



Ingegneria del Software

Corso di Laurea in Informatica per il Management

Introduction to software engineering

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The watermark is a circular seal from the University of Twente. It features a central figure holding a book, surrounded by the text 'UNIV ARTISTAR' and 'COLL IUR CIVIL'. The outer ring of the seal contains the words 'STUDIUM' and 'ARTIS'.

Software Engineering

Multi-person construction of multi-version software
[D. Parnas 78].

Software Engineering

- Creating a software product within a development team is not (just) about programming.
- Even if people have to come up with a clever algorithm... it is **much more important** that the code be **readable** and **maintainable** than be “clever”. If it’s **too clever**, the **next person** to modify the code will likely **break it**.

[Adam Barr on interviewing developers]

The problem

Software projects fail



The problem

Software projects fail



The problem

The pace of change in computer and software technology drives the demand for new and evolved software products. As software size and complexity increase programming techniques and processes that worked effectively for an individual or a small team to develop modest-sized programs do not scale-up well to the development of large, complex systems .

In the late 60s this leads to the so called “software crisis”.

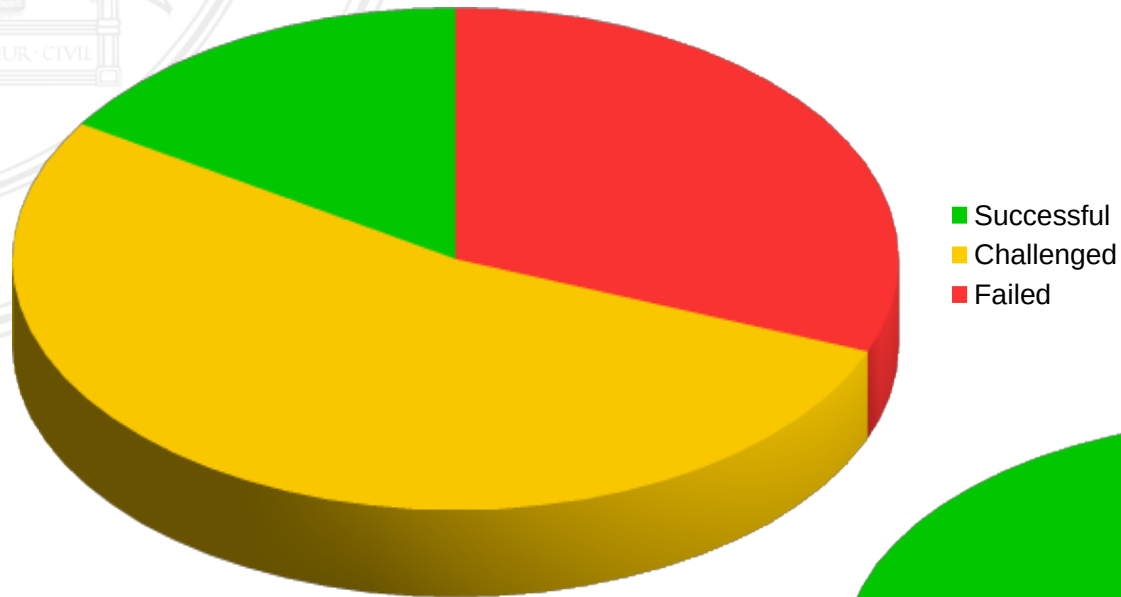
Complex?

- Windows Server 2003 – 50M SLOC
- Mac OS X 10.4 – 86M SLOC
- Linux kernel (2023) – 25M SLOC
- *All* Google – 2B SLOC

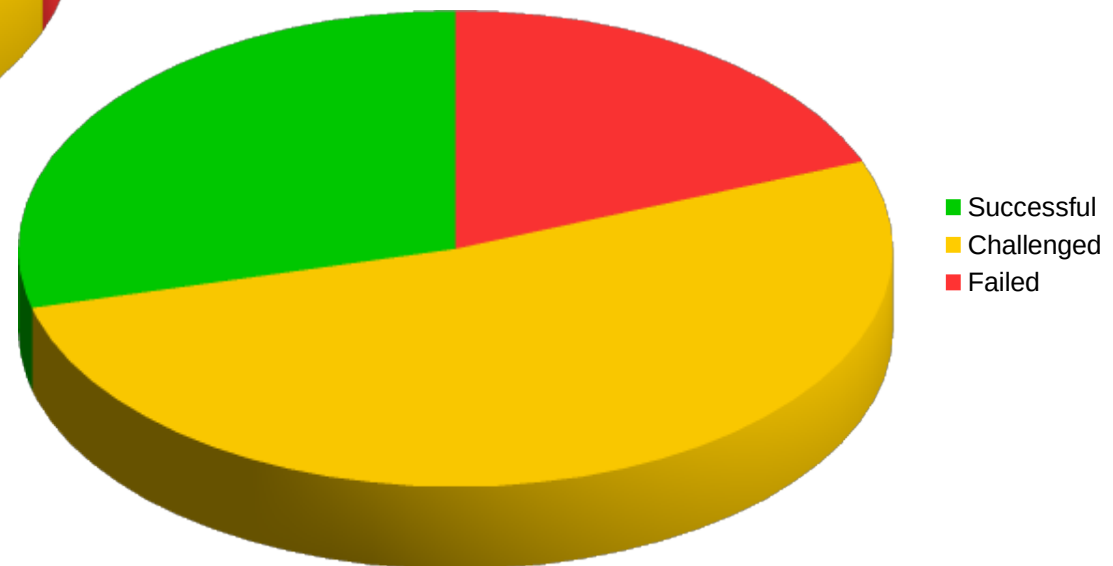
The horror story

- The dreaded Standish Chaos report

1994 Software Projects



2015 Software Projects



Looking for a solution

- Software Development: Craft, or Science?
- Formal discussion of software engineering as a discipline took place at the 1968 NATO Conference on Software Engineering [Naur 1969].

