



Introduction to Engineering Ethics

ME 395

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A Personal Story

1979 – Engineering Internship

1981 – Hired by a consulting engineer firm

1986 – My 1st employer makes the news

2002 – I discover my former colleagues are
famous

What is Ethics?

- Ethics is a branch of philosophy that encompasses right conduct and good living in the moral issues that arise in life.
- Ethics is a tool that enables a **moral person** to determine the **right conduct** in an ambiguous **situation**
 - A **Person** applies a
 - **Standard**
 - to a **Situation**

What is Professional Ethics?

Concern for **moral issues** that arise because of the **specialized knowledge** of professionals, and how the use of this knowledge should be governed when providing service affecting **individuals, organizations** and the **public (Stakeholders)**

- A **Person** applies a
- **Standard**
- to a **Situation**
- affecting **Stakeholders**

The **NSPE** Code of Ethics

- Codifies those values expected of Professional Engineers by society
- Four Sections
 - Preamble ← The Moral Engineer
 - Fundamental Canons ← Standards & Stakeholders
 - Rules of Practice ← Situations
 - Professional Obligations

Preamble to NSPE Code of Ethics

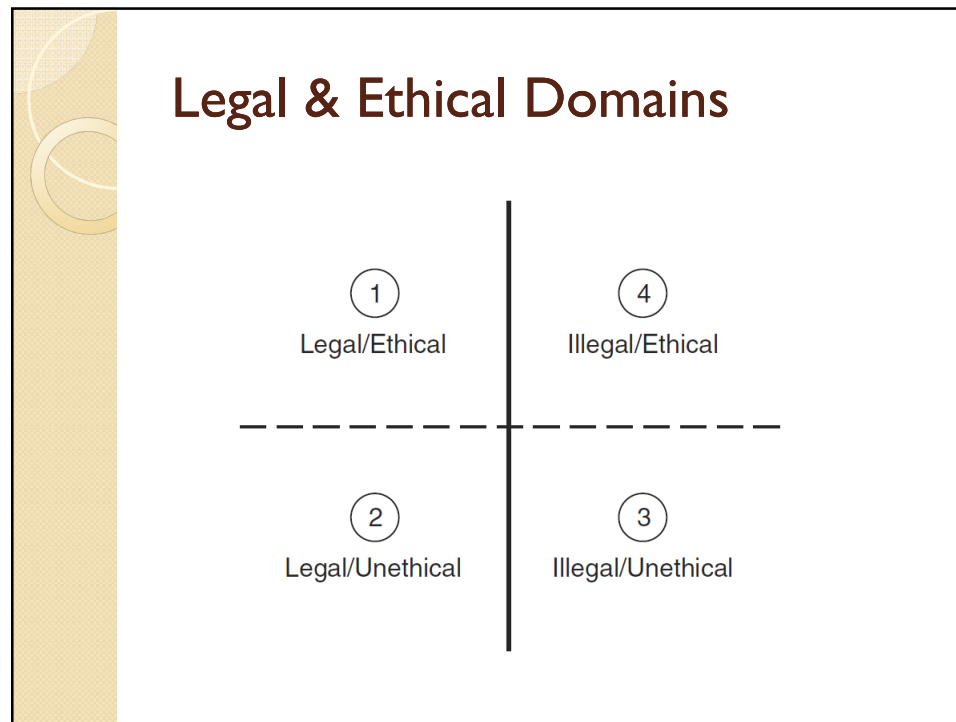
Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of **honesty** and **integrity**. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers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

The Standard Summarized in the Canons

- Public health & safety are paramount
 - Associate with reputable people
 - Practice sustainable development
- Perform Services only in area of competence
- Make truthful & objective public statements
- Be faithful agents or trustees for clients
- Avoid Deceptive Acts
- Encourage conduct that is honorable, responsible, ethical and lawful

Relation of Ethics & Law

- Law is a formalized code of conduct describing what society feels is the proper way to behave
- Ethical conduct is the behavior desired by society that is separate from the minimum standards of the law
- The practice of engineering requires knowledge of and practical application of both.



