Software Engineering

Summer 2017

A Software Crisis

Denver International Airport

- Approved for construction in 1989
- First major airport to be built in the United States in over 20 years.
- Three terminals + several runways
- Built on 53 square miles of land (Twice the size of Manhattan Island!)

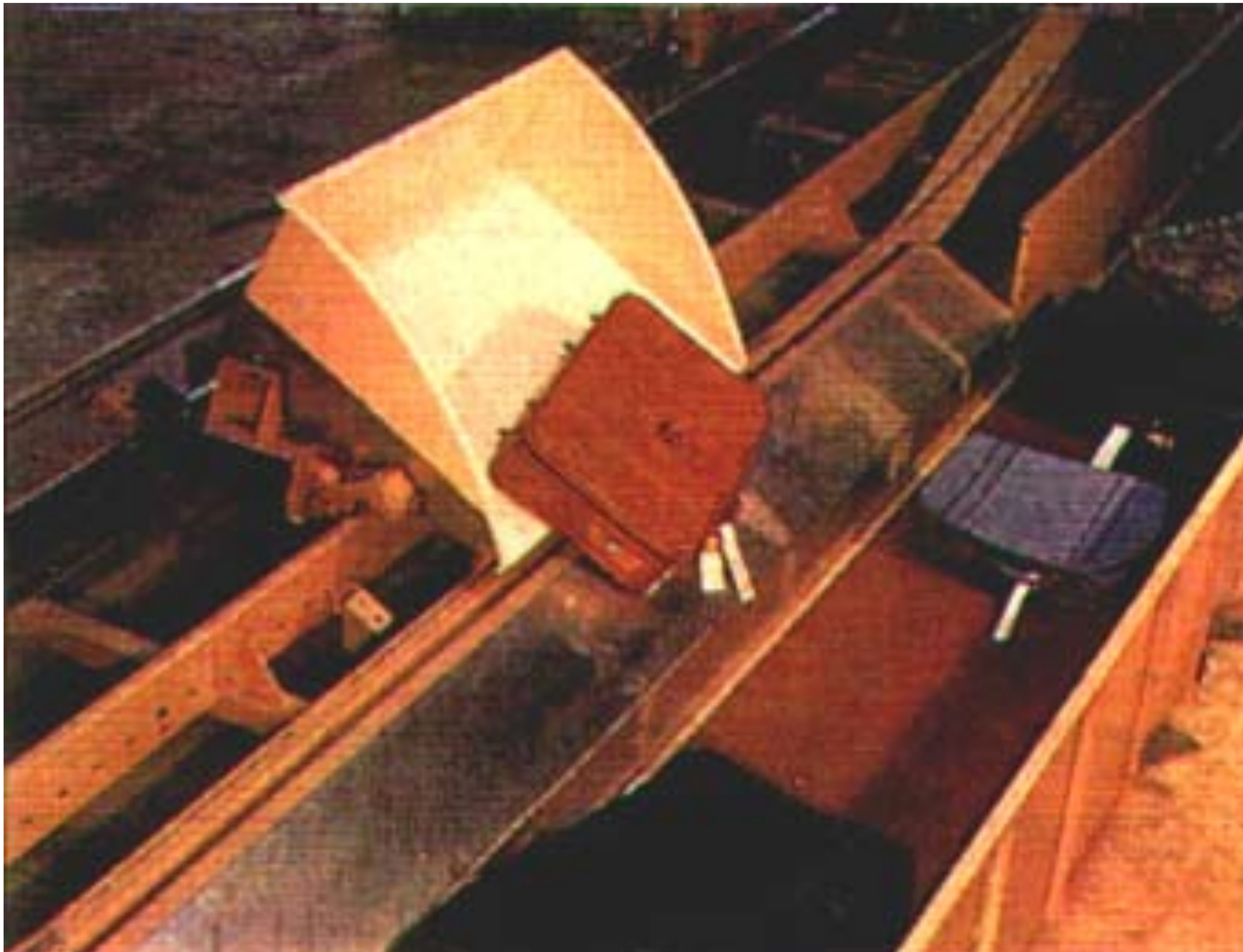
BAE Contract

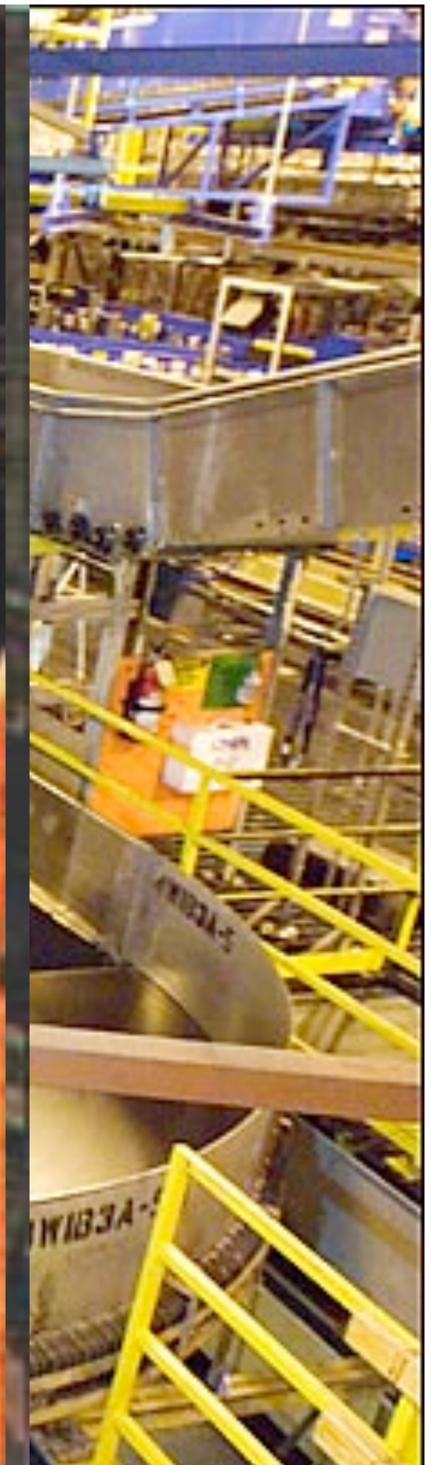
- Original assumption: Every company builds its own baggage transport system
- United (70% Denver traffic) was the only to begin planning; contract with BAE
- First fully automated baggage system
- Later, Denver airport extended contract to entire airport – three times original size

