



**Ethics in
Electrical and Computer Engineering**

**Lecture #2: Ethical Dilemmas, Choices,
and Codes of Ethics**

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Resolving Moral Dilemmas

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

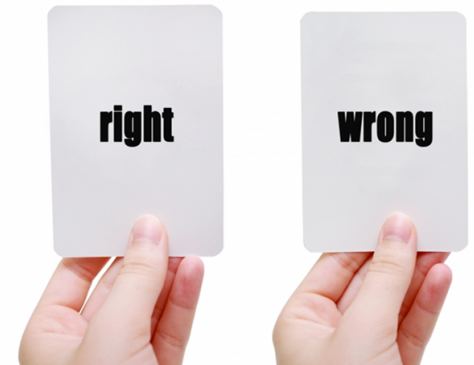
- Get hard, documented facts, discuss with others
- Competence matters in gathering technical facts

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
- An engineering design problem?





NSPE, BER Case 96-4

- 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., nuclear, air quality control, water quality control). As the part of the design of a particular software system, 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 standard setting organization-standards 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 protect...



...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 and cost the company a significant amount of money. Also, delaying implementation will mean the state public service commission utility rates will rise significantly during this time. The company requests Engineer A's recommendation concerning the need for additional software testing.

Question: Should Engineer A design the software to meet the new standards?



Analyzing 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



Analyzing the case, continued...

- 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 > 6 months
 - Testing will hurt competitive advantage?
 - Utility rates will rise



Analyzing the case, continued...

- 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?



Analyzing the case, continued

- **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 competence in coming up with an economical test is critical here). In this option, all constraints considered, you *try* to protect the safety, health, and welfare of the public



Resolving moral dilemmas, “line-drawing”

- Harris et al. idea to try to make solving moral dilemmas more analytical/quantitative
- Given moral dilemma
 - Establish key features, issues
 - Establish extremes of features/issues and paradigms (indicating totally ethical vs. clearly unethical aspects)
 - Construct a line drawing (see below)
 - Evaluate “test case” (your current moral dilemma)



Line-drawing, bribery example (Harris et al.)

- Victor is an engineer in a large construction firm. He has been assigned the task of being the sole person to recommend rivets for the construction of a large apartment building. After some research and testing, he decides to recommend ACME rivets for the job, which he determines are of the lowest cost and highest quality. On the day after Victor's decision was made, an ACME representative visits him and gives him a voucher for an all-expense-paid trip to the annual ACME Technical Forum, which meets in Jamaica. The trip will have considerable educational value, but will also provide day trips to the beach and other points of interest. **Question: If Victor accepts, has he been bribed?**



Line-drawing, bribery example (Harris et al.)

Feature	Paradigm (bribery)	Test case	Paradigm (not bribery)
Gift size	Large	--- <u>X</u> -----	Small (<\$1)
Timing	Before decision	----- <u>X</u> ----	After decision
Reason	Personal gain	-----X-----	Educational
Responsibility	Sole	-- <u>X</u> -----	None
Product quality	Worst	-----X----	Best
Product cost	Highest	---X-----	Lowest

X – test case feature evaluation, X important issue

Do you see a “creative middle solution”?

What about affect on future decisions on ACME?

What is company policy? Is there an *appearance* of bribery?

May not be a bribe, but still may not be a good idea!



Codes of Ethics

- Why are codes important?
 - Serve and protect the public
 - Guidance/support for engineers
 - Inspiration, deterrence, discipline
 - Shared standards, education, mutual understanding
 - Profession's image
- Limitations of codes
 - Too vague to be useful in every day ethical decision-making?
 - Impossible to cover all eventualities



National Society of Professional Engineers (NSPE)

- Code of Ethics for Engineers
- Preamble: Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality,



- fairness, and equity and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.



Fundamental Cannons

1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in 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.



Also...

- Rules of Practice
- Professional Obligations
- Several pages long...
- Consider a shorter code...



“Hold paramount the safety, health, and welfare of the public”

- How to assess impact on human safety, health, and “welfare”?
- Amartya Sen uses a “capabilities approach:”
 - Being able to live a long life in health
 - Being able to get an education, being able to work
 - Being able to have freedom of expression and association
 - Others...
- Lack of welfare=capability deprivation
- **Note:** It does not say the engineer should be encouraged to focus on (even extreme) capability deprivation. Should it?



IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:



1. To accept responsibility in making engineering decisions consistent with the safety, health, and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;

Concern: “Disclose” phrase nice, but “**consistent**” vs. ABET (NSPE), “engineers shall hold **paramount** the safety, health, and welfare” ... is a weaker statement? What does “consistent” even mean?



