Ethics in
Electrical and Computer Engineering

Lecture #13: Global Issues

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What are "global issues"?

- **Global issues:**
  - World-wide impacts (the world is shrinking)
  - Long time periods (we are learning about this)
  - Cross-cultural, multi-national (real impacts; is doing engineering the same here as everywhere else?)
- **Relevance to engineering?**
  - Broad thinking in engineering design process is essential!
  - Engineering is naturally cross-cultural (e.g., students)
  - Globalization is happening!
  - Impact on engineering profession is unfolding

Multinational corporations

- Technology transfer: "moving technology to a new location and implementing it there" (hardware or technique)
- Engineers need to be "cross-cultural social experimenters"
- Appropriate technology: "identification, transfer, and implementation of the most suitable technology" (social, cultural, value factors play a key role)

Appropriate technology

- Scale (too big, start small...)
- Technical/managerial skills (e.g., for safety). Example: Bhopal disaster
- Materials and energy (availability, cost)
- Physical environment (temperature, humidity, salinity, water)
- Human values (acceptability to end users)
- Sustainable development
- Impact on local jobs and economy
- *Participation* of locals is very important!

The Bhopal Disaster

- Union Carbide, based in US, operated in 37 host countries
- Dec. 3, 1984, a leak and overheating in a storage tank in Bhopal, India
- Tank contained methyl isocyanate (MIC) a toxic ingredient used in pesticides
- MIC burns any moist part of the body, scalding throats, nasal passages, blinding eyes and destroying lungs
- Within an hour the leak exploded in a gush that sent 40 tons of MIC into the atmosphere
- The worst industrial accident in history!

- 500,000 persons exposed
- 2500-3000 deaths within a few days
- 10,000 personally disabled
- 100,000-200,000 injured (exact figures disputed)

- Ten years later
  - 12,000 death claims
  - 870,000 personal injury claims
- 2001 victims/families received compensation from Union Carbide of $600 each (still outstanding claims in 2003)
- Causes of the disaster
  - Extremely lax safety procedures
  - Gross judgment errors by local plant operators
  - Possible sabotage with unintended consequences

- Greater sensitivity to social factors was needed in transferring chemical technology
- Extent of disaster would have been lessened if Union Carbide had used smaller tanks to store MIC (as required in France)
- Govt of India required Bhopal to be operated entirely by Indian workers
  - Union Carbide in the beginning spent much training Indian workers
  - Union Carbide initially had U.S. engineers make site visits for safety inspections
  - BUT, in 1982, financial pressures led Union Carbide to relinquish its supervision of safety at Bhopal

- In the following two years safety practices eroded
  - High turnover of employees
  - Failure to properly train new employees
  - Low technical preparedness of the local labor pool
  - Plant moved from US safety standards to lower Indian standards
- By 1984, several extreme hazards, and many smaller ones, were present
- Lesson: Be very careful in dealing with transfer of dangerous technologies to other countries. It requires years of diligence and financial commitment.

Sweatshops

- Manufacturing sites in the developing world, that engineers help set up and operate
- The "race to the bottom" (why sweatshops occur)
- Problems

  - Safety standards? Working conditions?
  - Environmental standards?
  - Freedom of association (unions)?
  - Fair wage (discussed below)?
  - Improve all these? Then, need to employ fewer people? Put the sweatshop out of business? Went there in the first place to save money! And, the sweatshop would normally help the community.
  - Is there a "creative middle solution" to this moral dilemma?

Engineer's moral responsibilities at a global scale?

- "When in Rome?" ("ethical relativism")
- This can excuse horrors! Safety, environment, etc.
- "Ethical absolutism"? One detailed world-wide set of rules possible? No, not likely!
- Is engineering ethics the same everywhere? Japan: Professionalism? Moral autonomy? El Salvador: Views on cases (e.g., bribery, nepotism)?
- "Ethical relationalism", "ethical pluralism"… all things considered in the current context, many moral perspectives acknowledged…
- Example: Degree of safety (e.g., workplace, product), reductions of cost of manufacture
- International human rights creates constraints, perhaps…

International Human Rights
(see also UN Universal Declaration on Human Rights)

1.   Right to freedom of physical movement
2.   Right to ownership of property
3.   Right to freedom from torture
4.   Right to a fair trial
5.   Right to nondiscriminatory treatment
6.   Right to physical security
7.   Right to freedom of speech and association
8.   Right to minimal education
9.   Right to political participation
10. Right to subsistence

Question: Does the US always follow these? Any of them, fully?

Example: Women engineers' rights and nondiscrimination

Corresponding duties/obligations?