The Scope

- 20 miles of track
- 6 miles of conveyor belts
- 56 laser arrays that read bar coded tags
- 400 frequency readers
- 3,100 standard size baggage ‘Telecars’
- 450 6.5 ft by 4 ft oversize cars
- 55 separate computers

The System





The Timeframe

- BAE started work 17 months before scheduled opening October 31, 2003
- In Munich (similar system), engineers had spent *two years* just *testing* the system (with 24/7 operation six months before the airport opened)

More Risks

- Most of buildings were already done, so BAE had to accommodate system (sharp turns, narrow corridors…)
- BAE paid little attention to German sister project and devised system from scratch
- Little communication within BAE

Final Blunder

- The decision to broadcast the preliminary test of the "revolutionary" new baggage system on national television

A Disaster

- Carts jammed together
- Damaged luggage everywhere, some bags literally split in half
- Tattered remains of clothing strewn about caused subsequent carts to derail
- Half the luggage that survived the ordeal ended up at the wrong terminal

More Issues

- Carts got stuck in narrow corridors
- Wind blew light baggage from carts
- 5% of the labels were read correctly
- Normal network load was 95%

Complexity: Empty Carts

- Empty carts need to go where they are needed
- Cart has to be at its “cannon” at the right moment
- Lanes have limited length ➔ traffic jam
- All controlled by single central system

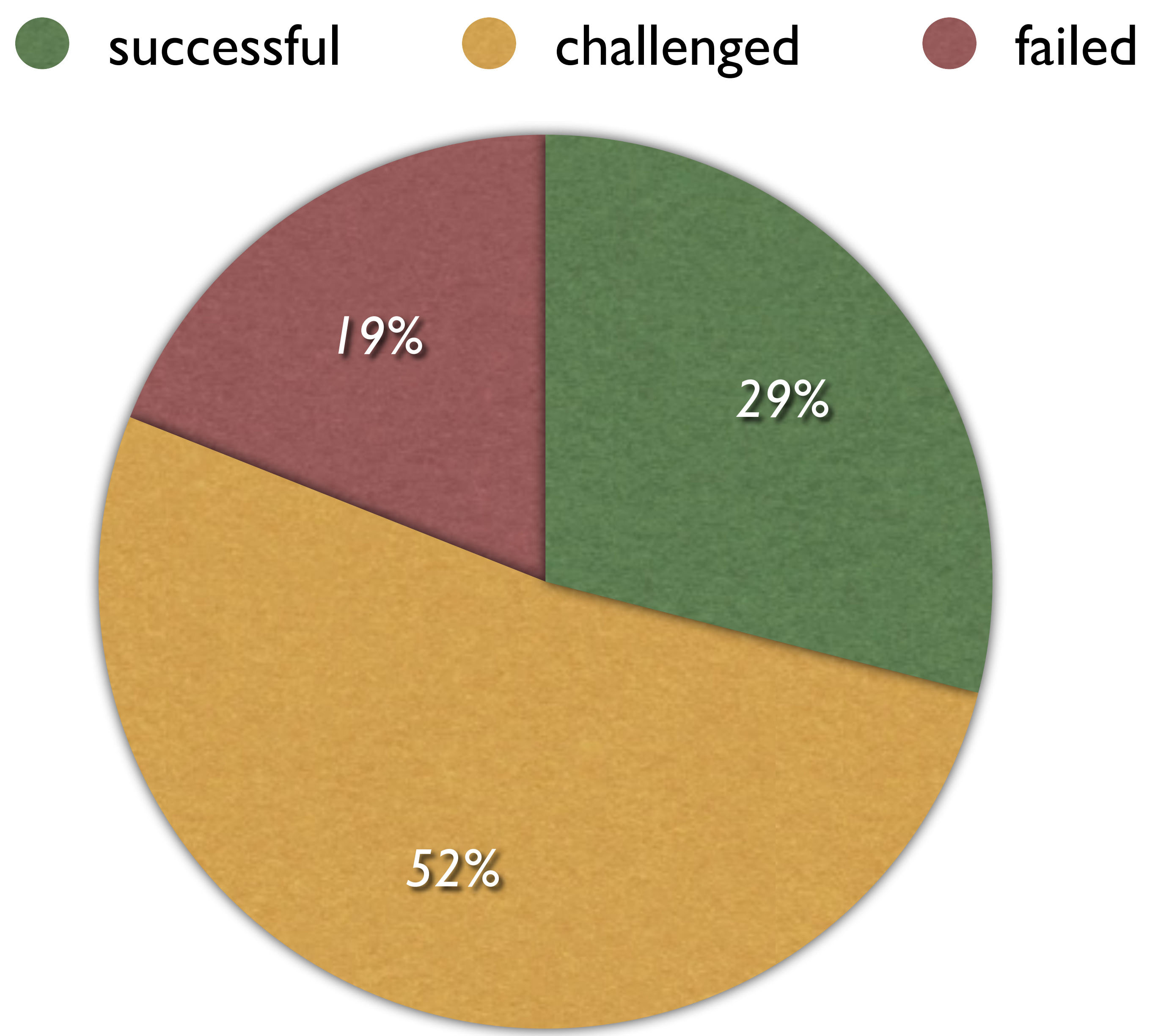
Consequences

- Airport opening delayed four times – overall, sixteen months late
- New engineering firm
  - split system in three (one per terminal)
  - implemented manual backup system
- BAE got bankrupt
- Overall damage: 1.3 bln USD

Glass' Law

Requirement deficiencies
are the prime source
of project failures.

