The software development process

A personal view

Robert Brady

Summary

Why bother?
Early (procedural) approach
Seminal research on complexity (IBM 1984)
The first revolution – IBM vs Microsoft
Sophisticated tools (objects etc.)
Agile and SCRUM (last 5 years)
Test-oriented development?

Why bother?

- "Recruit great developers"
  - They are 10-50 times more productive than average developers
  - who are 10-50 times more productive than poor developers
- "The process is secondary"

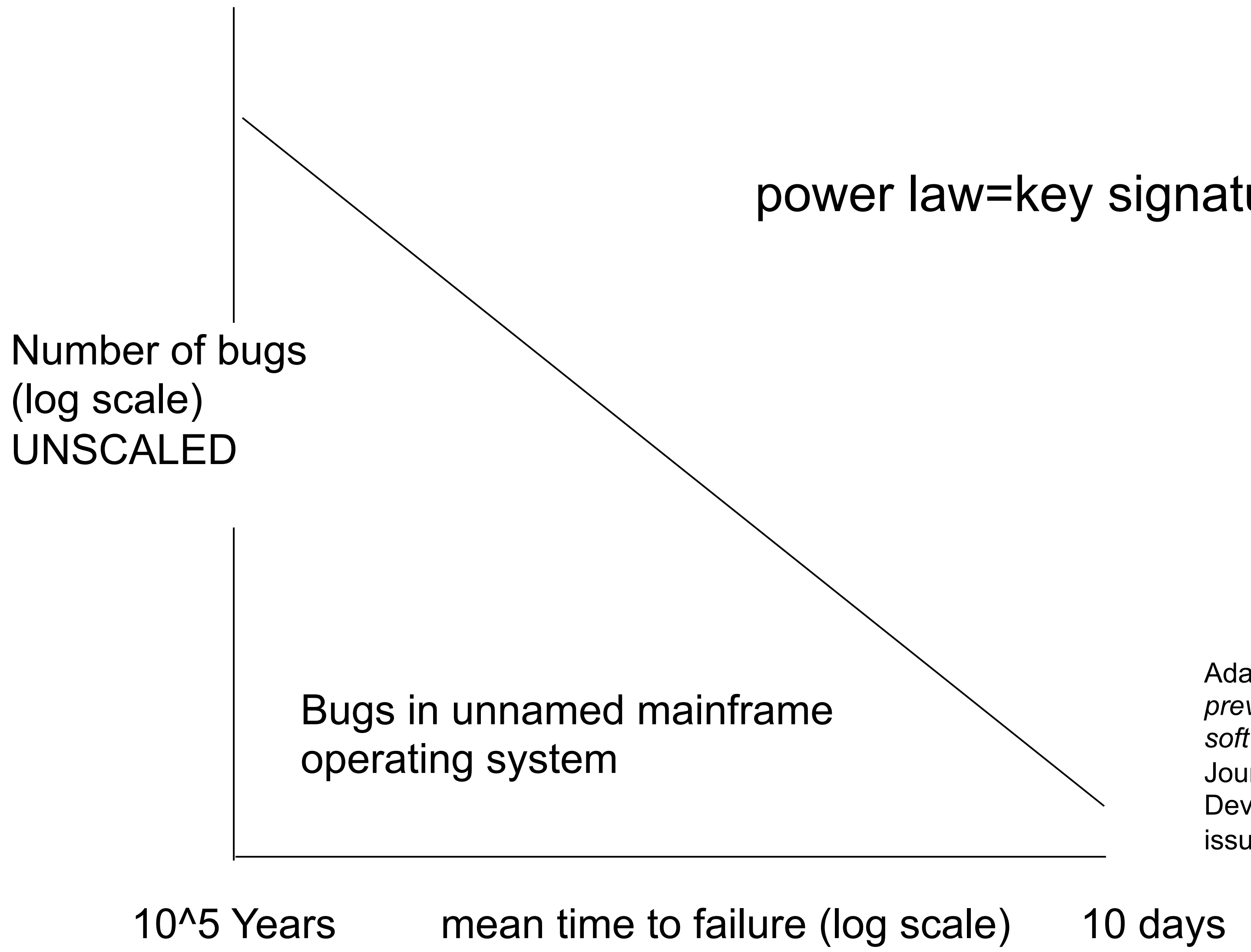
First revolution - IBM vs Microsoft

- According to “Big Blues: the Unmaking of IBM”:-
  - In the late 1980’s, IBM lost $70 billion of stock value
  - and gave an entire market away to a small company
  - Mainly because it couldn’t write software effectively.
- But IBM “did it right”. It followed all the standard rules taught in computer science courses at the time:
  - Get the design right before you write the code
  - Write complete documentation
  - Get it right first time
  - Use formal methods, design walk-throughs etc. to satisfy yourself that the code is bug-free, before release
  - Regard other methods (eg Microsoft’s) as “hacking”
- So what went wrong?

Size is important

0.1-1kb	Typical punch-card program The IBM development method was probably developed for this type of program
2kb-10kb	Typical software module/class Typical computer science project(?)
16kb	Operating system of Sinclair Spectrum
200kb	Our first software product – 1986
18 Mb	Human Genome – active code (30k genes * protein size 800) Number varies from year to year
20Mb	Our current software product (~20b per line)
750Mb	Human genome - including rubbish code (3 x 109 base-pairs)
4Gb	Windows Vista and associated products
218Gb	Storage on my laptop