Looking for a solution

By the early 1970's, it was apparent that proper software development practices required more than just the underlying principles of computer science; they need both the analytical and descriptive tools developed within computer science and the rigor that the engineering disciplines bring to the reliability and trustworthiness of the artifacts they engineer.

Discussion

Is software engineering different from other engineering branches?

Software – Engineering?

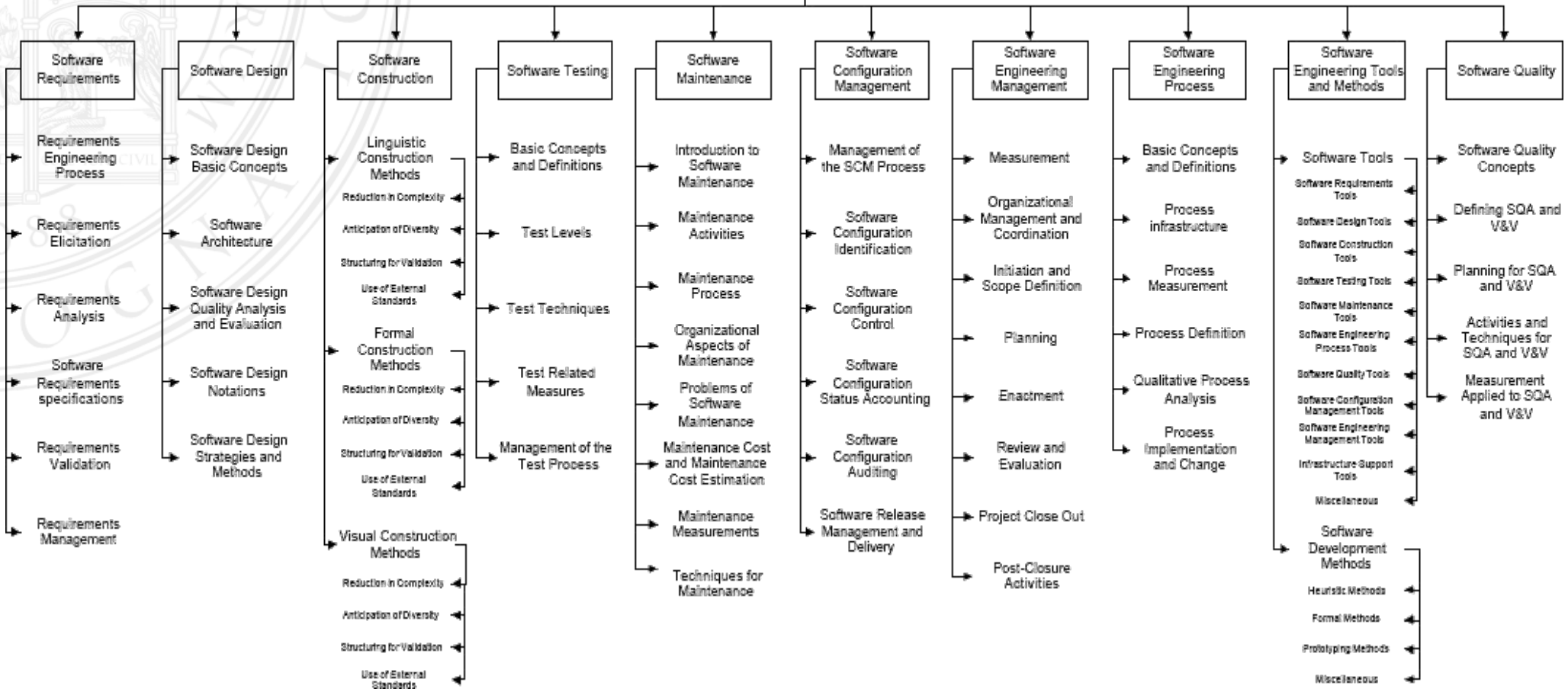
Software engineering is different in character from other engineering disciplines, due to both the intangible nature of software and to the discrete nature of software operation. It seeks to integrate the principles of mathematics and computer science with the engineering practices developed to produce tangible, physical artifacts.

Software Engineering

These definitions clearly state that software engineering is about creating **high-quality software** in a systematic, controlled, and **efficient** manner. Consequently, there are important emphases on analysis and evaluation, specification, design, and evolution of software. In addition, there are issues related to management and quality, to novelty and creativity, to standards, to individual skills, and to teamwork and professional practice that play a vital role in software engineering. [IEEE 04]

SWEBOK

Guide to the Software Engineering Body of Knowledge



Facing complexity

Key tools:

- Abstractions
- Models

Abstraction

- The process of formulating generalized ideas or concepts by extracting common qualities from specific examples

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- The process of formulating generalized ideas or concepts by extracting common qualities from specific examples
- ...the entire history of software engineering is one of rising levels of abstraction (for abstraction is the primary way we as humans deal with complexity) [G. Booch]

Model

- A representation of the system under analysis that answers as the system does for a given set of questions

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- All models are in simulacra, that is, simplified reflections of reality, but, despite their inherent falsity, they are nevertheless extremely useful

Model



Ceci n'est pas une pipe.