Project Success



Source: Standish Group CHAOS Report, 2015
based on 50,000 software projects around the world

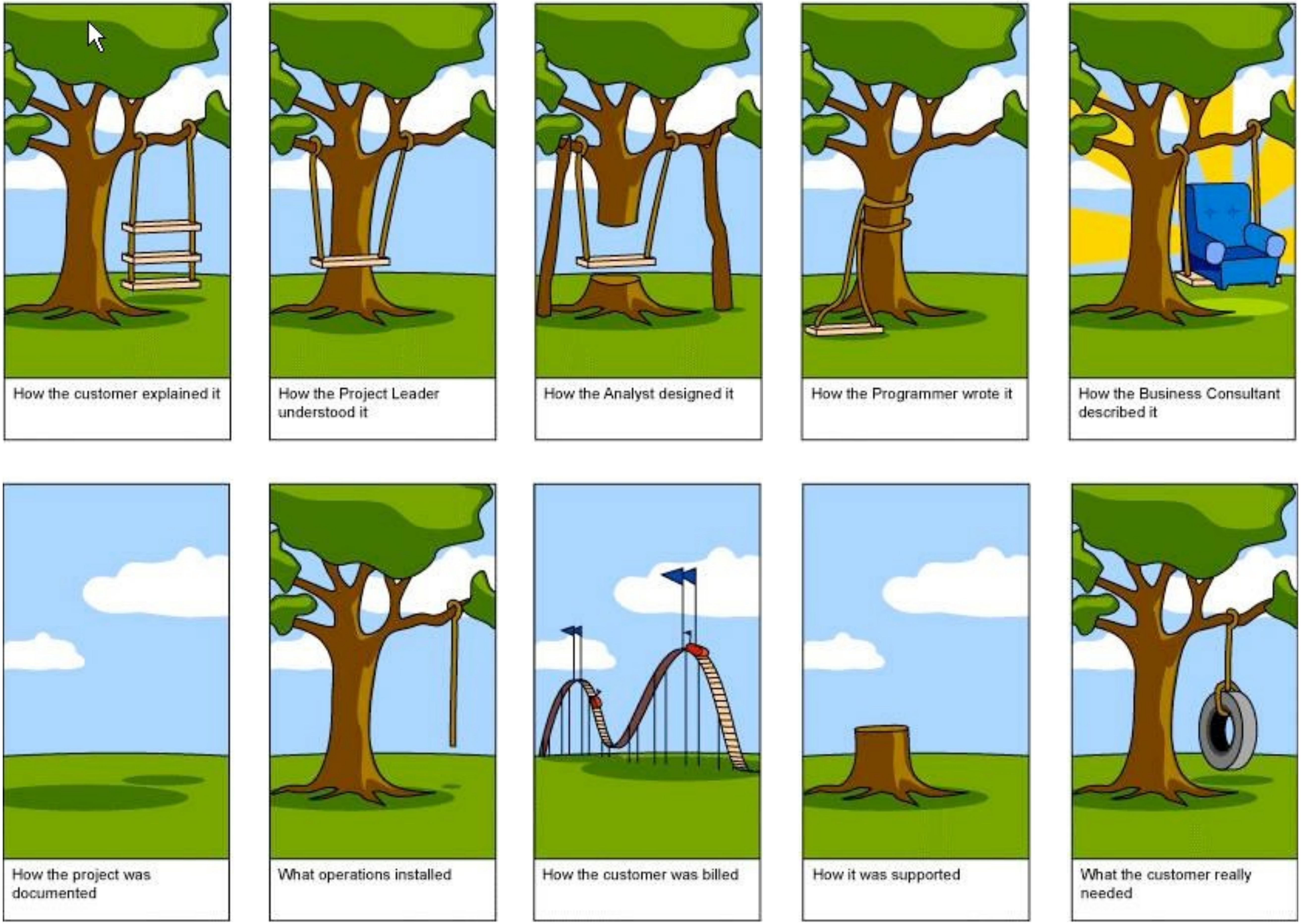
Project Success by Size

	SUCCESSFUL	CHALLENGED	FAILED
Grand	2%	7%	17%
Large	6%	17%	24%
Medium	9%	26%	31%
Moderate	21%	32%	17%
Small	62%	16%	11%
TOTAL	100%	100%	100%

Source: Standish Group CHAOS Report, 2015, based on 50,000 software projects around the world

More Examples

- Mariner 1 (1962)
  Missing overbar crashes Venus probe
- Eole 1 (1971)
  72 weather balloons get wrong cmd
- Nimbus 7 (1978)
  Satellite misses ozone hole for 6 yrs
- HMS Sheffield (1982)
  Exocet rocket id'ed as "friend"
- Stanislaw Petrow (1983)
  Russia detects global nuclear attack
- Therac 25 (1985)
  Radiation overdose kills six
- Stock crash (1987)
  Dow Jones loses 22% in one day
- Vincennes (1988)
  Passenger jet mistaken to be F-14
- Patriot (1991)
  Misses to shoot down Iraqi Scud
- Climate Orbiter (1999)
  Confuses metrics and imperial
- US Blackout (2003)
  50 mln affected for 5 days
- Apple SSL bug (2012)
  18 months w/o SSL authentication
- Heartbleed bug (2014)
  Silent data leak in major SSL code
- Stagefright MMS (2015)
  All Android <5.1 vulnerable


How the customer explained it
How the Project Leader understood it
How the Analyst designed it
How the Programmer wrote it
How the Business Consultant described it
How the project was documented
What operations installed
How the customer was billed
How it was supported
What the customer really needed

Challenges

- Why does it take so long to get software finished?
- Why are the development costs so high?
- Why can't we find all errors?
- Why do we spend so much time and effort maintaining existing programs?
- Why is it difficult to measure progress?