Corporations promoting morally just measures

- Corporations should seek to promote the "common good"
  - Respect basic human rights in every country
  - Utilitarianism perspective - business to benefit the host country (e.g., communities like companies do here such as Battelle) benefits the company, "win-win"
  - Promote morally just institutions, policies
- Example: What is a "fair wage"?
  - As in host country? Called exploitation!
  - As in origin country? Exorbitant?
  - Somewhere in between? "Living wage"?
- Example: Nepotism. Is it ok? Family loyalty vs. company loyalty

Globalization of Engineering

- Student/Alumni Example: Motorola phone
- Example: Off-shore IT growth (other technologies to follow?)
- Effect on you?
  - Salary (compete with other countries)
  - Job quality (technical challenges)
  - Need for global awareness? Read, travel.
  - Need for technical competence, creativity, language skills, professionalism in order to compete!
  - Read T. Friedman's "The World is Flat"

Globalization's Impact on Engineers' Unions?

- What will the impact of globalization effects on the creation of engineer's unions?
- Should engineers unionize / strike?
- Is it "professional"?
- Doctors and lawyers have their own organizations but do they strike?
- What are our professional responsibilities to work even if we are not being treated fairly?
- Should more engineers get involved in politics and policy?

Computer Ethics and the Internet

- Computers are the technological backbone of our society
- Difficult to envision eventual impact of computers (ethics evolving)
- The internet and free speech
  - Internet has brought about more communications and hence promoted free speech
  - Having a positive impact on development of democracy. But…

- Pornography: Is sexually explicit material intended primarily for sexual purposes ("know it when you see it")
- Obscene pornography is pornography that is immoral or illegal in many countries and is not protected in the U.S. by the First Amendment rights to free speech
- Wide agreement that child pornography and extremely violent and degrading portrayals of women are obscene
- Internet has made control of obscene pornography very difficult
- Example: Porn in the workplace

- Hate speech is not forbidden constitutionally
- Internet a resource for racist and hate groups
- Control of porn and hate speech:
  - Government top-down controls (Children's Internet Protection Act, 2001, libraries getting federal funds must use filters to block porn)
  - Individual bottom-up controls (parent's filters)
- Most people do not want too much control over internet content (since it could be the ultimate defender of freedom, equality, and opportunity)

Problems with Computers

- **Job elimination:** Computers lead to elimination of jobs

- **Customer relations:** Should make it easy for consumers to catch and correct errors

- **Stock trading:** Automated with computers – must ensure that it is fair to all

- **Military weapons:** Automation of war – how reliable are these computer systems?

- **Abuse:** embezzlement, theft

- Computer crooks tend to be intelligent and to view their exploits as intellectual challenges
- Engineers must envision not only the intended context which the computer will be used, but both likely and possible abuses
- Hardware protected by patent laws
- Software is often copyrighted (but must abuse in breaking copyright laws)

Privacy

- Inappropriate access

- Hackers – e.g., violations of privacy
  - Sometimes contend that all information ought to be freely accessible
  - But there are legitimate limits on access to information: individual privacy, national security, freedom within a capitalist economy to protect proprietary information essential in pursuing corporate goals

Case: Privacy vs. Security

Edward Snowden

- National Security Agency (monitored by executive and legislative branches) and CIA -surveillance (phone, cameras, internet)

- Engineer's right/responsibility/obligation to whistleblow on privacy issues?

  - Surveillance really for national security reasons? Actually, for criminal reasons, discrimination, political reasons, for advertising, helping healthcare/insurance/credit organizations admit/reject clients? Other?

  - What is a (serious) violation of privacy? Google does it every day!

  - What other methods are there to protect the country (e.g., from terrorism)?

  - Have the surveillance methods been successful? People saved, bad guys in jail/deported, attacks stopped?

  - Should you first work from within the organization, before the whistleblow? Yes, recall our earlier discussion. Do you really have the expertise to evaluate the broad issue and trade-offs involved, if many other <u>elected</u> individuals are doing the same thing?
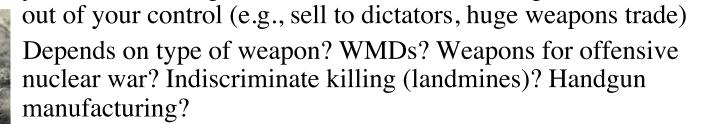
- 1970 Fair Credit Reporting Act restricted access to credit files

- Privacy Act of 1974 gave right of inspection and error correction to federal government files (it prohibited information contained in government files from being used for purposes beyond those for which it was originally gathered unless such use was explicitly agreed to by the person whose file it is)

Global Issue Example: Career Choice and Weapons Development

- Example: Tobacco industry, automotive safety, medical electronics, energy, education

- Think globally about the impact of what you do as an engineer: long-term, range of people, environment, etc.

- Example: Weapons development (key social justice issue)
  - Career choice, a *personal decision*—but you should think about it
  - Good? Protect (defense), humanitarian/peace-keeping missions, counter-terrorism?, "war on drugs"?
  - Always trust your president/government/democracy?
  - Bad? Products beyond your control? War decisions largely out of your control, weapons trade decisions based on profit motives and out of your control (e.g., sell to dictators, huge weapons trade)

  Depends on type of weapon? WMDs? Weapons for offensive nuclear war? Indiscriminate killing (landmines)? Handgun manufacturing?