Ethics, Law & Science

- If you have an ethical question, don't ask your lawyer
 - She will advise you what you can do
 - Ethical questions ask what you should do
- If you have an ethical question, don't look to the science or engineering disciplines
 - Engineering science is concerned with "what is" not "what ought to be"

The Situation

Three Challenges Engineers Face

- Engineers come from...and practice in...a society that doesn't take ethics seriously
- Engineers are faced with problems of conflicting "rights" (rather than decisions between right and wrong)
- Engineers practice their profession in environments often unsympathetic or hostile to their ethical obligations.

Do Students Take Ethics Seriously?

High School

- 40% willing to lie or cheat to get into college

College: Cheating Acknowledged by:

- 45% of law school students
- 48% of education students
- 54% of engineering students
- 56% of MBA students

Do Political Leaders Take Ethics Seriously?

- The House Ethics Committee sanctioned a member for:
 - Willful ignorance of wrongdoing
 - Abuse of power
 - Abuse of trust
 - Behavior which undermines the integrity of the House
- The Congressman replied that he was pleased the committee found “there was no violation of any House **rules** by any member or staff.”

Seattle Times – 12/9/06

Obligations to Stakeholders

Questions of “conflicting rights” are often resolved by considering the obligations owed to **Stakeholders** who are affected by the Professional’s actions

- Lawyer (obligation to client of privilege)
- Business (obligation to stockholders)
- Journalist (obligation to protect sources)
- Doctor (obligation to patient)
- Engineer (obligation to the Public Welfare)

NSPE Fundamental Canons

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

...and as a *professional obligation* (2 d) :

- Engineers shall strive to adhere to the principles of sustainable development in order to protect the environment for **future generations**.

Why it's hard to do your duty

Many ethical dilemmas involve taking a stand in environments hostile to a moral position that interferes with group goals.



Standing Against an Unethical Environment

- **Know the *Environment you're working in***
- Know who *You* are
- Determine who your *Stakeholders* are
- Determine your *Obligations* to stakeholders
- Responding to toxic group *Arguments*

Construction Industry Survey

- Over 80% observed unethical transactions
- 50% believe construction industry is tainted by ***unethical*** acts
- 30% believe construction industry is tainted by ***illegal*** acts
- Over 90% believe more ethics training should be available

Helpful Ethical Distinctions

- **Conduct** describes the outside act
 - How it appears & what its impact is
 - Adjectives are “Right” and “Wrong”
 - *She did the right thing*
- **Virtue** describes the inside attitude
 - Thoughts accompanying the behavior
 - The real motivation
 - Adjectives are “Good” and “Bad”
 - *His motives were good*

Example

An elderly person appears to need help crossing the street

- What is Right Conduct – Good Virtue?
- What is Right Conduct – Bad Virtue?
- What is Wrong Conduct – Bad Virtue?
- What is Wrong Conduct – Good Virtue?

in·teg·ri·ty

noun

the quality or state of being complete or undivided

In other words:

Conduct and Virtue are consistent

Ethical Stakeholders

Employer

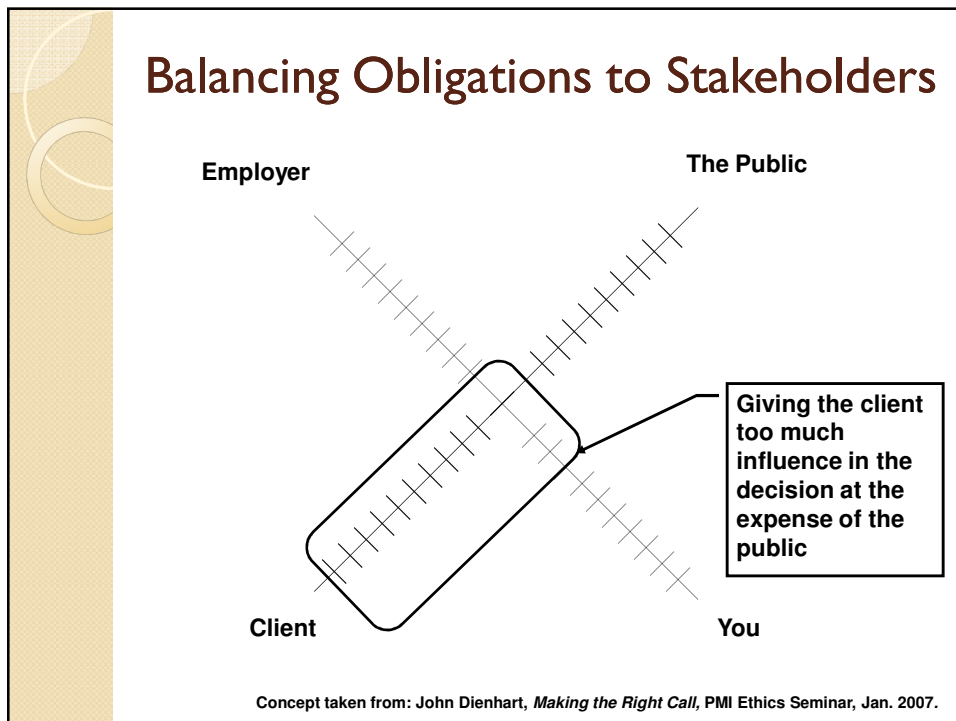
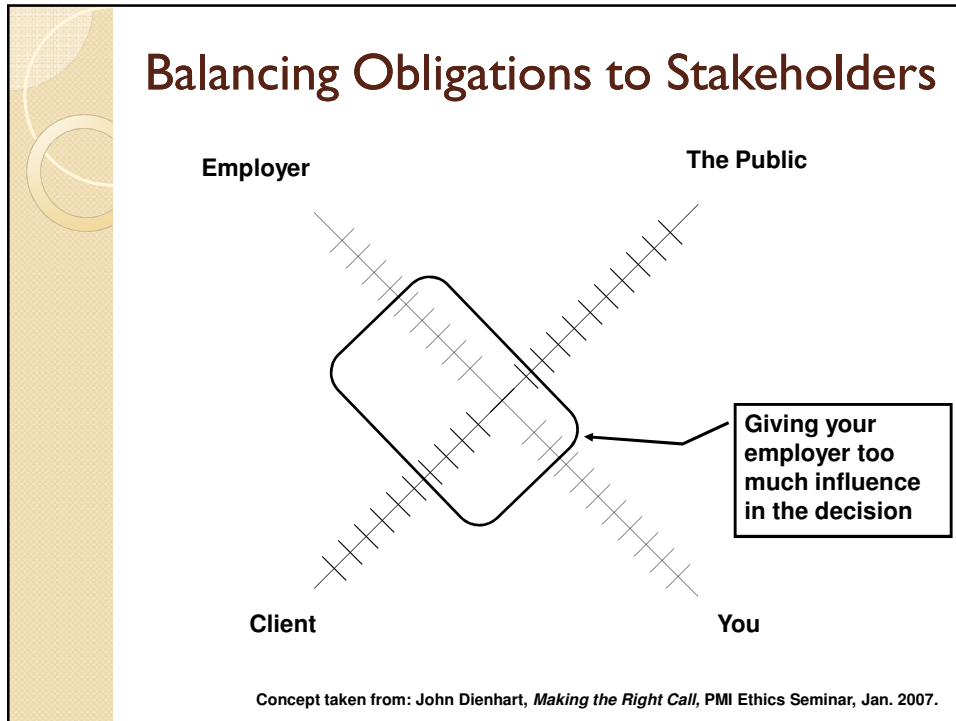