Topics

- Requirements Engineering
- Software Specification
- Software Design and Architecture
- Software Quality Assurance and Testing
- Software Maintenance and Evolution
- Software Project Management

Your Lecturers

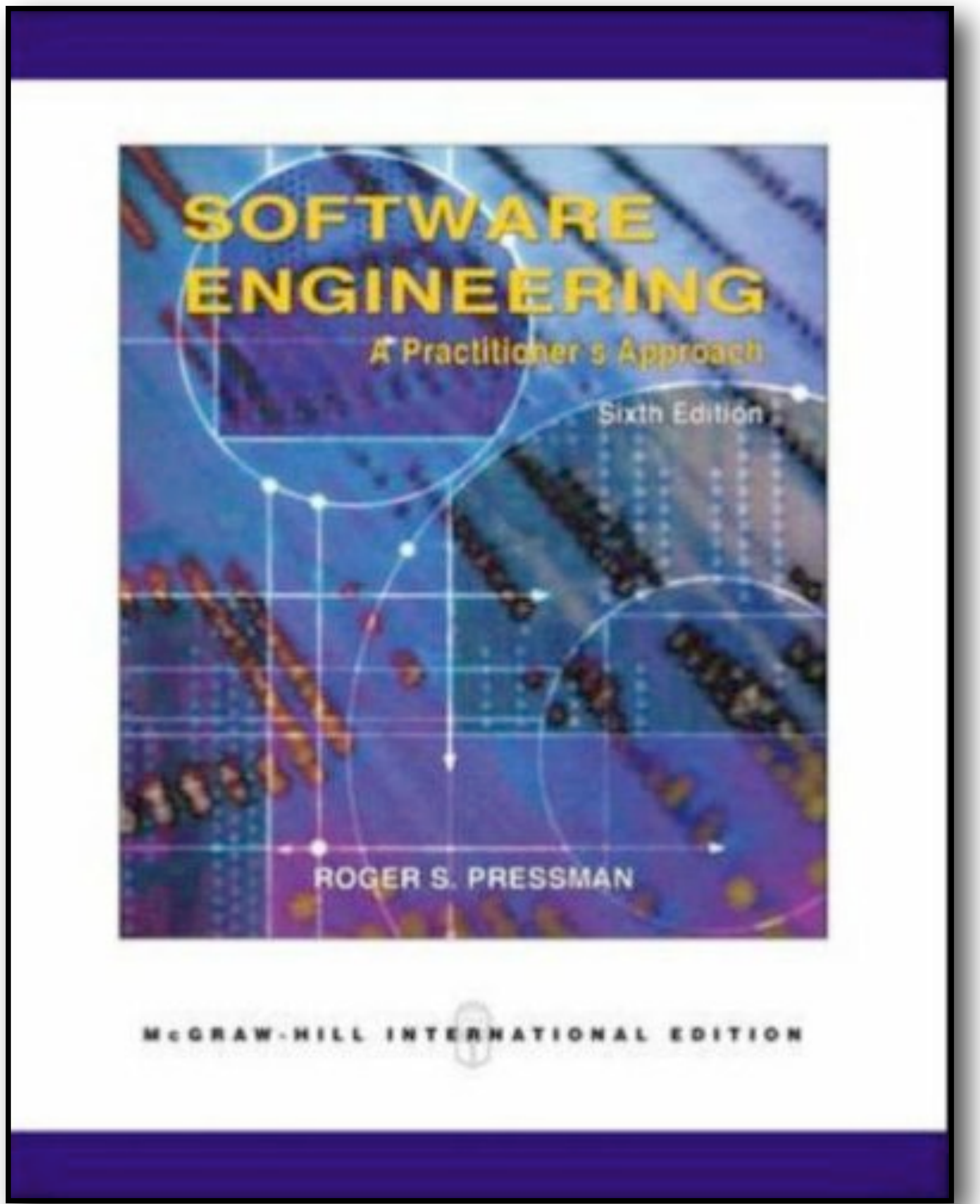
- Andreas Zeller
- Dr. Alessio Gambi
- Dr. María Gómez Lacruz
- Lecture **every Tue+Thu 8:30** here in E2.2
- Start with 2x/week, later 0x/week

