Lecture 8A: Ethics in Engineering and Computing

Key Issues...

- Understand the importance of professional ethics
- Recognise the difficulty in making a decision when it involves ethics
- Appreciate that professional ethics help engineers to be better professionals

1. The *Challenger* Disaster - What Went Wrong?

Technical: O-rings eroded and unable to seal. Hot gases leaked out. A flame plume was directed and breached an external hydrogen/oxygen tank and caused explosion.

Behind the scenes Chief O-ring engineer Roger Boisjoly reported the problem concerning the O-ring. Morton Thiokol's no-launch recommendation was questioned by space center. Gerald Mason, VP at MT, knew MT needed a new contract from NASA, telling supervising engineer, "Take off your engineering hat and put on your management hat." The earlier no-launch recommendation was reversed.

2. The Flaw in the Intel Pentium Chip (see Readings Week 8)

Major flaw: incorrect answers given when performing double-precision arithmetic. Intel claimed the flaw to be insignificant. After much pressure from publicity, Intel agreed to replace all flawed chips upon request.

Ethical Issues

What were the ethical responsibilities of the engineers working on the Pentium chip once they became aware of the flaw? How can an engineer be sure that there are no defects in a product? If it is impossible to eliminate all defects in a product, what level of defects is acceptable?

3. Examples of flaws in vehicles

PEUGEOT recalls 240K of its 307 hatchback built between 2003-2006 due to insufficient sealing of the antilock brakes and ESP steering system which would lead to a short circuit.

FORD recalls Territory built between 2004-2008 due to fluid leak issue in the front brake which may result in reduced braking effectiveness.

TOYOTA recalls >8million cars due to problems the brake systems. Toyota US production halted in the US and Europe. The problems allegedly caused 19 deaths in a decade

Ethical Issues

Why would they sell the vehicles even when they found flaws in them? Suppose a warning such as "This product may contain unexpected flaws, and might not function properly under all conditions." has been placed in the manual or related publications. Does this solve the ethical problems for the company?

4. Ethics and Morals

Professional ethics is the set of standards adopted by professional insofar as they see themselves acting as professionals

Personal ethics is the set of one's own ethical commitments, which are usually acquired in early home or religious training and often modified by later reflection

Common morality is the set of moral ideals shared by most members of a culture or society

4.1 Ethics in Action

An engineer refuses to design military hardware because he or she believes war is immoral.

A civil engineer refuses to design a project that he or she believes will be contrary to the principles of sustainable development.

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Personal ethics are often what drive people to change the world.

Professional ethics tells you how to use your profession as a tool.

5. Professional Bodies (to be discussed in later lecture)

Australian Computer Society: www.acs.org.au

Engineers Australia: www.engineersaustralia.org.au/about-us/discipline-complaints/code-of-ethics/code-of-ethics_home.cfm

6. Why Professional Codes of Ethics needed?

(A) They furnish common, agree-upon standards for professional conduct, are of benefit to both professionals and the public

Examples: Engineer Jane would not leak any information on the current project she is doing with other competitors. A physician will inform us of options so that we can make free and informed decisions.

(B) They provide a focus for debate on how professional ethics could/should be modified

Example: The objection to stem cell research that involves the destruction of an embryo or foetus.

(C) They provide rationale for professional to adhere to professional standards even when pressured by others to violate them

Example: John's firm is in competition with another firm for a large construction contract. John's supervisor asks him to make some public statements suggesting that the engineers in the competing firm are not as competent as the engineers in John's firm. John knows that this implied claim would be false, and he refuses to honor his superior's request, citing professional code requirements that he not untruthfully criticize other engineers

7. What would you do?

You are an engineer who works for state government, but you hope to leave soon for a more challenging job with Optus. You are advising a committee that is considering ten bids for constructing a new broadband network. One bid comes from Optus and you think that Optus' bid is the best. Should you advise the committee to accept Optus' bid? Why or why not?

8. Conflict of Interest

"…exists for a professional when acting in a professional role, she or he is subject to "influences, loyalties, temptations, or other interests" that tend to make the professional's judgment less likely to benefit the customer or client than the customer or client is justified in expecting"

Conflicts of interest can be actual, potential or apparent.

8.1 When does Conflict of Interest occur?

- An exercise of judgment or advice is required for decision making
- Special interests that might influence the exercise of that judgment
- Prior or family relationships
- Financial interests

Another example

John owns a small company that uses valves. In his designs often specifies valves made by a relative of his, even when valves made by other companies might be more appropriate.

9. A method of case analysis

1. Take the Ethical point of view: Equality, Justice, Respect.
2. Develop a detailed description of the case to be analysed
3. Try to see the ethical issues and traditional solutions
4. Call upon your ethical knowledge and skills: precedents, analogies
5. Get the advice of others
6. Take advantage of one or more systematic analysis techniques:
   - Professional standards analysis
   - Roles and responsibilities analysis
   - Stakeholder analysis
   - Systematic policy analysis
7. Draw ethical conclusions about the case
8. Draw relevant lessons about the case.

10. Summary of Main Points

Ethics play an important role in professional conduct and have crucial impact on the society

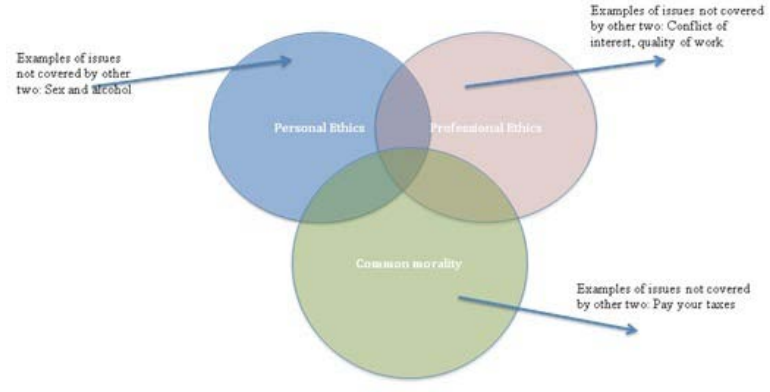
Conflict of interest would seriously affect one's professional judgment

Piracy is a serious crime which must be avoided at all time (see later lecture)

11. References

[1] Compiled by Brad Stappenbelt, *Introduction to Professional Engineering*, Thomson, 2007

[2] Information sheet G070v5, Australian Copyright Council. [Online] Available: www.copyright.org.au



Three sources of ethics that direct our ethical behaviour showing how they may overlap

Many personal ethical frameworks are based on religious beliefs, and most religions have things in common. For example, the Buddhists believe in the 8-fold path shown above. The ethical conduct part includes not killing, not lying and not stealing like other religions.

Question 1 A B C D E	Question 2 A B C D E	Question 3 A B C D E	Question 4 A B C D E	Question 5 A B C D E	Question 6 A B C D E	Score / 6