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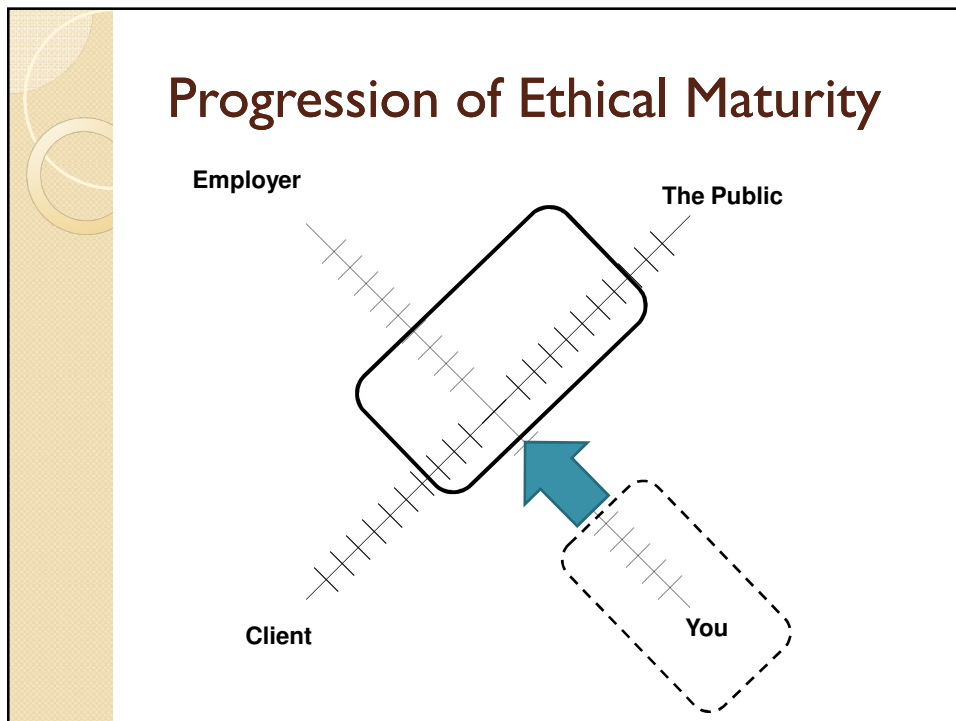
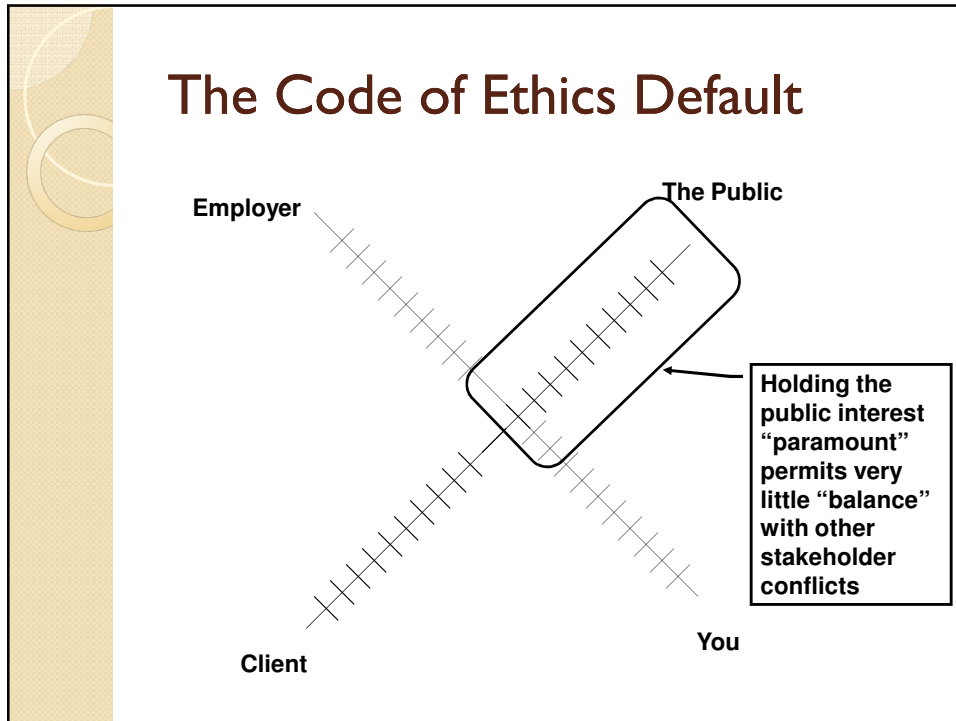
Client