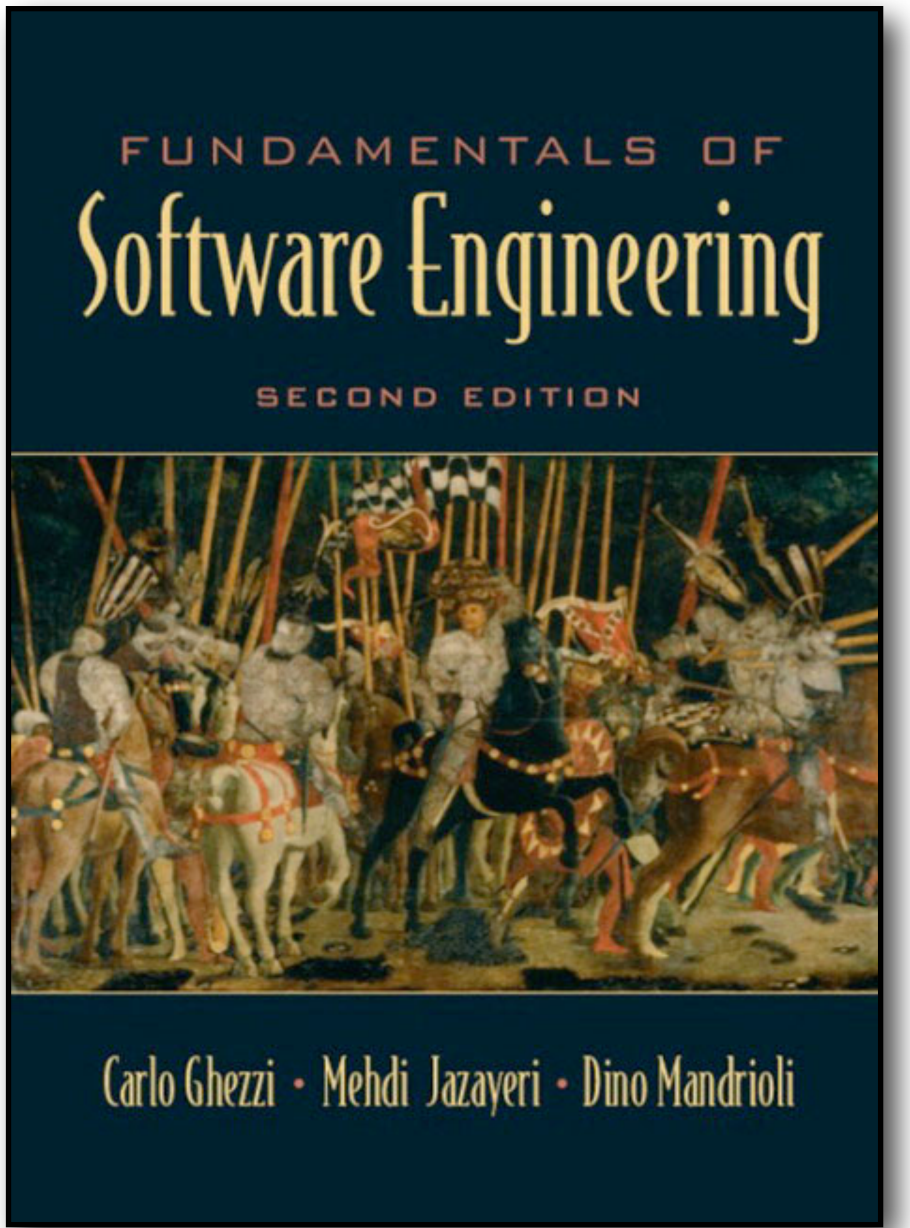
Your Tutors

- Ezekiel Soremekun Olamide (course manager)

- Abbas Rezaey
- Adekunle Onaopepo
- Aditya Gulati
- Ahmad Taie
- Alyona Morozova
- Chirag Shah
- Firuza Sharifullaeva
- Jyoti Prakash
- Muhammad Muaz
- Petr Tikhonov
- Timo Gühring
- Tri Huynh

Books


SOFTWARE
ENGINEERING
A Practitioner's Approach
Sixth Edition
ROGER S. PRESSMAN
McGRAW-HILL INTERNATIONAL EDITION


FUNDAMENTALS OF
Software Engineering
SECOND EDITION
Carlo Ghezzi · Mehdi Jazayeri · Dino Mandrioli

