GE105
Introduction to Engineering Design
College of Engineering
King Saud University

Lecture 12.

Engineering Ethics

SPRING 2016

Before we Start

Ethics is knowing the difference between what you have a right to do and what is right to do.
Potter Stewart

Ethics are more important than laws.
Wynton Marsalis

"Educating the mind without educating the heart is no education at all."
Aristotle

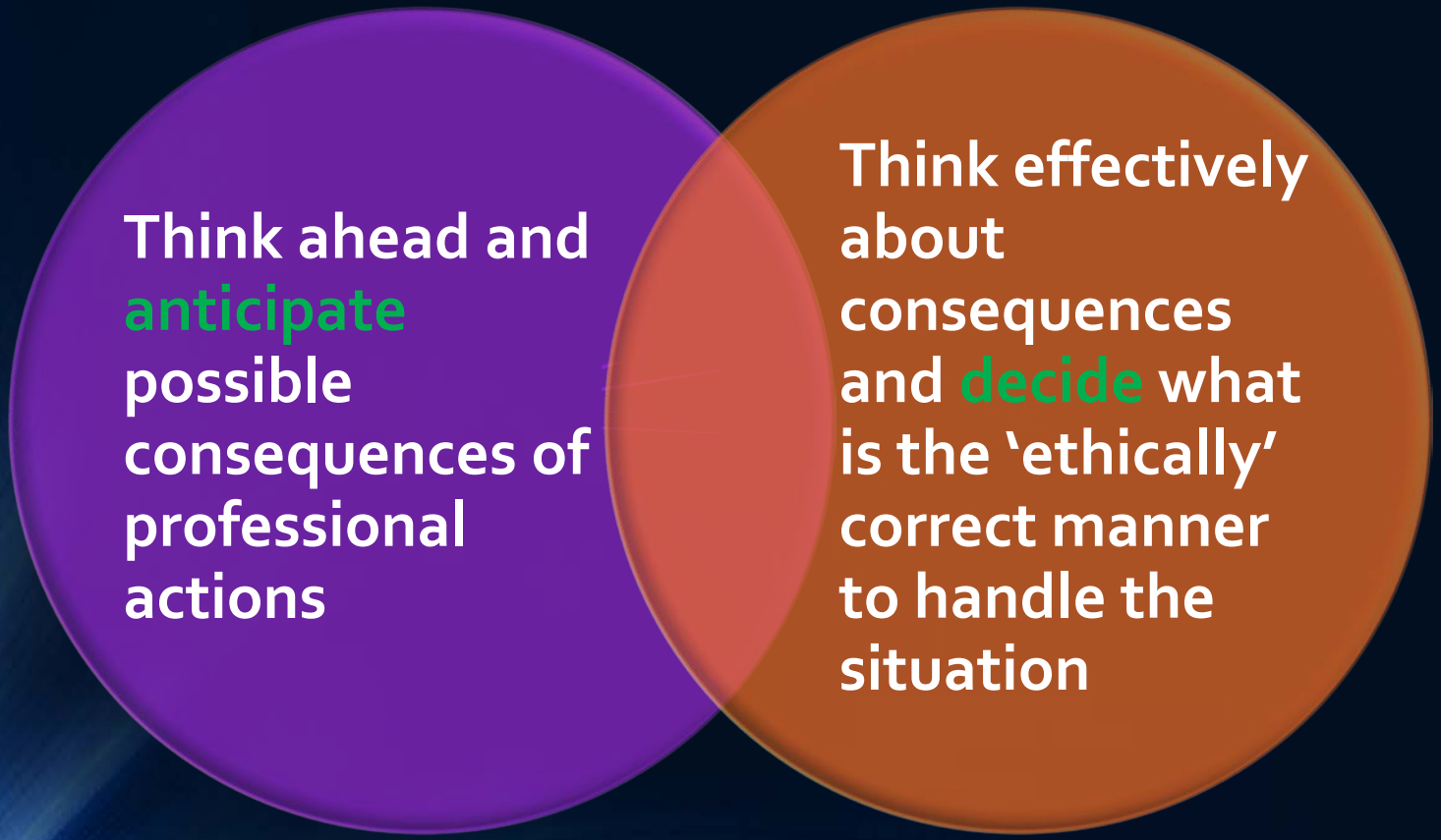
"Education without values, as useful as it is, seems rather to make man a more clever devil."
C.S. Lewis

Ethics

- A set of moral values and principles which form the standards of the code of conduct of individuals, organizations and professions.
- It is the principles of good and bad behavior governing what is right and wrong conduct.

Engineering Ethics

Engineering is based on "Preventative Ethics" which is based on two dimensions:



Standards of Proper Conduct

Professional Ethics: the set of standards adopted by professionals to govern their particular profession, known as the 'code of ethics' for that profession

Personal Values (Ethics): the set of one's own ethical commitments, usually developed in early home, religious, or social training

Common Morality: the set of moral ideals shared by most members of a culture or society

Concepts of Engineering Ethics

- Ethical considerations are an integral part of making engineering decisions.
- The professional obligations of engineers go beyond fulfilling a contract with a client or customer.
- Codes of ethics can provide guidance in the decision-making process
- Ethical obligations do not stop at any country's border; **they are global**

Engineering Codes of Ethics

- Accreditation Board for Engineering and Technology (ABET)
- National Society of Professional Engineers **(NSPE)**
- Institute of Electrical and Electronic Engineers (IEEE)
- American Society of Mechanical Engineers (ASME)
- American Society of Civil Engineers (ASCE)