IBM: seminal measurements 1984



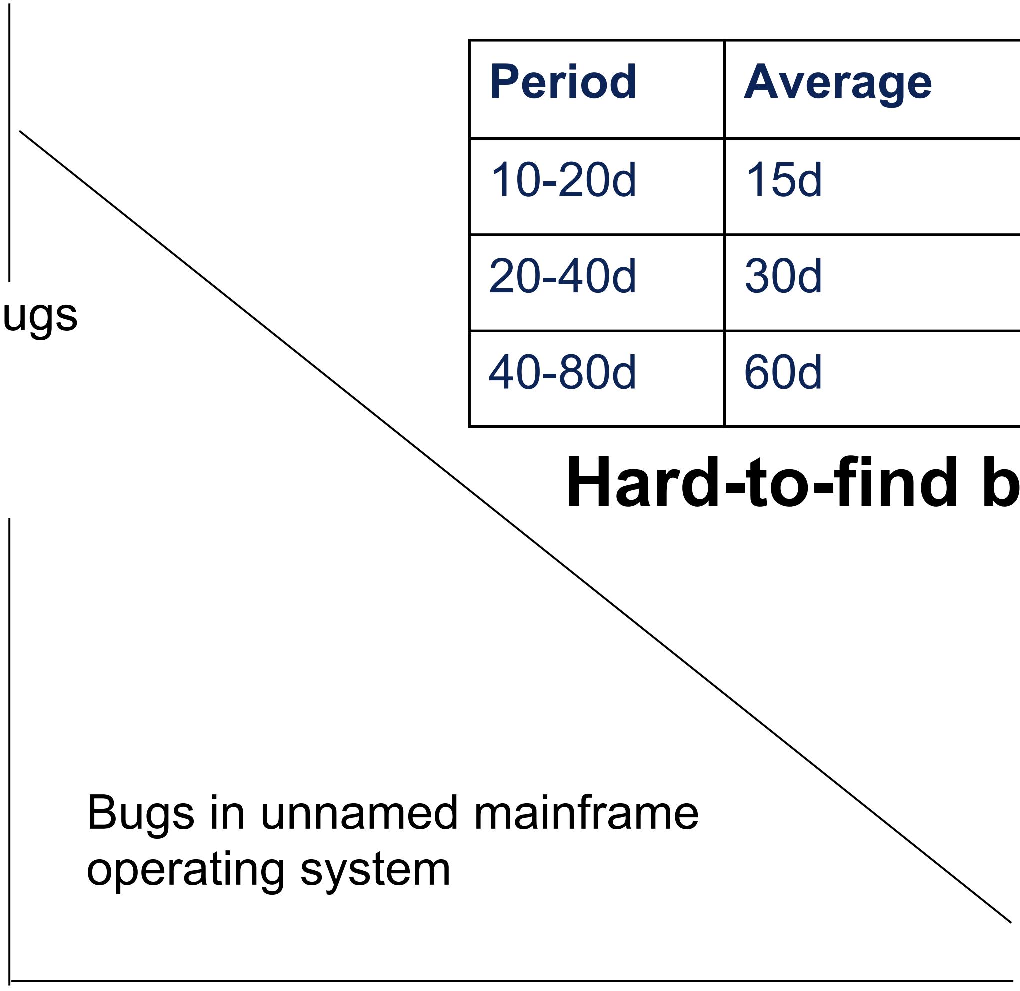
power law=key signature of complexity

Adams E. N., *Optimising preventive maintenance of software products*, IBM Journal of Research & Development, Vol. 28, issue 1 pp 2–14 (1984)

IBM: seminal measurements 1984

Period	Average	bugs	MTTF
10-20d	15d	1	15d
20-40d	30d	2	15d
40-80d	60d	4	15d

Hard-to-find bugs dominate