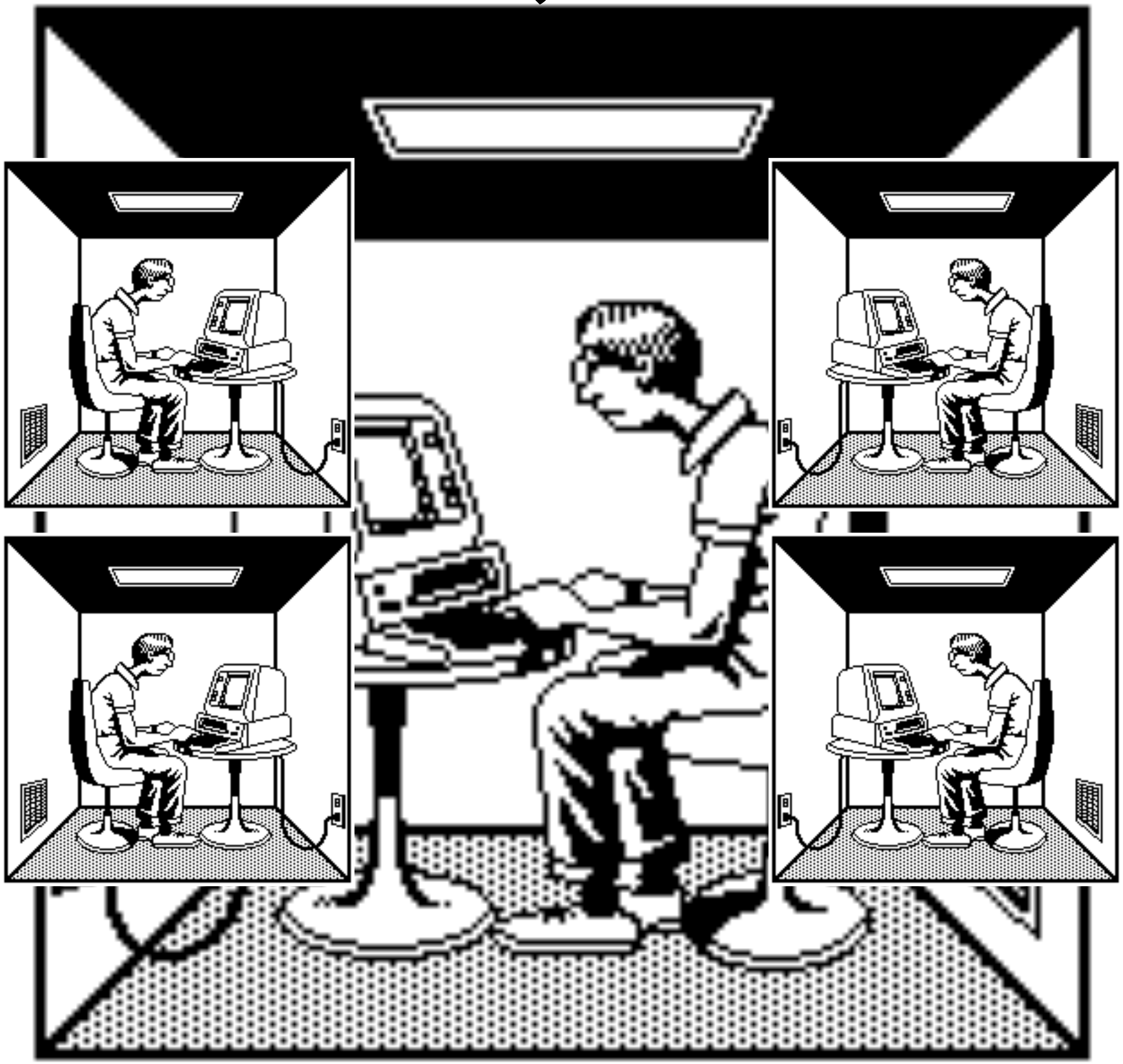
Exam

(+ extra exam beginning of September)

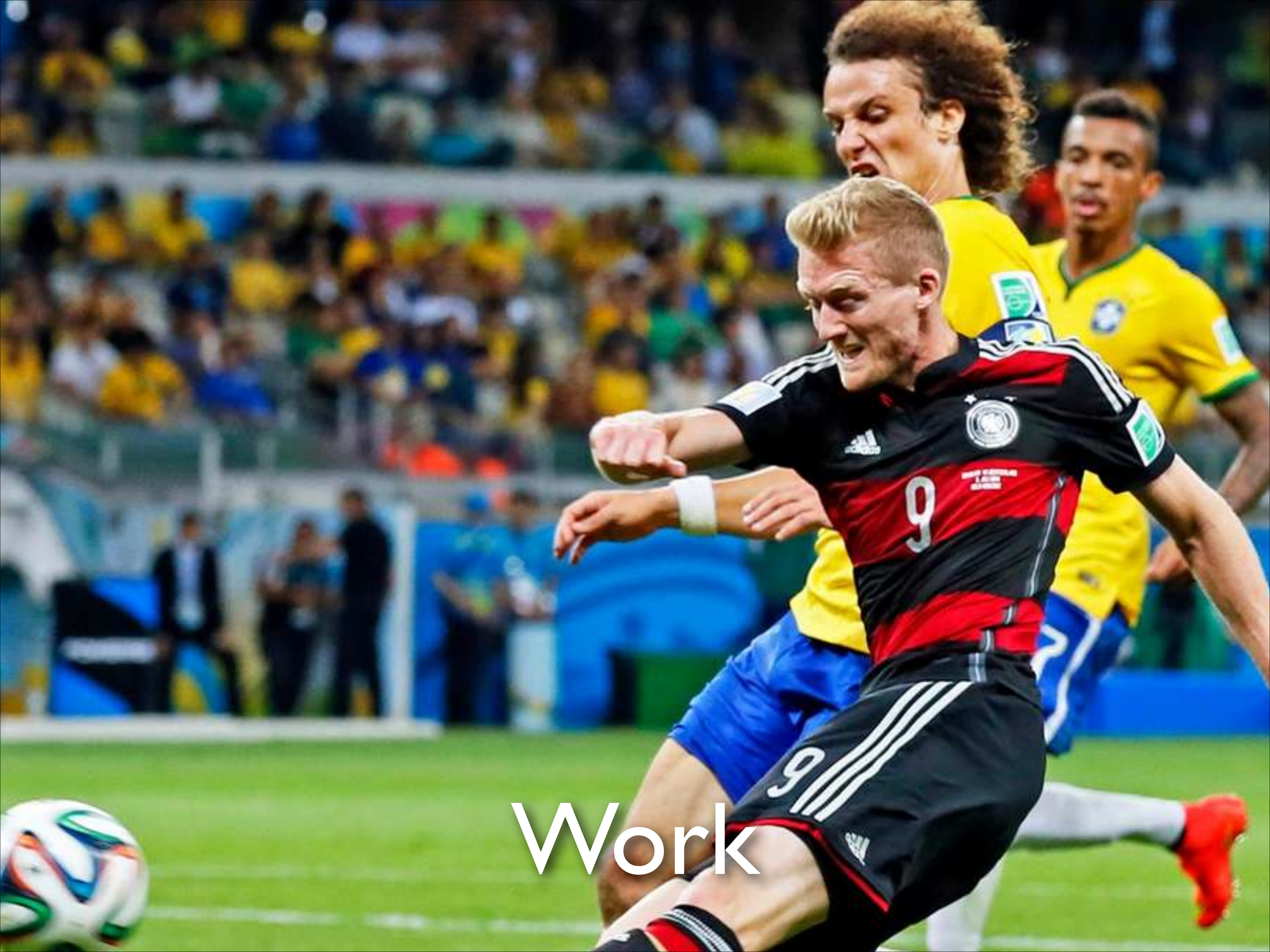
Projects

- SW Engineering is best learned by *doing*
  (There is no "theory of software engineering")
- Therefore, *projects* make up 2/3 of course

