risked this "benefit" and caused the death of the crew and a huge setback to the NASA program. A very bad and risky decision, but still a decision.

Shuttle Disasters

What SHOULD happen:

- **SPACE SHUTTLE DISCOVERY**
at STS-120 Launch



What DID happen:

- **SPACE SHUTTLE CHALLENGER**
at SPS-25 Launch Jan 28, 1986



Lecture 2: Details of Step 4

• Step 4: Evaluate solutions

- Each alternative is weighed according to its advantages and disadvantages and the alternative with the most advantages and the least disadvantages is then selected.
- your solutions to the dilemma should be ranked. Why would you prioritize one competing value/principle over another?
- *For example, your client's right to choose a beneficial course of action could bring hardship or harm to others who would be affected.*

Getting Down to Cases (1 of 2)

Cases serve several important functions:

1. Through the study of cases, we learn to recognize the presence of ethical problems, even in situations where we originally saw only technical issues.
2. Studying cases is the best way to develop our skills in ethical analysis. Cases stimulate the moral imagination by challenging us to think of possible alternatives for resolving them and to think about the consequences of those alternatives.

Getting Down to Cases (2 of 2)

3. A study of cases shows us that the codes of ethics, however useful, cannot provide ready-made answers to many of the cases generated by professional engineering practice. Cases can convince us that there is no substitute for developing our own ethical skills, and that in some cases, the codes themselves should perhaps be revised.
4. Cases can show us that sometimes the world of practice presents us with dilemmas that are not easily resolvable and that professionals may disagree about what is right.

Lecture 2: Three Ways to resolve Conflict / Dilemmas

Conflict problems can be solved in three ways:[Harris, Pritchard, and Rabins, 2000].

- The first solution is an obvious health and safety protection of the Public, as it more important than your duty to your employer. In this type of case, the resolution of the conflict involves an easy choice.
- A second solution is sometimes called the “creative middle way” as you will see in the upcoming slides.
 - This solution is an attempt at some kind of a compromise that will work for everyone. The emphasis here should be on the word “creative,” because it takes a great deal of creativity to find a middle ground that is acceptable to everyone and a great deal of diplomacy to sell it to everyone. You will see this example shortly.
- Lastly, when there is no easy choice and you can’t find a middle ground, all that is left is to make the **hard choice**. Sometimes, you have to bite the bullet and make the best choice possible with the information available at the time. Frequently, you must rely on “gut feelings” for which path is the correct one. A very tough situation.

Lecture 2. Class Example, Case in Public Interest

- Engineer A is employed by a software company and is involved in the design of specialized software in connection with the operations of facilities affecting the public health and safety (i.e., air quality, sterilization against a virus, water quality control). As the part of the design software design, Engineer A conducts extensive testing and although the tests demonstrate that the software is safe to use under existing standards
- Engineer A is aware of new draft standards that are about to be released by a UL or CDC standard which the newly designed software may not meet. Testing is extremely costly and the company's clients are eager to begin to move forward.
- The software company is eager to satisfy its clients, protect the software company's finances, and existing existing jobs; but at the same time, the management of the software company wants to be sure that the software is safe to use.
- A series of tests proposed by Engineer A will likely result in a decision whether to move forward with the use of the software. The tests are costly and will delay the use of the software by at least six months, which will put the company at a competitive disadvantage.

Lecture 2: Flow Charting as an Valid Aid to Ethics Conflict analysis

- The key to effective use of flow charts for solving ethical problems is to be creative in determining possible outcomes and scenarios and also to not be shy about getting a negative answer and deciding to stop the project.

Lecture 2. Lets Analyze the Case

Moral clarity:

- What is wrong? What is the core issue/question?
- Will the software meet the new standards?
- Why are there new standards?
 - Experience shows new failure modes
 - New tests designed to test new failure modes
- Engineer's role in new standards?
 - Development of new standards
 - Following new standards

Lecture 2. Lets Analyze the Case

Know the facts

- It is critical software (health/safety of public)
- New standards to test new failure modes (that you need to understand)
- Testing is costly, company finances at stake
- Need to protect existing jobs
- Testing will delay release by more than 6 months
- Testing will hurt competitive advantage?

Lecture 2. Lets Analyze the Case

Consider options:

- Option 1:** Ignore the new tests, take risk to public safety/welfare, save time/money
- Option 2:** Conduct the tests, risk jobs, hurt finances, become certain software will work, **protect safety/welfare of the public**
- Option 3:** Creative middle of the road solution: Is there are limited version of full tests that could be conducted that would partially test, but save some money/time?

Lecture 2. Lets Analyze the Case

Make a reasonable decision

- Pick Option 2 since safety / health / welfare of the public is paramount
- If company says no, pick Option 3 and try to do a limited test for the failure mode (your ability devise an alternative and economical test is critical here). In this option, all constraints considered, you try to protect the safety, health, and welfare of the public

Lecture 2.

Three "ethics checks" to you decide what is right

1. Is it legal? Will I be violating either civil law or company policy?
2. Is it balanced? Is it fair to all concerned in the short term as well as the long term? Does it promote win-win relationships?
3. How will it make me feel about myself? Will it make me proud ?
Would I feel good if my decision was published in the newspaper?
Would I feel good if my family knew about it?

Lecture 2.



**The following phrase is from the IEEE
Code of Ethics:**

**“To improve the understanding of technology, its
appropriate application, and potential consequences.”**

To students:

Please identify as many strategies as you can for satisfying this statement

End of Lecture 2



EXERCISES

Practical activities to do, either individual or in groups during the training process

Proceed to Lecture 2 Assessment # 1 - Essay

Proceed to Lecture 2 Assessment # 2 – True / False