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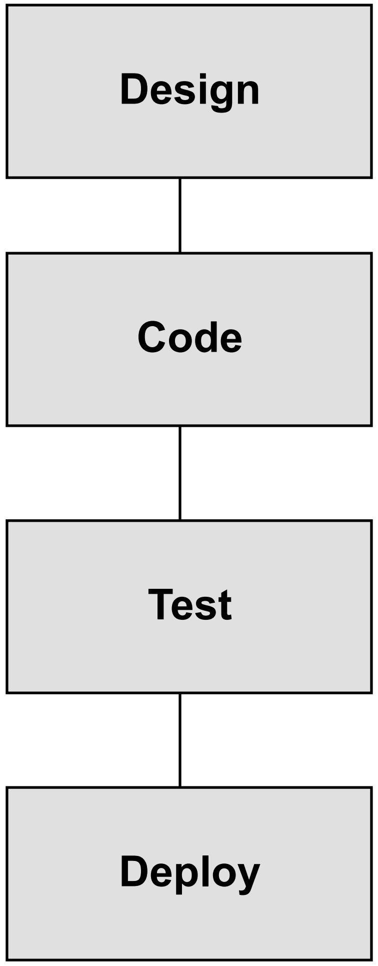
Organising the code

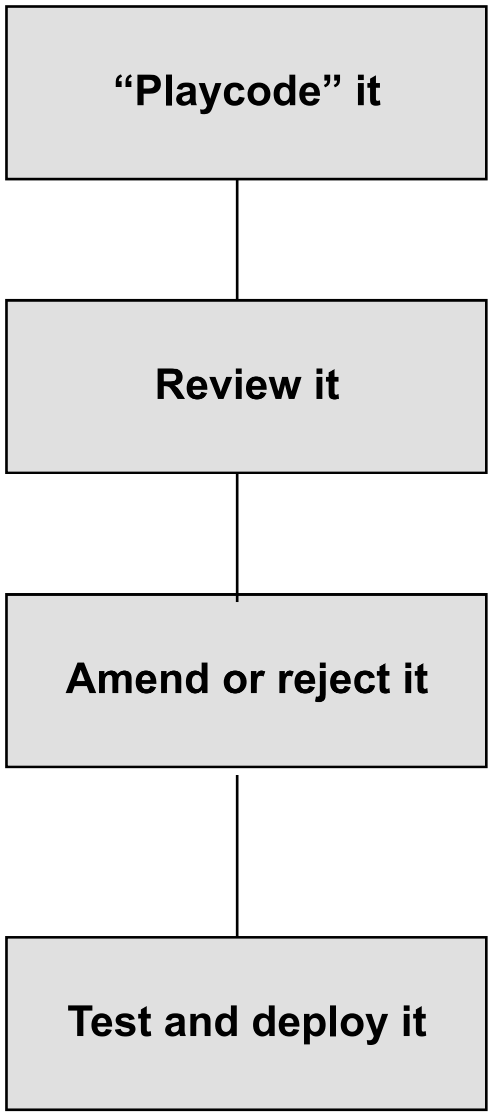
Waterfall model



Mainstay of development process
Good for small modules or sub-units, particularly if you can have simple and well-specified interface.
Be careful
- Different people for each stage = lost information = failure
- Microsoft at one stage: "We don't have programmers, we have developers"