Projects



Team


Work

Tutor

Supervision


Honor

Client

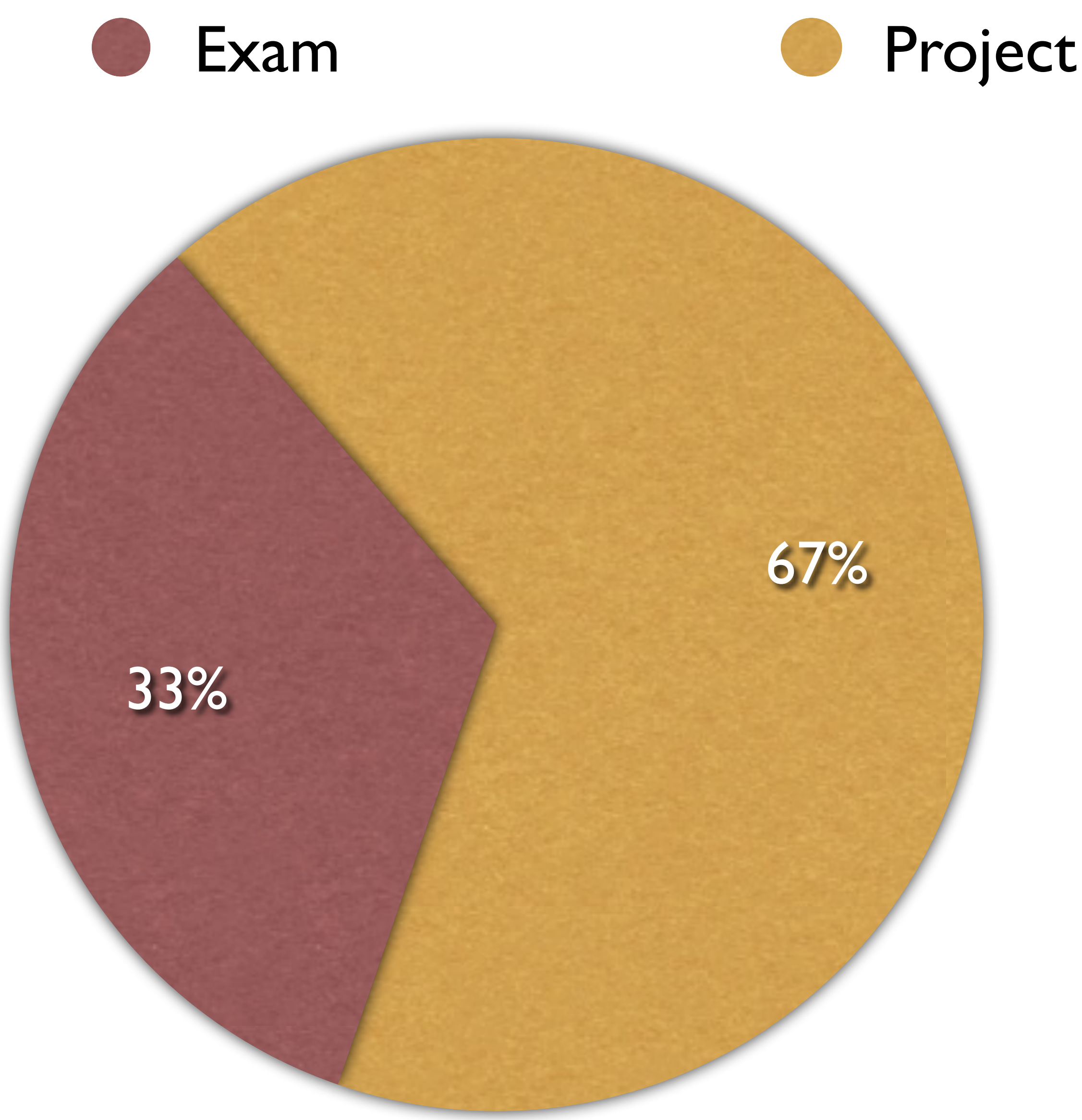
Project Details

- Non-trivial piece of software
- Suggested by *client* (mostly CS members)
- Client is *busy* (spends max 15 hrs total)
- Client is *vague* (on purpose)

Deliverables

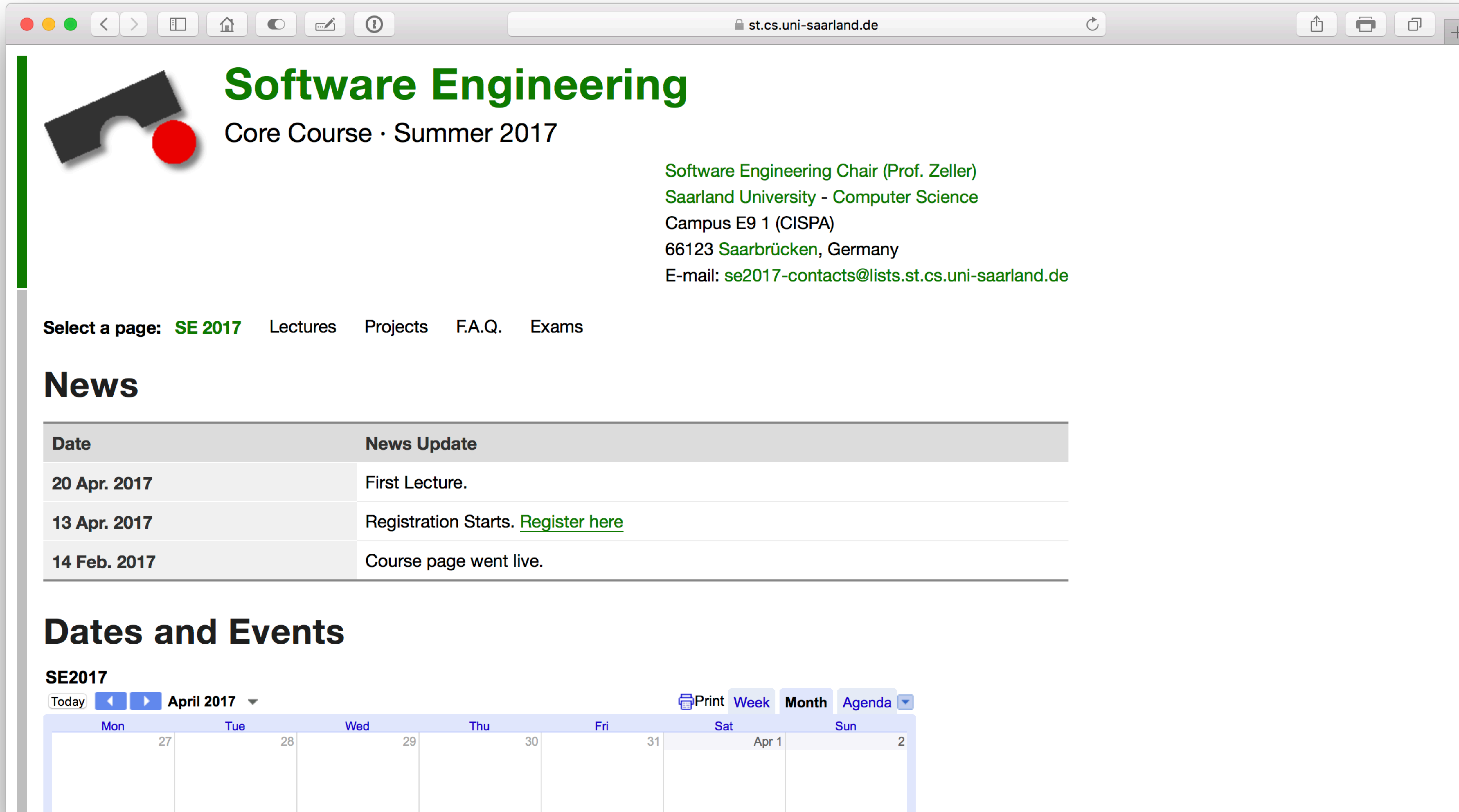
- Full set of *requirements*
- User interface design
- Architecture design
- Project plan
- Prototype

