



Software Engineering

Summer 2009

1

Everything on these slides can also be found on the Web site:

<http://www.st.cs.uni-sb.de/edu/se/2009/>

A Software Crisis



2

Denver International Airport (DIA)

Construction started in 1989 • 53 sq miles
• Planned: 1.7 bio USD costs, opening 1993

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!)

3

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

4

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

5

The System



6

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

10

Final Blunder

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

11

While all of the previous blunders contributed to the failure of the system, the worst mistake was still yet to come. It was a decision so terrible, so foolish, so absolutely



12

What camera crews depicted was truly a disaster; carts jammed together, damaged luggage everywhere, some bags literally split in half, and the tattered remains of clothing strewn

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

13

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%

14

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

15

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

16

Glass' Law

Requirement deficiencies are the prime source of project failures.

17

This and other laws are found in Endres/Rombach: Handbook of Software and Systems Engineering. Evidence: Denver airport case study and two more

Chaos Report

- 31% of projects were *aborted* prior to completion
- in small (large) development companies, *only 16% (9%) of all projects were completed within projected budget and time limits*

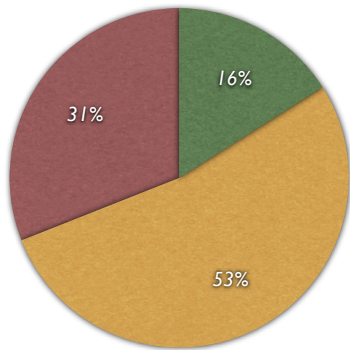
Survey by the Standish Group, 1994 – 350 companies with >8000 software projects

18

<http://www.standishgroup.com>

Project Success

● successful ● operational ● cancelled



Survey by PC week, 1995: 365 information systems professionals on success of software development projects

16% of all projects
successful
53% operational, but less
than successful
31% cancelled

19

More Examples

Toll Collect
(2003)

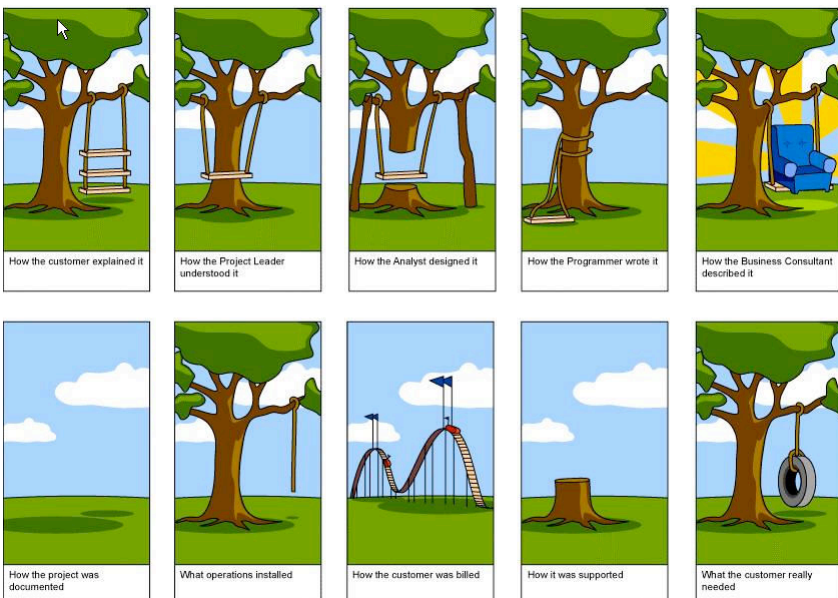
Airbus A 380
(2006)

Airbags (1999)

AT&T outage
(1990)

Airbags: RISKS 20.28,
March 29, 1999: a baby
sitting in
a rear facing car seat
mounted to the front seat
in a Volkswagen Golf was
killed by the impact of the
deploying air bag in an
oncoming traffic
collision. The car owners
and parents of the killed
baby had previously had