Ideal process
- Sit with a user
- Agree small issues/problems
- Fix some yourself (nobody else)

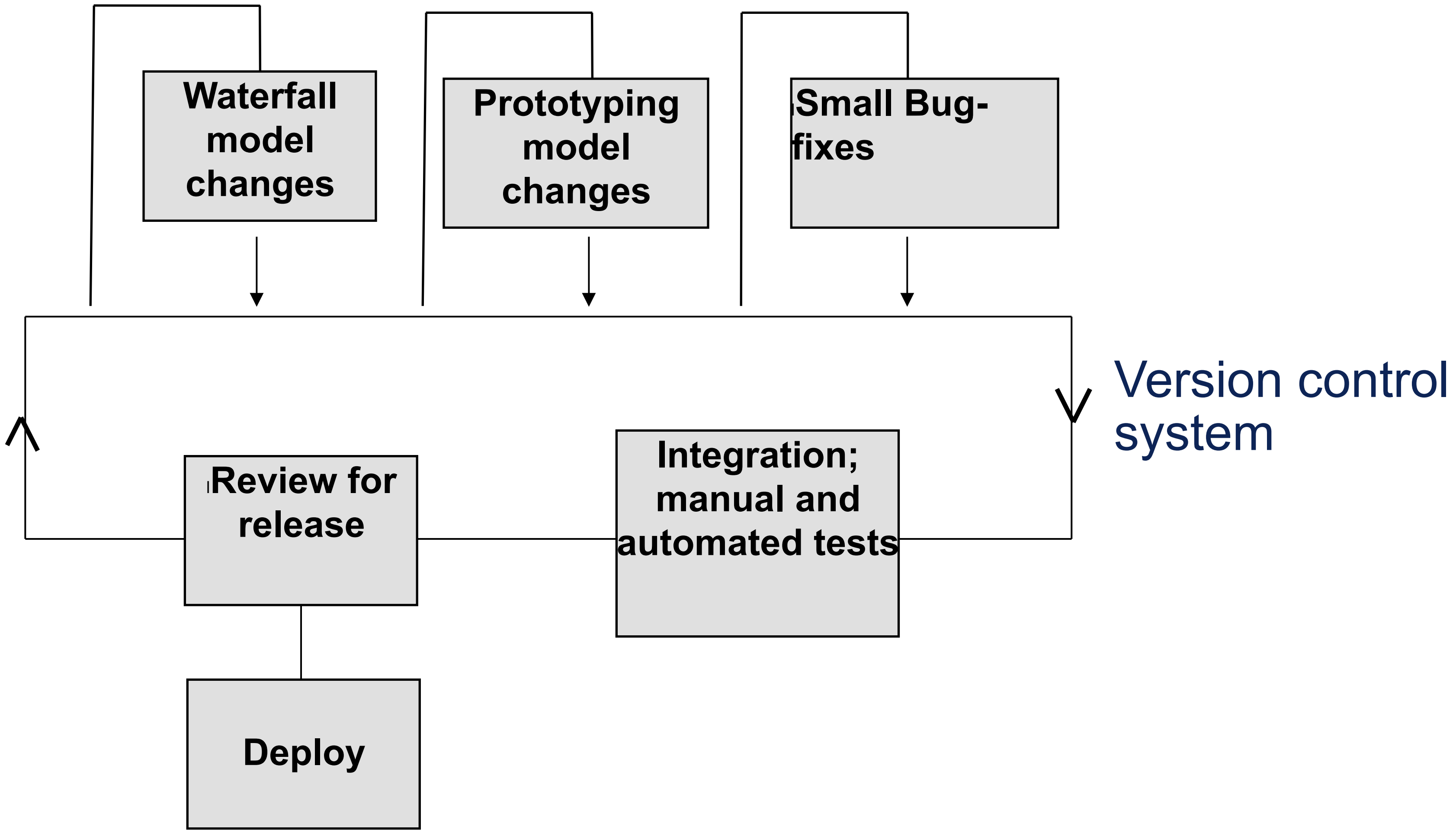
Prototyping



Good where there are significant project risks or unknowns
e.g. external software, new techniques or methods, or can't decide between alternatives