Grading



- Need to pass exam **and** project to pass
- Project grades based on **group performance** (with bonus for individuals)

Web Site


st.cs.uni-saarland.de
Software Engineering
Core Course · Summer 2017
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Select a page: SE 2017 Lectures Projects F.A.Q. Exams
News
Date
News Update
20 Apr. 2017
First Lecture.
13 Apr. 2017
Registration Starts. Register here
14 Feb. 2017
Course page went live.
Dates and Events
SE2017
Today
April 2017
Print
Week
Month
Agenda
Mon
Tue
Wed
Thu
Fri
Sat
Sun
27
28
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30
31
Apr 1
2

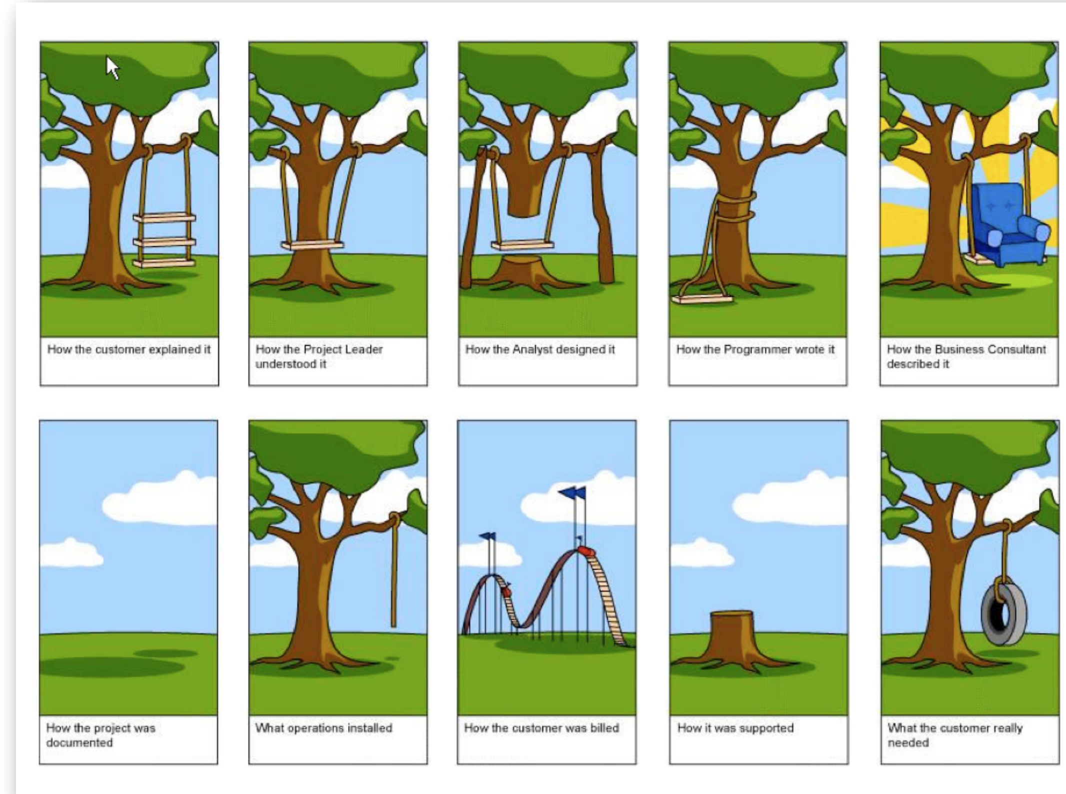
Sign up!

News Update

First Lecture.

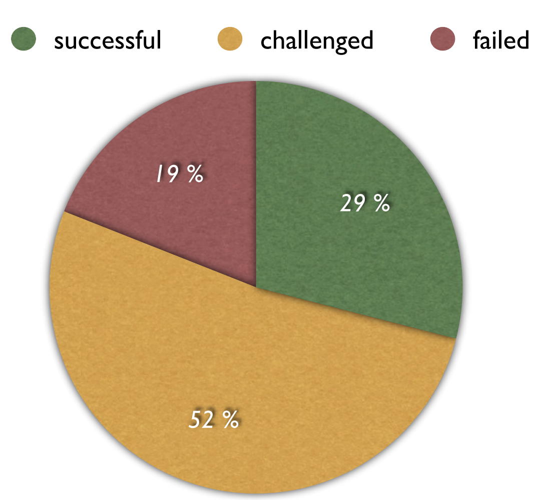
Registration Starts. Register here

Course page went live.



Summary

Project Success



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