You

Many ethical deliberations involve balancing obligations to stakeholders

Concept taken from: John Dienhart, *Making the Right Call*, PMI Ethics Seminar, Jan. 2007.





Stakeholders Example Ford Pinto Gas Tank Decision

Design goals:

- Sell for less than \$2000
- Weigh less than 2000 lbs
- Deliver in 2 years



http://userpages.umbc.edu/~cpaul1/theintegralworm/EthicalPaper_2.htm

Stakeholders Example Ford Pinto Gas Tank Decision

The Pinto met all Federal Safety Standards.

In pre-production testing, Ford found that the gas tank was likely to leak and possibly burst into flames when struck from behind. Eleven tests averaging 31 mph were performed before the Pinto went into production. In three of the eleven tests the fuel tank did not rupture.

- ❑ In one test, a plastic wiffle ball was placed between the front of the gas tank and the differential housing so that the differential bolts would not rupture the fuel tank.
- ❑ In the next successful test, a piece of steel was placed between the fuel tank and the bumper.
- ❑ In the third test, the fuel tank was lined with a rubber liner similar to the arrangement used by race cars of the time.

The Cost to Correct?

Ford estimated that correction of the problem would require them to fix 12,500,000 vehicles to avoid 2,100 burned vehicles.

Sales	11 million cars, 1.5 million light trucks
Unit Cost	\$11 per car, \$11 per truck
Calculation	11,000,000 × \$11 1,500,000 × \$11
Total Cost	\$137,500,000

What should Ford do?

http://userpages.umbc.edu/~cpaul1/theintegralworm/EthicalPaper_2.htm

Ford Pinto Gas Tank Decision

Who are the Stakeholders?

- Ford Shareholders
- Ford Employees
- Ford Customers
- Passengers
- Firefighters
- EMTs



Stakeholders Example Ford Pinto Gas Tank Decision

Corporate management decided to go ahead with this design because the assembly line machinery tooling was already prepared and corporate management concluded that it was not cost effective to add an \$11 per vehicle design improvement to the Pinto's manufacturing cost to remedy the design flaw.

What do you think they meant by “Cost Effective?”

The Cost not to Correct?

Ford estimated that not correcting the problem would result in 2,100 burned vehicles.

Avoid	180 burn deaths, 180 burn injuries, 2100 burned vehicles
Unit Cost	\$200,000 per death, \$67,000 per injury, \$700 per vehicle
Calculation	180 × \$200,000 180 × \$67,000 2100 × \$700
Total Benefit	\$49,530,000

How did Ford calculate the “cost” of a human death?

Ford's Calculation The Value of a Human Life

Component		1971 Costs
Future productivity losses	Direct	\$132,000
	Indirect	\$41,300
Medical costs	Hospital	\$700
	Other	\$425
Property Damage		\$1,500
Insurance administration		\$4,700
Legal and court		\$3,000
Employer losses		\$1,000
Victim's pain and suffering		\$10,000
Funeral		\$900
Assets (lost consumption)		\$5,000
Miscellaneous accident cost		\$200
Total per Fatality		\$200,725

Responding to Toxic Group Arguments

Shine the light on bad reasoning by paraphrasing responses

- “It’s Legal”
(Our integrity is defined by what we can get away with)
- “It’s a bad law”
(Somehow civil disobedience is warranted)
- “It’s an industry norm”
(Everybody else is doing it)
- Do you always drive 55 mph?
(My ethical decisions are limited to my worst behavior?)
- Clearly you don’t have enough real work to do
(When you run out of arguments – attack the ethicist)
- If they’re so stupid they can’t tell the difference...
(Only smart people qualify as stakeholders)
- The bottom line is...
(Our profit is more important than our conduct)

Parting thoughts...

- Become a student of your own integrity
 - Do the inside virtues match the outside conduct?
- Think about ethical issues in advance of events
 - Ethical decisions made in haste are usually wrong
 - Unless properly trained, your “gut” is often wrong
- Try to involve more people
 - The “wrong choice” advocates often abhor scrutiny
 - The “wrong choice” advocates disappear when trouble results

Your Virtues Become your Conduct

- Your thoughts become your words
- Your words become your actions
- Your actions become your habits
- Your habits become your character
- Your character becomes your destiny

- *Anonymous*