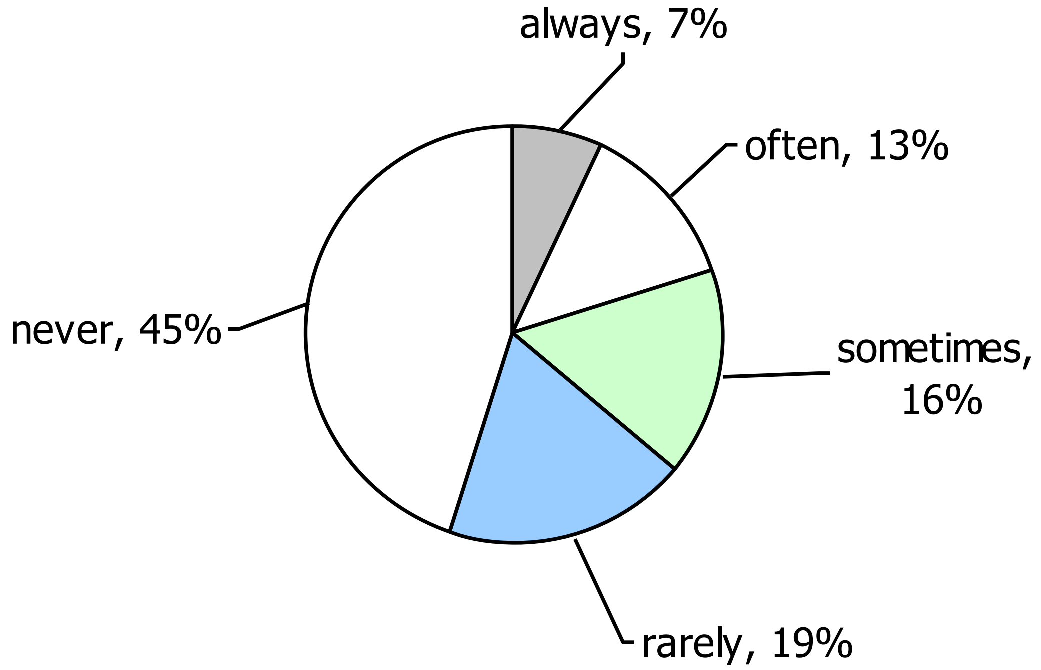
Not very predictable
a big problem in contracted developments

