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Evaluation in Software Engineering

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What is Software Engineering?

*Software Engineering means application of a systematic, disciplined, **quantifiable** approach to development, operation and maintenance of software.*

IEEE Standard Glossary

- Software development is by no means easy
  - It runs over a long period of time
  - It involves many people

It is time to evaluate!

- Software Engineering was born in 1968, but it is still maturing
- Evaluation and measurement play a pivotal role in Software Engineering

The Value of Evaluation

- Software engineers need to know methods, process and techniques
  - But, they also should know how to evaluate them
- A practitioner wants to evaluate methods and techniques before introducing them into the organization
- A researcher wants to evaluate new results against something existing

Evaluation is Control

"You can't control what you can't measure"

Tom DeMarco

- Control comes from being able to evaluate new methods, techniques, languages and tools

Process Evaluation

- The real evaluation of a process requires people using it
  - Empirical studies are crucial to evaluate process and human-based activities
- Empirical studies are common in social and behavioral sciences

Research Methods

- To perform scientific research in software engineering, we have to
  - Understand the methods available
  - Understand their limitations
  - Understand when they can be applied
- There are four research methods in software engineering
  - Analytical, Scientific, Engineering, and Empirical

Analytical and Scientific

- Analytical Method
  - A formal theory is proposed and then compared with empirical observations
  - It is often used in more formal areas of computer science, such as algorithms
- Scientific Method
  - The world is observed and a model is build based on observations
  - It is usually used in applied areas, such as network (to evaluate performance)

Engineering and Empirical

- Engineering Method
  - The current solutions are studied and changes are proposed
  - It is dominating in industry
- Empirical Method
  - A model is proposed and evaluated through empirical studies
  - Empirical studies have traditionally been used in social sciences and psychology

The need for Scientific Approach

- The engineering and empirical methods are variations of the scientific method
- A more scientific approach to software engineering is need
- The need for systematic experimentation has been emphasized since middle 80s
  - Basili raised this concern followed by Fenton, Kitchenham, Pfleeger and others

Bibliography

- C. Wohlin et al. **Experimentation in Software Engineering**, Springer. 2012.
  - Chapter 1 - Introduction