2. To avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;

Example: Ownership in a supplier's company



3. To be honest and realistic in stating claims or estimates based on available data;

Examples: When dishonest claims give you an advantage over a competitor, or when unrealistic claims endanger individuals

4. To reject bribery in all its forms;



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Example: Supplier gifts, when are they big enough to constitute a bribe?



5. To improve the understanding of technology, its appropriate application, and potential consequences;

Examples: Importance of teaching youth about engineering, importance of publishing engineering results in IEEE publications



6. To maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;

Example: A coop student who took on task that affected safety on a manufacturing line



7. To seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;

Note: Important to keep an emotional separation to your work so that when it is criticized you do not take it personally



8. To treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;

Note: There are certainly still problems in industry with these issues. We will discuss this more later.



9. To avoid injuring others, their property, reputation, or employment by false or malicious action;

Example: Speaking poorly of someone's project results when they do not deserve it



10. To assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Example: If you are a manager, giving them opportunities for professional development (e.g., taking courses or attending a conference)



Critique the code...

- You have moral autonomy - do not take it as given - challenge it! Demand that right!
- Some problems: “paramount” vs “consistent” discussed earlier +
 - **Short!** Compare to NSPE, ASCE, ASME...
 - Leaves out possibility of much education/guidance by reading it.
 - **Omissions? Yes!** Consider our earlier definitions of professionalism that lead others to put in statements on “public service” ...



Relevant portions of IEEE Code of Ethics

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and *in accepting a personal obligation to our profession, its members and the communities we serve*, do hereby commit ourselves to the highest ethical and professional conduct and agree: ...

5. *To improve the understanding of technology, its appropriate application, and potential consequences;*



National Society of Professional Engineers (NSPE)

- III. 2. A. Engineers shall seek opportunities to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health, and well-being of their community.
- This is THE code for the professional engineer!



American Society of Civil Engineers (ASCE), Code

- Cannon 1(e) says “Engineers should seek opportunities to be of constructive service in civic affairs and work for the advancement of the safety, health and well-being of their communities, ...” .



Software Engineering Code of Ethics and Professional Practice

- ACM/IEEE-CS Joint task force on software engineering ethics and professional practices
- Principle 1: Public: “...software engineers shall, as appropriate:”
 - 1.08. Be encouraged to volunteer professional skills to good causes and contribute to public education concerning the discipline.



American Medical Association (AMA), Principles of Medical Ethics (June 2001)

Section VII: A physician shall recognize a responsibility to participate in activities contributing to the improvement of the community and the betterment of public health

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For example: Free clinics, “Doctors Without Borders”



American Bar Association (ABA), Model Rules of Professional Conduct, ABA 2003

- Rule 6.1: **Voluntary Pro Bono Publico Service:** “... Every lawyer has a professional responsibility to provide legal services to those unable to pay. A lawyer should aspire to render at least (50) hours of pro bono publico legal services per year.”



The 1979 IEEE Code of Ethics

- Article IV: Members shall, in fulfilling their responsibilities to the community:
 1. Protect the safety, health, and welfare of the public and speak out against abuses in these areas affecting the public interest;
 2. *Contribute professional advice, as appropriate, to civic, charitable or other nonprofit organizations;*
 3. Seek to extend public knowledge and appreciation of the profession and its achievements



IEEE destroyed a key aspect of the
spirit of professionalism with their
1990 revision/shortening of the
1979 code



Social justice perspectives

- “Hold paramount the safety, health, and welfare of the public, **and encourage engineers to focus on improving the worst safety, health, and welfare problems**”? Better?
- Paid, or gratuitous, engineering with this goal:
 - Catholic: “preferential option for the poor” demands special attention for poor, and demands that everyone contribute to the “common good”
 - Jewish/Muslim: Views on charity (which in some cases can be service, not money)
 - Rawls: “Difference Principle” as it applies to a state’s institutions, “inequalities are only allowed that will reduce inequalities”
 - Sen: Broad view of how to focus on promoting justices and avoiding injustices



Individual obligations to serve vs. a profession's encouragement to serve

- Does an engineer have an obligation to serve humanity (e.g., for free)?
- Does an engineer have an obligation (even in paid employment) to help with the worst cases of capability deprivation?
- Are such obligations “duties” (certainly, engineers should not be coerced in any way to do these things)?
- If individuals do not have an obligation, does the profession *as a whole*? **In connection with this, should engineering profession's codes of ethics “encourage” engineers to do these things (or “aspire” to doing these things)? Not a requirement that any one engineer does these things.**



Attendance Question

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

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

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

Please: Put your name on the sheet
of paper and turn it in...