

Engineering as Social Experimentations

ENG101 Engineering Professionalism

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Engineering as Experimentation

Experiment on social scale involving human subject

Partial Ignorance:

- model-based design

- material characteristics

- material processes and fabrication

- stress tolerated by the finished product

- safe accomplishment of tasks with partial knowledge of scientific and societal laws

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Engineering as Experimentation

Uncertainties of outcomes:

Unknown possible outcomes and risks

Monitoring:

Make periodic observations and tests for successful performance and unintended side effects of intermediate and final products extended to the stage of client usage

The ultimate test of a product's efficiency, safety, cost-effectiveness, environmental impact, and aesthetic value lies in how well that product functions within society

Extends to the stage of client use

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Learning from the Past

It is *not enough* for engineers to rely on handbooks and computer programs without knowing the limits of the tables and algorithms underlying their favorite tools

The art of back-of-the-envelope calculations to obtain ballpark/nominal values with which to quickly check lengthy and complicated computational procedures must not be lost

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Contrast with Standard Experiments

Experimental Control

Experimental treatment vs. random sample in standard experiments under similar conditions

In engineering, no control group, only historical data is available unless a lab experiment is being performed

Experimental subjects are human beings or finished and sold products out of the experimenter's control

Control performed by clients and customers themselves who randomly select a product

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Contrast with Standard Experiments

Informed Consent: Knowledge and voluntariness

Requested as well as other pertinent and relevant knowledge of the product to make a reasonable decision

Agreement regarding shared risks and benefits of trying to medical testing

Product Knowledge, understandable information

Voluntary vs involuntary risks

Widely disseminated information for consent

Valid Consent: given voluntarily, based on understandable widely disseminated information, given to competent consentor for rational decision, widely disseminated information, representative consent

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Contrast with Standard Experiments

Knowledge Gained

- Nothing from fundamental knowledge
- Did it rightly?
- Concerned with the manner in which experiment is performed
- Available safety measures (safety exit)
- New knowledge about procedures, translation into a technical project

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Case Study

The power of technological products are often left turned on. From the safety perspective, who should be considered mainly responsible, the consumer or the manufacturer. How might an emphasis on the idea of informed consent influence thinking about this question?

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References

1. Zhu, Q., Martin, M. W., & Schinzinger, R. (2022). *Ethics in engineering*.