Experiments in Software Engineering

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(Controlled) Experiment

- Experiment is an empirical strategy that manipulates one factor (or variable) of the studied setting
- Different treatments are applied to the variable (or variables)
  - Other variables are kept constant
- Experiments are mostly done in a laboratory
  - They require a high level of control

Quantitative (+ Qualitative)

- Experiments are almost pure quantitative
  - Statistical methods are usually applied
- Qualitative data may be used to help in the interpretation and conclusions

Human vs. Technology

- Experiments can be human-oriented or Technology-oriented
- Human-oriented experiments
  - Humans apply different treatments to objects
  - Two groups use different inspection methods
- Technology-oriented experiments
  - Two different tools (e.g., two testing tools) are applied to different objects

Baseline

- It is common to consider the current (or typical) situation as baseline
  - Baseline (control group) is one level of the independent variable
- The new situation (evaluated group) is the one we want to evaluate
  - Another level of the independent variable
- Values of other variables should stay the same, i.e., controlled

Quasi-Experiment

- Quasi-Experiment is similar to experiment
- However, treatments cannot be based on randomization
  - They emerge from characteristics of the subjects or objects
  - Example: it is hart to randomize programming experience in a class

Case Study vs. Experiment

- Different environments
  - Case studies run in real environment
  - Experiments run in controlled environment
- Experiments are more controlled
  - Control is lower in a case study
- Experiments rely on measurements and manipulation of variables
  - Case studies are most observational

Bibliography

- C. Wohlin et al. **Experimentation in Software Engineering**, Springer. 2012.
  - Chapter 2 - Empirical Strategies (Section 2.4)