Software Engineering and Technology (MPSOF)

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About me

Riccardo

- **Coordinator of SE Master Program**
  Associate Professor, CSE department

- Research interests
  - Security and privacy by design
  - Empirical methods for security & privacy

- See www.scandariato.eu

About you

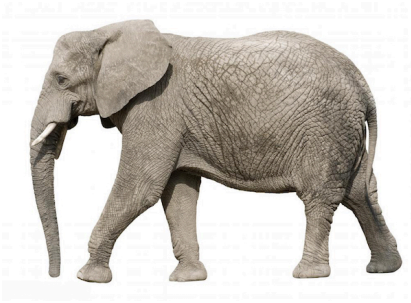
Do you have solid programming skills?


What can possibly go wrong ?!

What can possibly go wrong ?!

- Programming in the small… nothing!

- Programming in the large?



Big & complex

Several teams around the world

Long-living

Lots of stakeholders (conflicting qualities)

Multi-platform

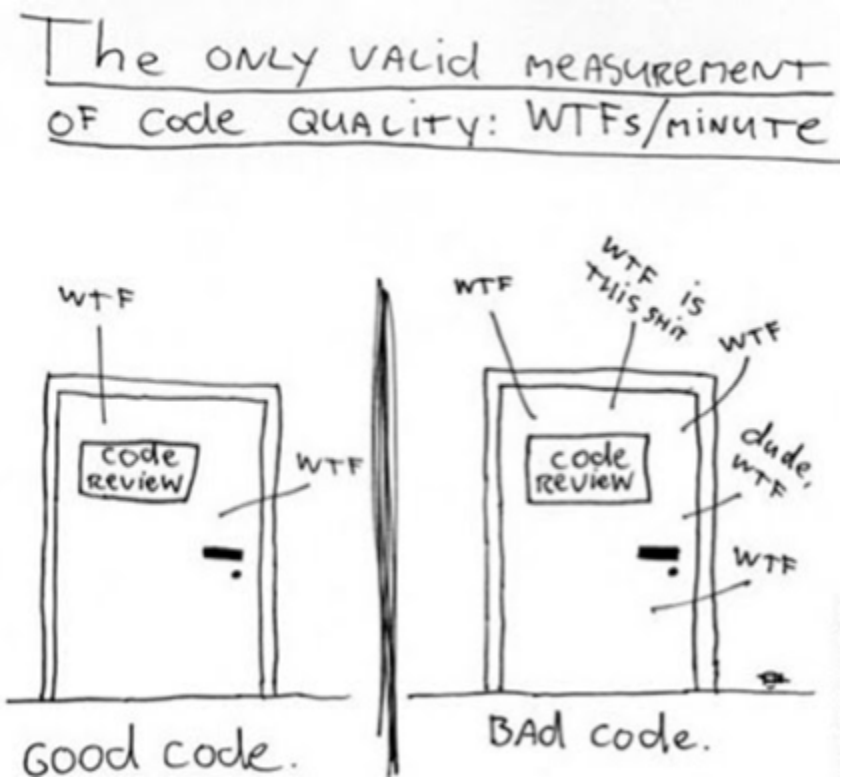
What can possibly go wrong ?!

"Of the IT projects that are initiated, **from 5 to 15%** will be abandoned before or shortly after delivery as hopelessly inadequate.

IEEE Spectrum, Why Software Fails, September 2005

What can possibly go wrong ?!

- Are you delivering quality?
  - Bugs, performance issues, security flaws…



What can possibly go wrong ?!

- Did you get the requirements right?

What can possibly go wrong ?!

- Did you get the design right?

