Professional Issues II
Unit 8: Software Engineering
Basic Understanding

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You will learn

- What Software Engineering is about
- Gain a first, naive picture of how it might look like
- Understand what software development models / software lifecle models are

Software Engineering (SE)

Definition

The IEEE Computer Society's Software Engineering Body of Knowledge defines "software engineering" as the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software, and the study of these approaches; that is, the application of engineering to software.

Tom Maibaum's view

Purpose of Software Engineering is to offer codified methods. These constrain the creativity of the practitioner so that what is built has some likelihood of working (being 'fit for purpose') and being safe. In other words, codified methods provide a clear route to guaranteed and repeatable success.

Tom Maibaum

Tom Maibaum is an Emeritus Professor of the Foundations of Software Engineering in the Department of Computing and Software, McMaster University, Canada. He now lives in The United Kingdom. Previously, he held similarly named Chairs at King's College London and Imperial College London. Throughout his career, his research has focused on the logical and categorical bases of software engineering and on the applications of these topics to software engineering methods. He has studied the philosophical and epistemological bases of engineering and, in particular, software engineering. Over the past 15 years he has worked with Mark Lawford and Alan Wassyng at McMaster University in the context of the McMaster Centre for Software Certification, developing new logical and epistemological foundations of safety reasoning.

Challange for Software Engineering: How to deliver (large) sofware projects

- on cost?
- on time?
- with quality?
  - safe
  - secure
  - functional for the end user
  - maintainable

Permance metrics

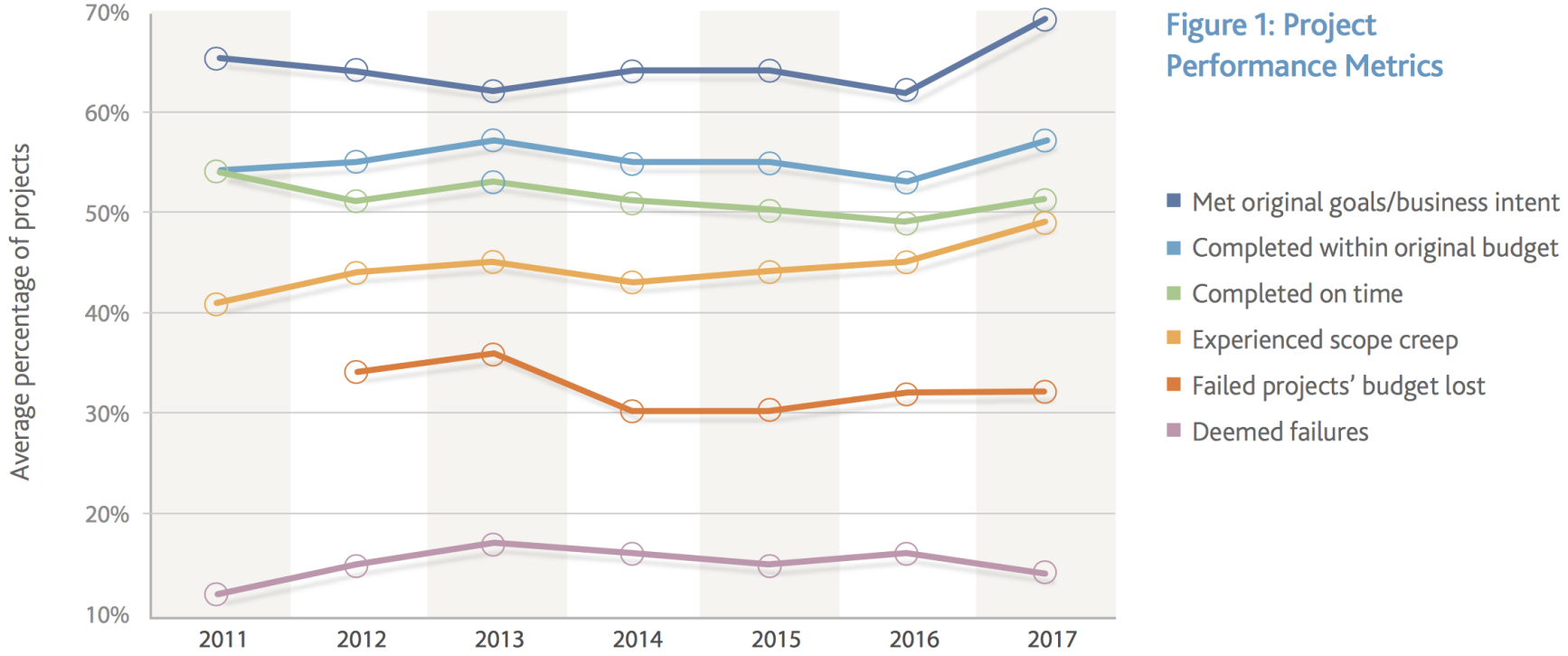

Figure 1: Project Performance Metrics

https://www.pmi.org/-/media/pmi/documents/public/pdf/learning/thought-leadership/pulse/pulse-of-the-profession-2017.pdf

Example: TollCollect – Tollbridge

Example: TollCollect – Project

What: Collect toll from Trucks (per km on motorway)

How: (roughly)

- Collect as data whan a truck passing under a special bridge;
- transform this data into toll;
- collect this toll fully automatically

When: System was opened two years behind schedule on January 1, 2005.

Example: TollCollect – Penalty

"Toll Collect has agreed to pay the German government 3.2 billion euros to settle a dispute over the late introduction of the system." (MAY 16, 2018)

That's Euro 4.8M per day.

See, e.g., https://en.wikipedia.org/wiki/Toll_Collect,

https://www.reuters.com/article/us-germany-transportation-toll-collect/

telekom-daimler-settle-truck-toll-dispute-with-german-government-idUSKCN1IH2MH

SE – Crossing point of various disciplines

- Psychology
- Management
- Economy
- Engineering
- . . .
- Computer Science

Building a house (naively)

1. Dig a hole.
2. Put in the foundation.
3. Build the walls.
4. Put on the roof.
5. Get windows and doors in.
6. Get water, gas, electricity in.
7. Get carpets and wallpapers in.

Observations

In building a house:

- Often clear order due to physical laws.

In building software (intangible):

- nearly no constraints

Software Development Model (SDM) / Software Life-cycle (SLC)

is a structure imposed on the development of a software product. . . . There are several models for such processes, each describing approaches to a variety of tasks or activities that take place during the process. [wikipedia]

SDM/SLC

addresses the following software project questions:

- What shall we do next?
- How long shall we continue to do it?

Berry Boehm in: A Spiral Model of Software Development and Enhancement, IEEE Computer, IEEE, 21(5):61-72, May 1988. http://csse.usc.edu/TECHRPTS/1988/usccse88-500/usccse88-500.pdf

What you have learned in this unit

Definitions

- Software Engineering
- Software Development Model (SDM) / Software Life-cycle (SLC)