Software Metris and Quality Engineering

CSE 8314 — Fall 2015

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Module V: Recent Development and Advanced Topics

- New Metrics and Applications

- New Models and ESE Guidelines

- Data Collection/Extraction/Mining

- Hypothesis Testing

New Metrics and Applications

- New metrics might be needed:

  ▷ new language/technology
  ▷ new application domain
  ▷ new vs. adapted/adopted metrics

- New language/technology

  ▷ CK metriics for OO
  ▷ Other new languages/technologies

- New application domains (+technologies):
  − e.g., Web, net-centric, SOA, Cloud, IoT, etc.

- NCSS complexity metrics (SDPS slides)

New Models and ESE

- *Empirical Research in S/w Eng. (ESE):* 2002 paper by Kitchenham, Pfleeger, Pickard, Jones, Hoaglin, Emam, Rosenberg (TSE 28(8):721-734).

- Why a guideline?

  ▷ More ESE research activities
  ▷ Maturing of SE and ESE
  ▷ Practical concerns:
    − reader/students
    − researchers/meta-analyst
    − reviewers/editors
    − journals/conferences etc

- More details in CSE 8340

ESE Guideline: Basis

- Internal basis for the guideline:

  ▷ Research experience in ESE
  ▷ Researcher experience in ESE
  ▷ from both author/reviewer perspectives
  ▷ Other CS/SE work

- External basis for the guideline:

  ▷ Scientific method
  ▷ Implicit guidelines used for emp. studies
     in other mature disciplines
     (most natural science)
  ▷ (Explicit) guidelines for emp. studies in
     other disciplines (e.g., medical)
  ▷ External experts as co-authors

- Result: *Preliminary* guidelines.

ESE Guideline: Sources

- Authors as information sources:

  ▷ Diverse background
  ▷ Experience in SE/ESE/statistics/others

- Other important sources:

  ▷ Similar guidelines for medical journals
  ▷ Meta-analysis studies
    (studies of empirical studies and results)
  ▷ Papers about statistical applications:
    – positive (guide, "what should be done")
    – negative ("what was wrong/to avoid")
  ▷ Other "soft" sciences
  ▷ List of specific references in paper

ESE Guideline: Topic Areas

1. Experimental context

2. Experimental design

3. Conduct experiment and data collection

4. Analysis

5. Presentation of result

6. Interpretation of result

Data Collection/Extraction/Mining

- Data collection

  ▷ Data source identification
  ▷ Data collection procedures
  ▷ Tools: computing vs extracting
  ▷ IBM data: complexity/defect/activity/etc.

- Data extraction:

  ▷ Tapping into pre-existing data sources
  ▷ Web measurement example (paper in Blackboard)

- Data mining:

  ▷ (unstructured/big) data source
  ▷ mining/extensive processing necessary
  ▷ AutoODC work at SMU (paper in Blackboard)

Validation and Hypothesis Testing

- Hypothesis: An assumption or concession made for the sake of argument.

    ▷ Simple hypothesis: One value of the population parameter ($\mu = 115$).

    ▷ Composite hypothesis: A range of values that the population parameter may assume ($\mu \neq 115$).

    ▷ Null Hypothesis (H_0): Status quo.

    ▷ Alternative Hypothesis (H_a): Believed to be true.

    ▷ Both H_0 and H_a can be simple or composite.

- Hypothesis Testing: Choose between two competing hypotheses about the value of a population parameter using the knowledge obtained from a sample.
    - Example HT: slides online (pp.45-48)