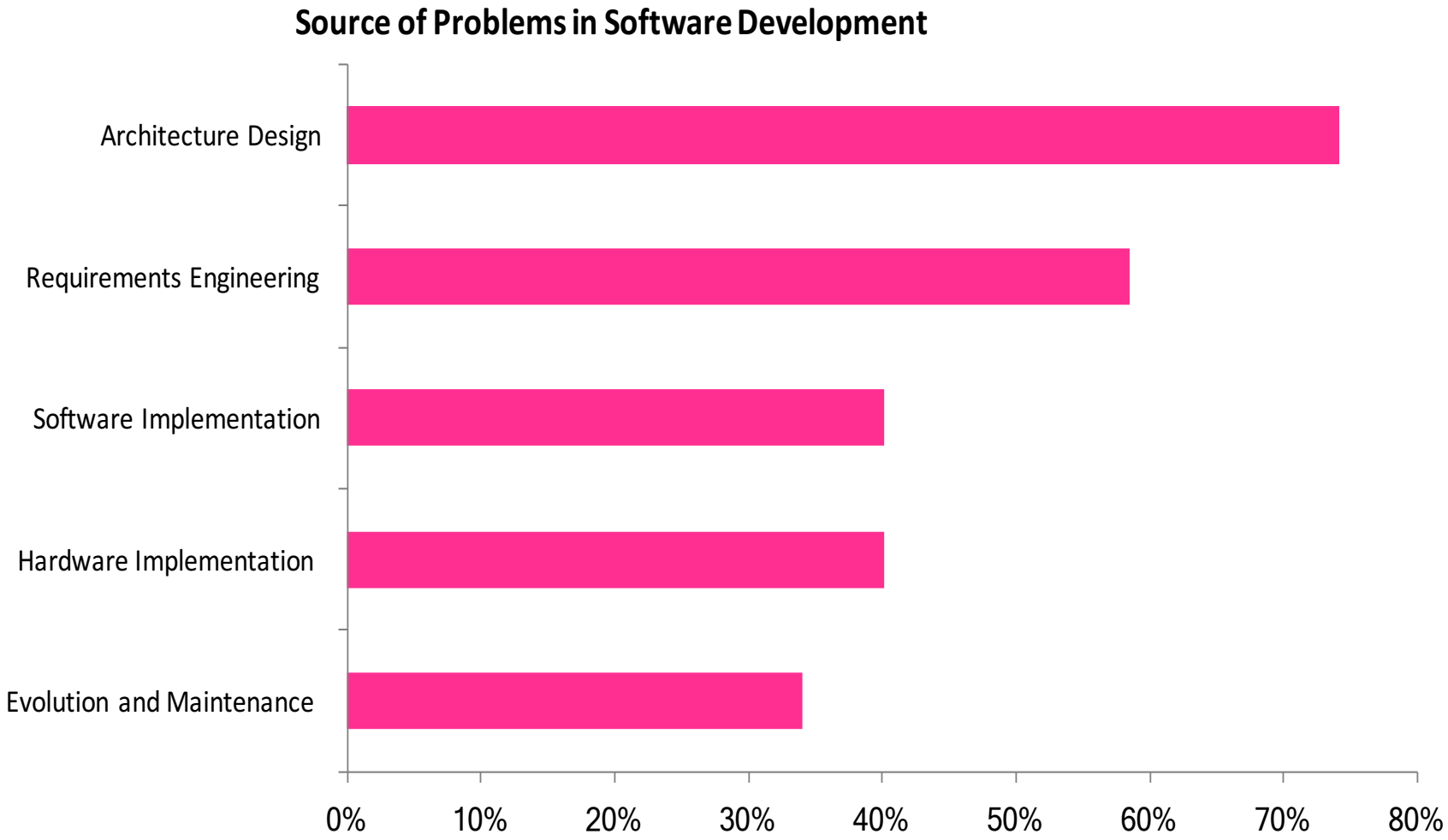
What can possibly go wrong ?!

- More bugs, more performance issues, requests for new features…

Delivered

Evolved

What does go wrong ?!