20



21

Your Tutors

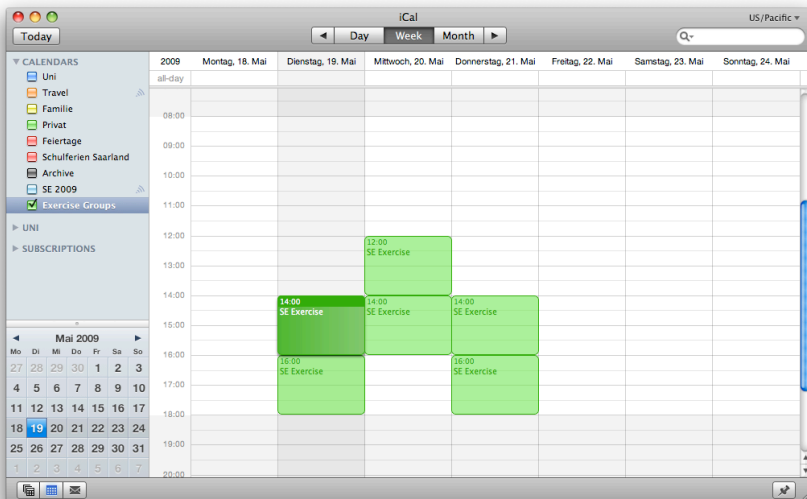
- Kim Herzig (coordinator)
- Yulya Patenko
- David Nemer

25



26

Exercise Dates



27

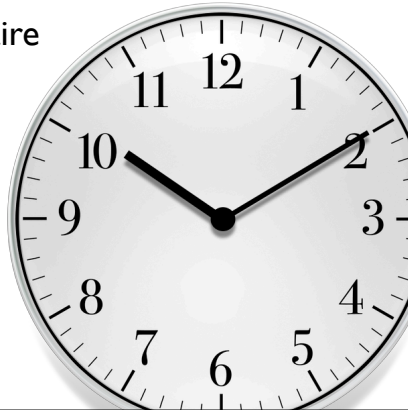
Exercise Sheets

- Every Thursday morning
- To be completed until next Thursday
- Discussed in exercise groups

28

Mini Tests

- Every Thursday morning at 08:30
- 10-minute questionnaire about last week's exercise sheet
- Be there on time!



29

Your Grades

- Log on to the Web site to see your grades
- You get a password by the end of this week

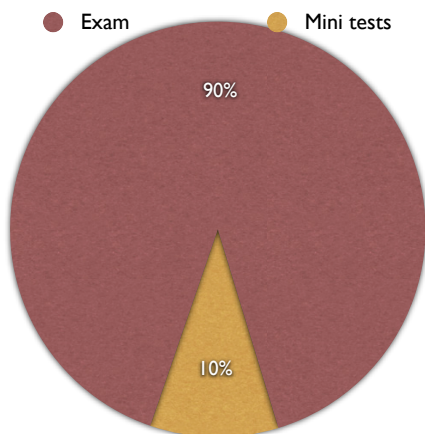
30

Exams

- Final Exam end of term (last week of July)
- Extra Exam beginning of term (October)
- Requirement: 50% of mini tests grades

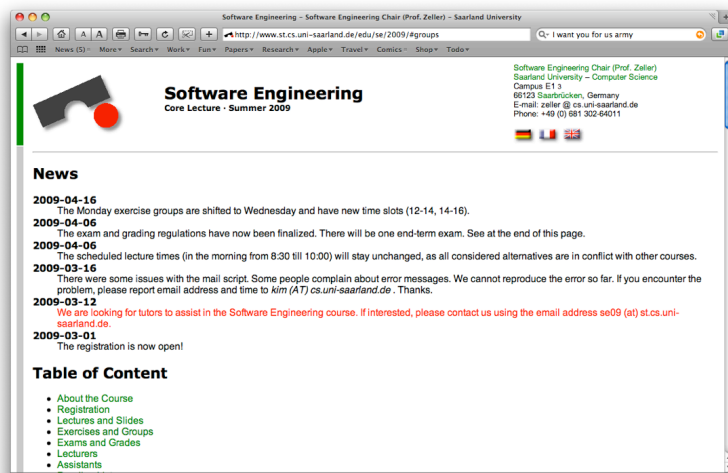
34

Grading



35

Web Site



36