"Just war theory"
(Augustine/Aquinas)

- Social justice perspective, Catholic origins, frequently used outside Catholic circles
- "If you want peace, work for justice"
- War is always a terrible event
- Offensive war is never moral… but…
- Even considering national sovereignty, the international community "has a moral obligation to intervene on behalf of those groups whose survival is threatened or whose basic human rights are seriously violated."

Elements of the just war theory

- Defense of your country is a right and duty
- Defense: To be licit, the use of force must correspond to certain strict conditions:
  - The damage inflicted by the aggressor on the nation or community of nations must be lasting, grave, and certain;
  - All other means of putting an end to it must have been shown to be impractical or ineffective;
  - There must be serious prospects of success;
  - The use of arms must not produce evils and disorders graver than the evil to be eliminated."
- Example: Was the Mexican-American war just?
- Example: Was WWII just? Hiroshima/Nagasaki?

- The right to self-defense must respect "the traditional limits of necessity and *proportionality*."

- Civilians and non-combatants must be protected

- During war, you must act ethically (e.g., no atrocities). Example: Vietnam, WWII

- "Engaging in a preventive war without clear proof that an attack is imminent cannot fail to raise serious moral and juridical questions." Example: Iraq

- Making contributions to defense of a country is an authentic contribution to peace. Yes, engineers

- Terrorism: Fear, arbitrary killing, immoral and to be defended against

Case: Indiscriminate killing

- Bob's employer manufactures antipersonnel bombs. By clustering 665 guava-sized bomblets and letting them explode above ground, an area covering the equivalent of 10 football fields is subjected to a shower of sharp fragments. Alternatively, the bombs can be timed to explode hours apart after delivery. Originally, the fragments were made of steel, and thus they were often removable with magnets; how plastic materials are sometimes used, making the treatment of wounds, including the location and removal of the fragments, more time-consuming for the surgeon. Recently, another innovation was introduced: by coating the bomblets with…

- phosphorus, the fragments could inflict internal burns as well. Thus, the antipersonnel bomb does its job quite well without necessarily killing in that it ties up much of the enemy's resources just in treating the wounded who have survived. Bob himself does not handle the bombs in any way, but as an industrial engineer he enables the factory to run efficiently. He does not like to be involved in making weapons, but then he tells himself that someone has to produce them. If he does not do his job, someone else will, so nothing would change. Furthermore, with the cost of living being what it is, he owes his family a steady income. Should Bob change jobs?

Case: Deterrence?

- Ron is a specialist in missile control and guidance. He is proud to be able to help his country through his efforts in the defense industry, especially a part of the "war on terrorism". The missiles he works on will carry single or multiple warheads with the kind of dreadful firepower which, in his estimation, has kept any potential enemy in check since 1945. At least there has not been another world war—the result of mutual deterrence, he believes. Does Ron have all the facts?

Case: Working on the highest tech ("cool") problems

- Marco's foremost love is physical electronics. He works in one of the finest laser laboratories. Some of his colleagues do exciting research in particle beams. That the laboratory is interested in developing something akin to the "death ray" described by science fiction writers of his youth is of secondary importance. More bothersome is the secrecy that prevents him from freely exchanging ideas with experts across the world. But why change jobs if he will never find facilities like those he has now? Should he change jobs?

Case: Weapons trade

- Joanne is an electronics engineer whose work assignment includes avionics for fighter planes that are mostly sold abroad. She has no qualms about such planes going to what she considers friendly countries, but she draws the line at their sale to potentially hostile nations. Joanne realizes that she has no leverage within the company, so she occasionally alerts journalist friends with news she feels all citizens should have. "Let the voters direct the country at election time"—that is her motto. Should he be "alerting" journalist friends?

Case: Get involved to make sure it is done right

- Ted's background and advanced degrees in engineering physics gave him a ready entry into nuclear bomb development. As a well-informed citizen he is seriously concerned with the dangers of the ever-growing nuclear arsenal. He is also aware of the possibilities of an accidental nuclear exchange. In the meantime he is working hard to reduce the risk of accidents such as the 32 "broken arrows" (incidents when missile launchings may have occurred erroneously) that had been reported by the Pentagon during the height of the Cold War, or the many others that he knows have occurred worldwide. Ted continues in his work because he believes that only…

- specialists, with firsthand experience of what modern weapons can do, can eventually turn around the suicidal trend represented by their development. Who else can engage in meaningful arms control negotiations? Do you agree with Ted?

Defense Industry Problems, Conclusions?

- Cost over-runs (engineers need to be good stewards of the taxpayer dollar!)
- Secrecy, to cover up problems with the organization (mistakes made in designs, improper behavior, etc.)
- Conclusions? No, it is a personal decision…
  - Spend just part of your career on it? On the right weapons? "Creative middle way" solutions? Perhaps.
  - Be a "conscientious objector engineer"? But, then should you do some other type of community service as a "replacement"?
  - **Important: At least think about it** (or any other career)

Attendance Question

- **Did Edward Snowden ("computer specialist", finished highschool via GED, did not attend college, did some work on an on-line master's degree) do the right thing in whistleblowing on top-level U.S. and British surveillance?**

  – Answer yes or no

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