P. G. Neumann, Computer-Related Risks, Addison-Wesley, 1995

Software projects are complex operations

Stakeholders

Architect

Developers

Requirements Engineer

Testers

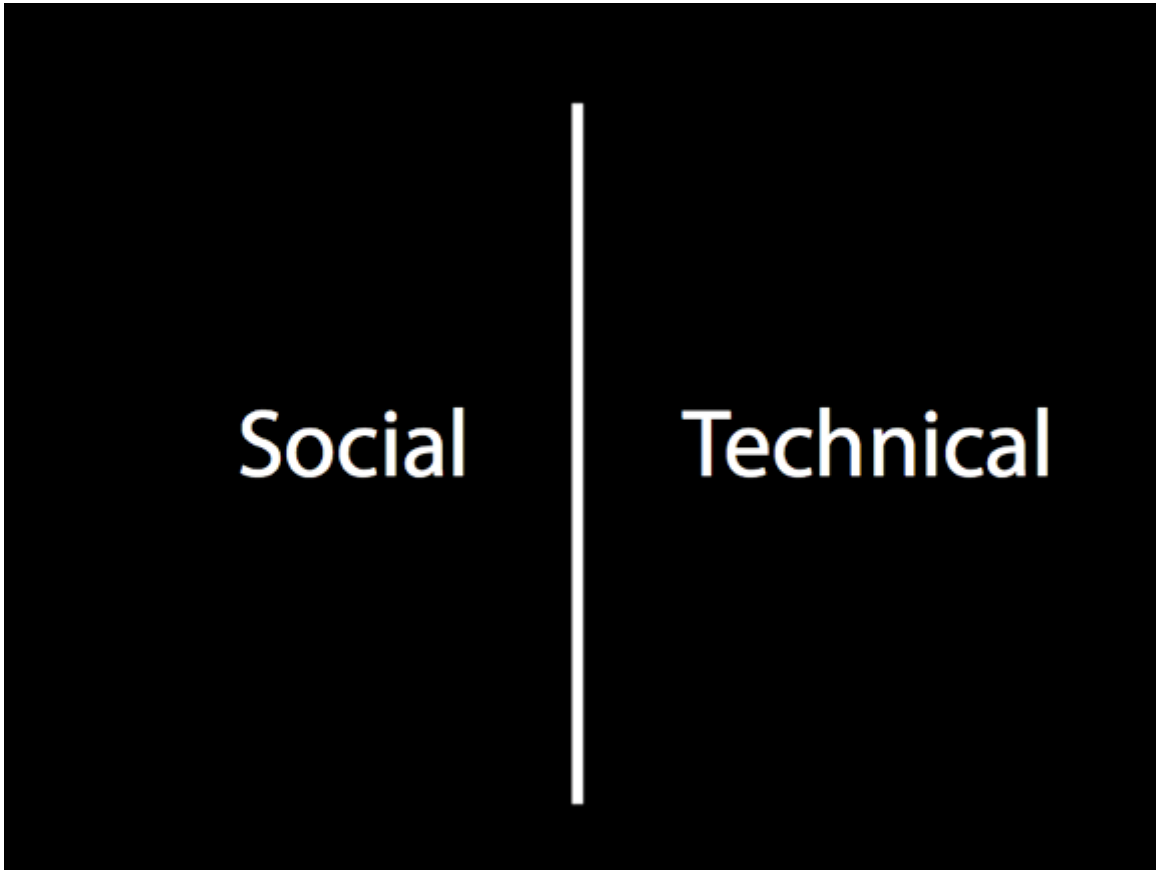
Requirements

Software Architecture

Software Product

Software engineering

Software engineering

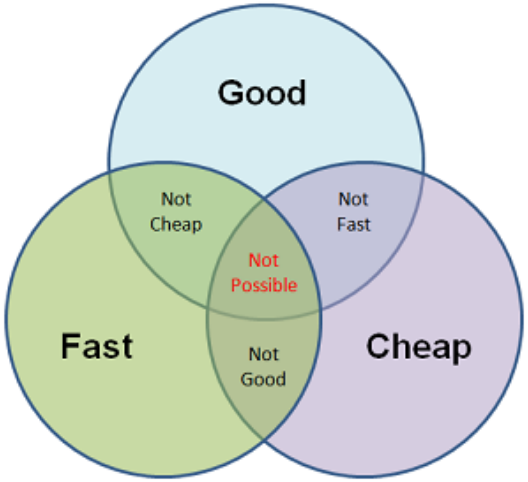


IEEE definition of software engineering

- The application of a systematic, disciplined, quantifiable approach to the development, operation and maintenance of software;
  - that is, the application of engineering to software.
- The study of approaches as in the above statement.

In other words

- Software engineering is a **branch of computer science**
- Using well-defined engineering concepts required to produce (+operate, +evolve) quality software products, in-budget and on-time



Software engineering problems

Just a few examples…

“Can I predict how many post-release bugs to expect in this file?”

✓Software metrics + machine learning

Software engineering problems

Just a few examples…

“ How can I reduce the no. of defects per kLOC? ”

- ✓ Pair programming, inspection,
- ✓ Test-first, integrate test with commit
- ✓ Use seamless static analysis…

Software engineering problems

Just a few examples…

"How can I reduce the maintenance costs for my SW product?"

- ✓ Clone detection (via code analysis)
- ✓ Improve architecture (e.g., use layers)

Software engineering problems

Just a few examples

“ Can I validate my design to be sure that customer data is treated confidentially ”

✓UML + formal methods

Software engineering (in practice)

- Techniques
  - Goal-oriented elicitation of requirements
  - Attribute-driven design
  - Model-based testing
  - Metrics for code quality …
- Processes
  - Waterfall, Agile …
- Management
  - Estimation …