Evolutionary model



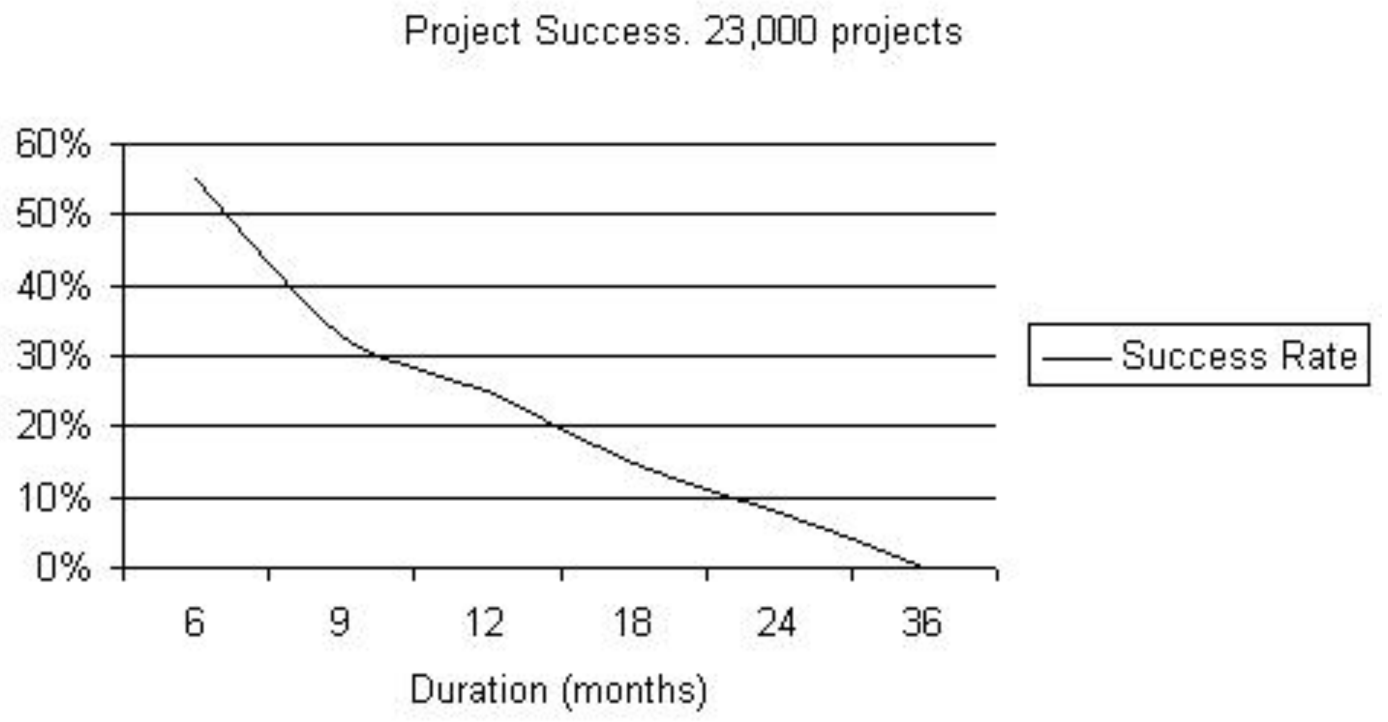
Organising the project

Problem with waterfall projects: 1. Unused features

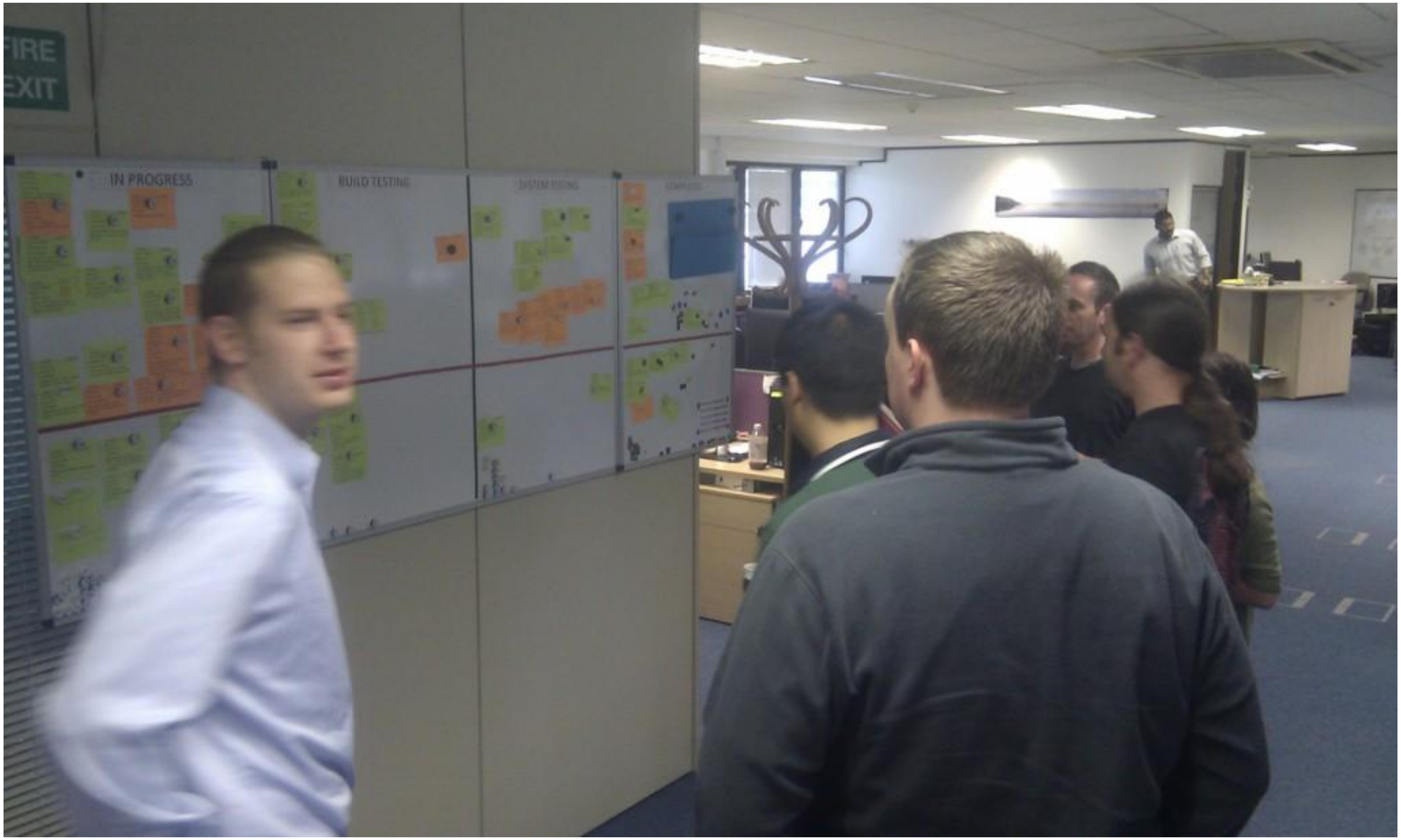


