

Professional Ethics & Human Values

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ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation

Engineers as responsible Experimenters

Codes of Ethics

A Balanced Outlook on Law.



ENGINEERING AS EXPERIMENTATION

Experimentation (Preliminary tests or Simulations) plays a important role in the design of a product or process.

Experimentation refers the activity, process or practice of making experiments

In all stages of converting a new engineering concept into a design like, First rough cut design,

Usage of different types of materials and processes,

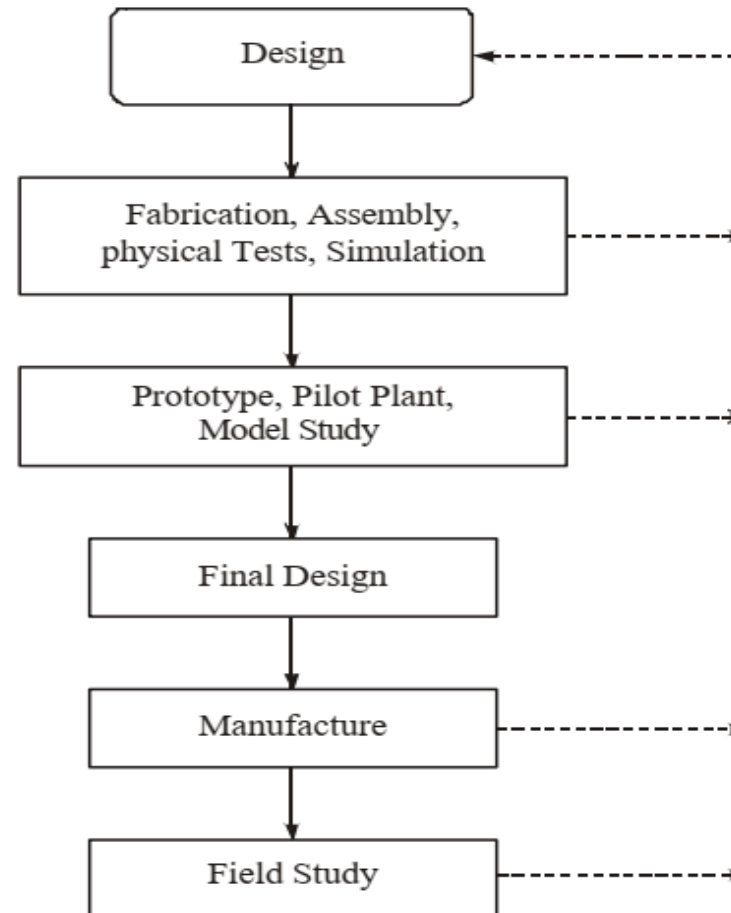
Detailed design,

Further stages of work design and

The finished product,

Experiments and tests are conducted to evaluate the product. Modifications are made based on the outcome of these experiments.

ENGINEERING AS EXPERIMENTATION





ENGINEERING PROJECTS VS. STANDARD EXPERIMENTS

SIMILARITIES TO STANDARD EXPERIMENTS

Partial ignorance

- The project is usually executed in partial ignorance.
- Uncertainties exist in the model assumed.
- The behavior of materials purchased is uncertain and not constant

Uncertainty

- The final outcomes of projects are also uncertain, as in experiments. Some times unintended results, side effects (bye-products), and unsafe operation have also occurred.

Continuous monitoring

- Monitoring continually the progress and gaining new knowledge are needed before, during, and after execution of project as in the case of experimentation.



SIMILARITIES TO STANDARD EXPERIMENTS

Learning from the past

- Engineers normally learn from their own prior designs and infer from the analysis of operation and results
- The absence of interest and channels of communication, ego in not seeking information, guilty upon the failure, fear of legal actions, and mere negligence have caused many a failure
- Eg: Titanic lacked sufficient number of life boats—it had **only 825** boats for the **actual passengers of 2227**, the capacity of the ship being **3547**!
- In the emergent situation, all the existing life boats could not be launched. Forty years back, another steamship Arctic met with same tragedy due to the same problem in the same region. But the lesson was learned



DISIMILARITIES TO STANDARD EXPERIMENTS

Experimental Control

Members for two groups should be selected in a standard experimental control ie., Group A and Group B.

The members of the group 'A' should be given the special experimental treatment.

The group 'B' do not receive the same though they are in the same environment. This group is called the '*control group*'

Though it is not possible in engineering but for the projects which are confirmed to laboratory experiments.

Because, in engineering the experimental subjects are human beings who are out of the control of the experimenter

So An engineer has to work only with the past data available with various groups who use the products.



DISIMILARITIES TO STANDARD EXPERIMENTS

Humane touch

- Engineering experiments involve human souls, their needs, views, expectations, and creative use as in case of social experimentation
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DISIMILARITIES TO STANDARD EXPERIMENTS

Informed Consent

Engineering experimentation is viewed as Societal Experiment since the subject and the beneficiary are human beings

When new medicines have been tested, it should be informed to the persons who undergo the test.

They have moral and legal rights to know about the fact which is based on “**informed consent**” before take part in the experiment. Engineering must also recognize these rights.

Informed consent has two main principles such as **knowledge** and **voluntariness**

Knowledge: The persons who are put under the experiment has to be given all the needed information to make an appropriate decision

Voluntariness: they must enter into the experiment without any force, fraud and deception



VALID INFORMED CONSENT

The consent must be given voluntarily and not by any force.

All relevant information shall be presented/stated in a clearly understandable form

The consenter must be capable of processing the information and to make rational decisions in a quick manner.

The information needed by a rational person must be stated in a form to understand without any difficulty and has to be spread widely.

The experimenter's consent has to be offered in absentia of the experimenter by a group which represents many experiments.



INFORMED CONSENT - ENGINEERING

the knowledge about the product

risks and benefits of using the product

all relevant information on the product