Experimental software engineering

Just an example

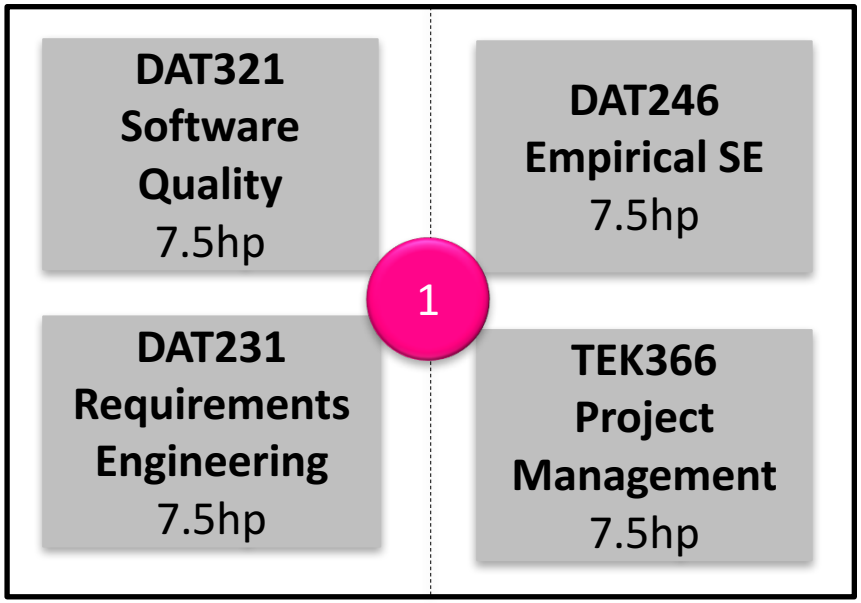
- A group of ***n*** engineers (control) inspecting some application with a **static analysis technique**
- Another group of ***n*** engineers (treatment) inspecting the same code using a **tool-based penetration testing**

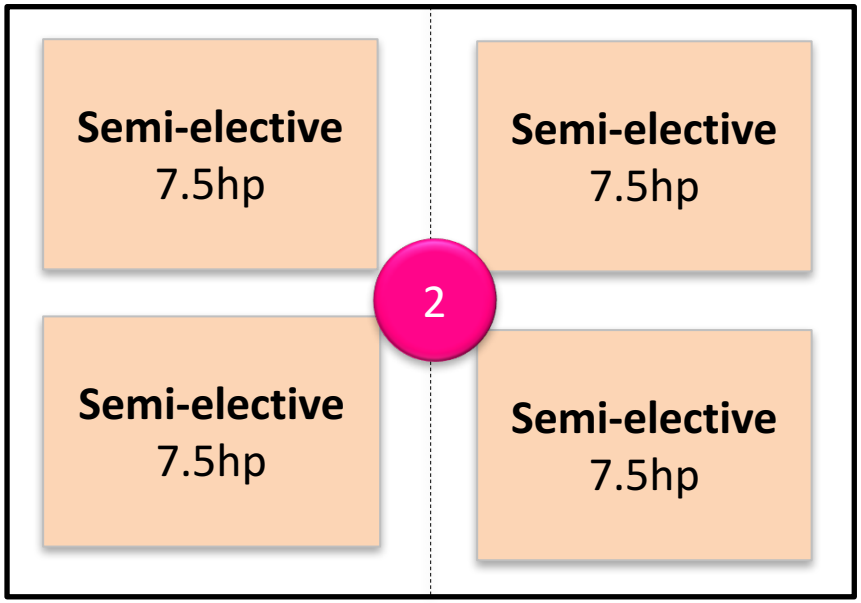
- **Which group finds more vulnerabilities?** Statistically significant differences (e.g., *t-test*)

R. Scandariato, J. Walden, W. Joosen, **Static Analysis Versus Penetration Testing: a Controlled Experiment**, ISSRE, 2013

Questions ?

THE MASTER PROGRAM





At least 15 credits from the "**Recommended Profiles**"

- Software and user experience
- Software architecture and process management
- Software and modeling
- Software and data science
- Software and real-time system
- Software and security
- Software and Algorithms

DAT321 Software Quality 7.5hp

DAT246 Empirical SE 7.5hp

1

DAT231 Requirements Engineering 7.5hp

TEK366 Project Management 7.5hp

Semi-elective 7.5hp

Semi-elective 7.5hp

2

Semi-elective 7.5hp

Semi-elective 7.5hp

Elective 7.5hp

Elective 7.5hp

3

DAT265 Software Evolution Project 15hp

DATX05 Thesis 30hp

4

https://masterthesis.cms.chalmers.se

@Lindholmen

Context

- Proximity to where software is made: **Lindholmen Science Park**
- Close collaboration (e.g., thesis) with…

Questions ?