Actual use of requested features [Johnson02]

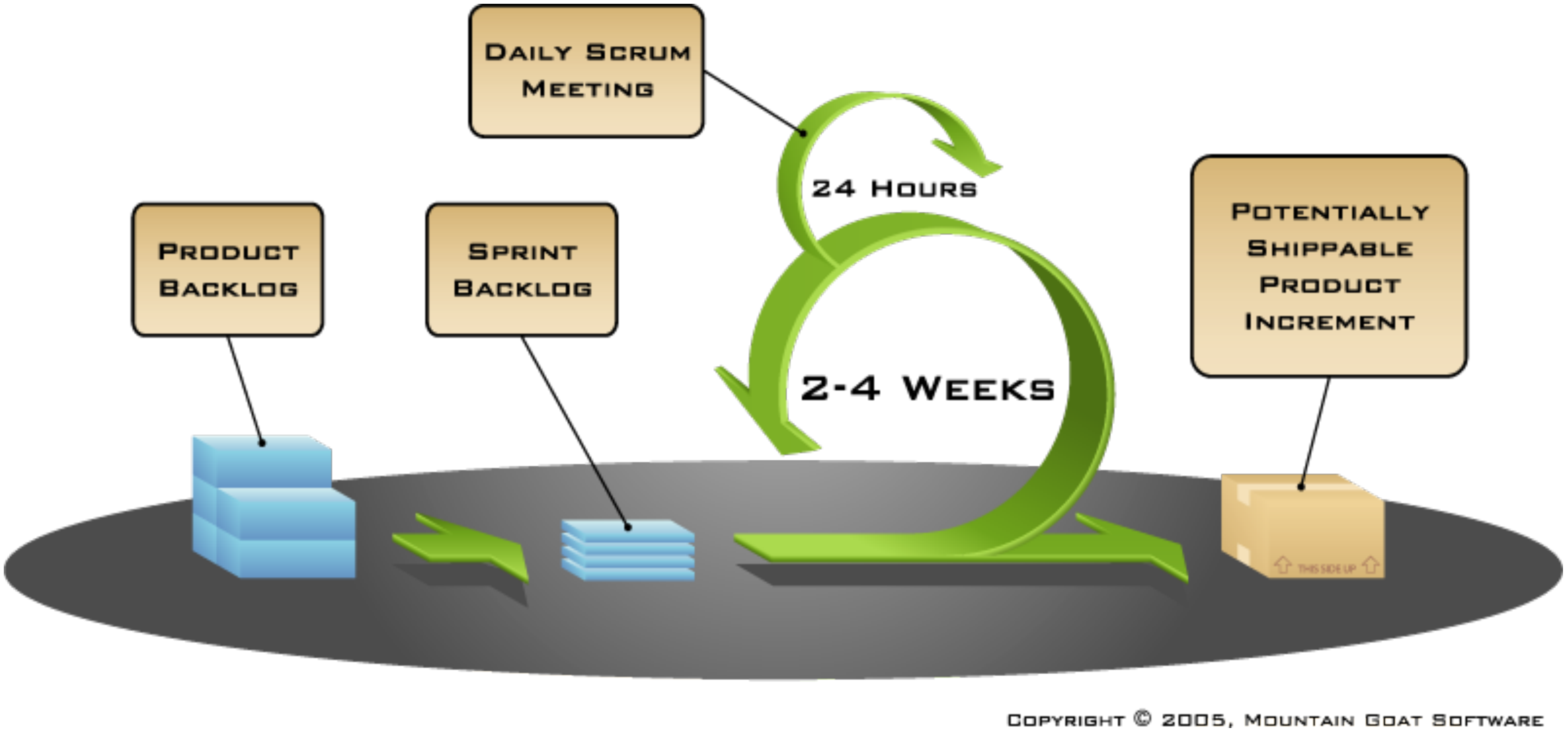
Problem with waterfall projects: 2. Project length/success profile



