Safety, Risk, and Risk Acceptability

ENG101 Engineering Professionalism

Dr. Zaid Ahmad, SMIEEE
Advisor, IEEE CUI Lahore
COMSATS University Islamabad, Lahore Campus

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Safety

Safety comes with a cost

Safety is relative

Absolute safety is neither attainable nor affordable
- No entirely risk-free activities and products
- No same degree of safety for all individuals or groups under all conditions

Safety is an acceptable risk
- Underestimated risk
- Gross overestimation of risk
- Ambiguity in risk

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Defining the Safety

A product or activity is safe if the risk are known according to some established value principles

The degree to which a person or group, judging on the basis of their settled values, would decide that the risks of something are more or less acceptable in comparison with the risks of some other thing.

Objective Safety: How the risks are considered acceptable or not acceptable

Subjective Safety: value perspectives differ

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Risks

A risk is the potential that something unwanted and harmful may occur.

Technological risks

- Danger of bodily harm
- Danger of economic loss
- Environmental degradation etc.

Identification and perception of risk

Technology has reduced natural hazards

Technological risks because of natural hazards affect our resources – population, improved and expanded technology, environment

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Discussion

Describe a real or imagined traffic problem in your neighborhood involving people who find it difficult to cross a busy street. Put yourself in the position of (a) a commuter traveling to work on that street; (b) the relative or spouse of someone who has to cross that street on occasion; (c) a police officer assigned to keep the traffic moving on that street; and (d) the town's traffic engineer working under a tight budget.

Describe how in these various roles you might react to (e) complaints about conditions dangerous to pedestrians at that crossing and (f) requests for a pedestrian crossing protected by traffic or warning lights.

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Accebtability of Risk

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Voluntarism and Control

We expose ourselves to the voluntary risks than involuntary risks

In engineering, people are more willing to be the subjects of their own experiments

Proficiency to maintain control the hazards

Striking reversal of preferences about how to deal with that danger

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Effect of Information on Risk Assessment

Information necessary for decision making.

The way information about a danger is presented

Example: U.S. is preparing for the outbreak of an unusual disease originating from Asia, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed:

If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved.

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Effect of Information on Risk Assessment

Alternative Presentation of Information:

If Program C is adopted 400 people will die.

If Program D is adopted there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die.

People tend to be more willing to take risks in order to avoid perceived firm losses than they are to win only possible gains.

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Job Related Risks

Employees may have little choice other than to stick with their current job regardless of the health risks, especially in areas where jobs are scarce.

Standards regulating conditions in the workplace (its air quality, for instance) are generally still far below those that regulate conditions in our general (public) environment.

Engineers who design and equip workstations must take into account the casual attitude toward safety shown by many employers, especially when they pay their workers on a piecework basis creating an environment that rewards productivity above all else, including safety.

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Magnitude and Proximity

Magnitude: Keen feelings about potential risks in terms of numbers

Proximity: Personal identification or relationship with victims, or the time a harm occurs

Misperceptions of numbers can easily make us overlook losses that are far greater than the numbers reveal by themselves

- Effects of risky activity are notable, and the victims are identifiable
- Out of sight, out of mind
- Assuming discounted probabilities for future predictions through lower probabilities
- Believing in a future counter measure
- Optimistic vs rare but dreadful incidents

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Magnitude and Proximity

Engineering dilemmas in safety conception

- Overly optimistic attitude
- Dread from big accidents despite their infrequency occurrences

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Cross-cultural Risk Perception

Cultural factors: race, gender, socioeconomic class, nationality

Examples:

- French participants tended to rate some technological issues (e.g., genetically engineered bacteria, nuclear waste) as having higher risk than their American counterparts.
- Chinese public held an overwhelmingly positive attitude toward nanotechnology compared to people from Western countries such as Canada, Switzerland, the UK, and the United States. The strong support of nanotechnology among Chinese public may decline if more negative consequences of nanotechnology are disclosed publicly.

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Discussion

In some technologically advanced nations, a number of industries restricted by safety regulations have resorted to dumping their waste on—or moving their production processes to—less-developed countries where higher risks are tolerated. Examples are the dumping of unsafe or ineffective drugs by pharmaceutical companies from highly industrialized countries, and in the past the transfer of asbestos processing from the United States to Mexico. More recently, toxic wastes—from lead-acid batteries to nuclear wastes—have been added to the list of "exports." To what extent do differences in perception of risk justify the transfer of such hazards and production processes to other countries? Is this an activity that can or should be regulated?

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Case Study

Challenges, risks and threats to human security in the 4th industrial revolution
https://scindeks.ceon.rs/Article.aspx?artid=0354-88722001081M

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References

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