Extract of NSPE Code

General rules: Engineers, in the fulfillment of their professional duties, shall:

- Hold paramount (vital) the safety, health and welfare of the public in the performance of their professional duties
- Perform services only in areas of their competence
- Issue public statements only in an objective and truthful manner
- Act in professional matters for each employer or client as faithful agents or trustees
- Avoid deceptive acts in the solicitation of professional employment

Extract of IEEE Code

- Safety, health and welfare of the public, and to disclose (reveal) promptly factors that might endanger the public or the environment;
- To avoid real or perceived conflicts of interest, and to disclose them to affected parties;
- To be honest and realistic in stating claims or estimates based on available data;
- To reject bribery (corruption) in all its forms;
- To treat fairly all persons regardless of such factors as race, religion, gender , disability, age, or national origin;

Personal Ethics (everyday examples)

- Software piracy
- Copying of homework or tests
- "Borrowing" office supplies from employer
- Copying of Videos or CD's
- Plagiarism
- Expense account padding((Adding unnecessary material or expenses for the purpose of increasing the cost claim)
- Personal use of the copy machine at work

Ethical Issues are Seldom Black and White

Conflicting Demands

Ethical standards are usually relative and personal, there is seldom an absolute standard

Whistle-Blowing

The term whistle-blower comes from the whistle a referee uses to indicate an illegal or foul play.

- Whistleblower is a person who exposes misconduct or illegal activity occurring in an organization such as fraud, health and safety violations, and corruption.
- Whistleblowers may make their allegations internally (within the accused organization) or externally (to regulators, law enforcement agencies, to the media or to groups concerned with the issues)

Whistle-Blowing (contn'd)

- It is morally permissible for engineers to engage in external whistle-blowing if:
  - ✓The harm that will be done to the public is serious and considerable
  - ✓Getting no satisfaction from their immediate superiors, even after going to the board of directors
- Need a documented evidence that would convince a reasonable, impartial observer
- There must be strong evidence that making the information public will in fact prevent the threatened harm

Case Studies in Engineering Ethics

Case 1: The "challenger" disaster (1986)

Designed a system that required a gasketed connection and did not have sufficient data to predict performance across a spectrum of conditions; pressure from management to end the job lead to:

- Poor Engineering Judgment
- Entire crew lost
- Space program set back years
- Lost public confidence

Case 2: The "Ford Pinto" Gas Tank (1972)

- Under management pressure, engineers designed an automobile component that later proved to fail under certain conditions and could be replaced for only $11 under a recall
- At $11 per vehicle to recall, the total cost would be $137 million
- Corporate decision based on a Benefit/Cost analysis
- Fearing the loss, Ford did not recall for repair

Case 2 (contn'd)

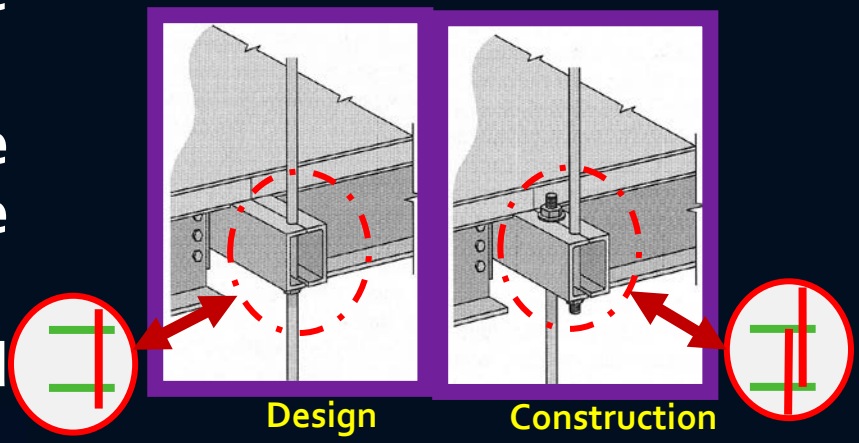
- Over 500 documented deaths related to rear-end collisions in the Pintos
- Hundreds of serious injuries and thousands of burned vehicles

- Lawsuits and personal injury cases totaled over $450 million
- Company nearly folded after the lawsuits and low sales due to lack of trust in Ford products

Case 3: The "Hyatt Regency " (Kansas City 1981)

Engineers were asked to sign on a set of shop drawings that had come from a reliable vendor with whom they had a very good working relationship

- Support system was changed in the shop drawings by the steel fabricator
- Engineer failed to review the shop drawings and therefore did not discover the change
- The change doubled the load on the supports
- 32 ton walkways collapsed
- 114 deaths, 200 injuries
- Engineers prosecuted



Ask yourself (when Making Decisions)

Is it safe?

Is it legal?

Is it the right thing to do?

Is it just, balanced, and fair?

How will it make me feel about myself?

If something terrible happened, could I defend my actions?

Does this choice lead to the greatest good for the greatest number?

Final Thoughts

- Read carefully the code of ethics of your profession, better yet, memorize it!
- Never disclose information given to you in confidence, unless it violates ethical codes
- Assume responsibilities of your mistakes
- Never accept gifts that compromise your ability to perform with freedom
- Start applying (no plagiarism, no software pirating, no abuse of office resources,…)

"Indeed the most honorable of you in the sight of God is the most righteous."

Chapter 49, Verse 13