Project length vs. success [Johnson98]


FIRE
EXIT
IN PROGRESS
BUILD TESTING
SYSTEM TESTING

Scrum methodology


Daily Scrum Meeting
24 Hours
Product Backlog
Sprint Backlog
2-4 Weeks
Potentially Shippable Product Increment
This side up
Copyright © 2005, Mountain Goat Software

Scrum framework

Roles

- Product owner
- ScrumMaster
- Team

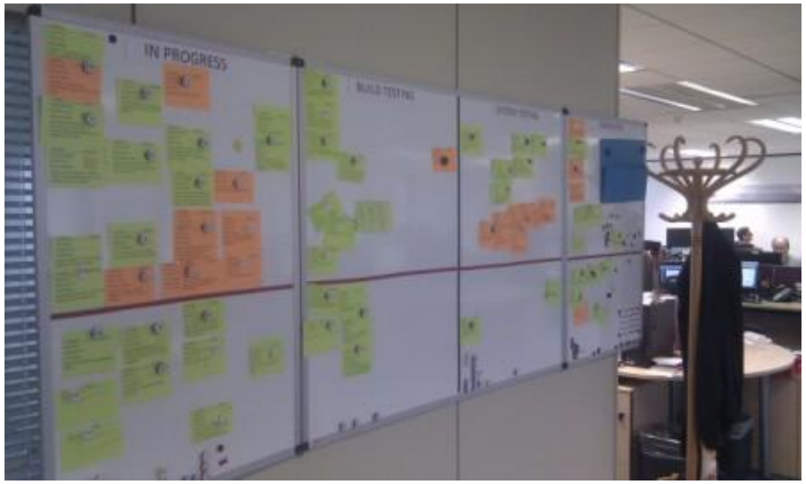
Ceremonies

- Sprint planning
- Sprint review
- Sprint retrospective
- Daily scrum meeting

Artifacts

- Product backlog
- Sprint backlog
- Burndown charts

The daily scrum



- Parameters
    - Daily
    - 15-minutes
    - Stand-up
- Not for problem solving
    - Whole world is invited
    - Only team members, ScrumMaster, product owner, can talk
- Helps avoid other unnecessary meetings

Test-oriented development

Experimental (for us)

Requirements – design – develop – test
miscommunication throughout the chain
testing at the end so it suffers most

Requirements – design – test – develop
test engineer is part of the development team
Tests run automatically with each daily build

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