HIGH VISIBILITY, RAPID TURNAROUND RESEARCH: CASE OF AGILE SOFTWARE DEVELOPMENT

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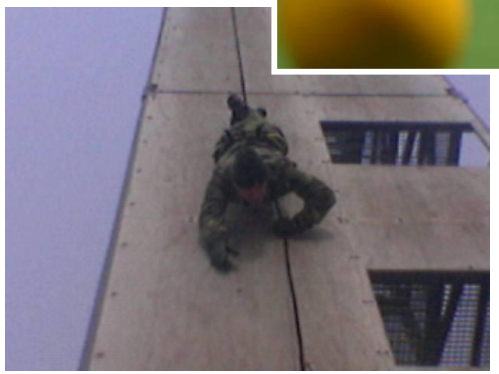


ABRAHAMSSON'S PROFILE

- Employed by VTT Technical Research Centre of Finland, Research professor
- Currently, the project Manager for AGILE-ITEA, 176 Person-year, 8 country, 22 organization embedded agile software development research project
- Management & steering group experience from 9 agile software development projects in 2003-2005
- Agile panelist (Profes 2002, ESPEG 2003, ICSE 2004, IFIP 2005)
- 50+ Scientific publications

VTT'S AGILE RESEARCH TEAM

- Pekka Abrahamsson
- Tuomas Ihme
- Tua Huomo
- Outi Salo
- Minna Pikkarainen
- Pekka Kyllönen
- Kaisa Komulainen
- Markku Kulmunki
- Tapio Matinmikko
- Ville Peltola
- Erkki Siira
- Antti Moilanen
- Jukka Haikara
- Sanna Soininen
- Kari Kolehmainen
- Maria Siniaalto
- Vili Törmänen
- Tanja Kynkäänniemi

CONTENTS

- Status & philosophy of VTT's agile research
- Industry-In-Lab
- Introduction to agile software technologies
- An example of a modern agile solution: The Mobile-D
- Beyond agile

STATUS SUMMARY

- ~40 publications (http://agile.vtt.fi)
- Empirical focus: 35 companies involved
- Annual VTT seminar series
- XP2006-conference organization
- Services developed
  - Mobile-D™ -development method
  - ENERGI industry & academia
  - Exploratory empirical data on agile development
  - Agile/agility assessment framework
  - Project management tool
  - Industry colloquium
- PC-committees, panels, etc.

BACKGROUND ON AGILE RESEARCH

- In order to stay in business, we need to produce meaningful (convincing or contradicting) results rapidly:
  - In large industry, financing/planning cycles are currently in 6 month segments
- è focus in short term industrial impact (secure funding)
- è keep in mind our research agenda (empirical body of evidence, SW eng. theories, develop/test hypotheses, etc.)

MAKING USE OF AGILE PRINCIPLES IN OUR EMPIRICAL RESEARCH

- Following agile principles,
  - Involve the customer (i.e., the target company)
  - Keep research cycles short & release often (days & weeks rather than months)
  - Learn from your mistakes (change in research design)
  - Progress is measured by working software
    - Scientific arena: Publications
    - Industry: Empirical evidence & research results (solutions), active industrial deployment

MOTIVATION FOR EMPIRICAL FOCUS

- Empirically validated data on agile methods and individual practices therein are difficult to locate at present
- One characteristic of Agile conferences is the shared strong belief
- Agile proponent's arguments remain without any empirical justification
  - § Cost of change is low in agile mode?
  - § Happier, more productive, more motivated developers?
  - § Better test-coverage, more robust code, easier to maintain?

For once, wouldn't it be nice to see an Agile project to have reliable data on …

Implementation domain, criticality

-Project size

-CMMI level

-Story, task estimates

-# of process adjustments planned, realized

-Actual work size in lines of codes

-Decision rationales

-XP code quality

-Actual time used

-Team size

-XP practice effort use

-Rework costs

-Team productivity (loc/hour)

-Cost of XP learning

-Actual # of defects detected, categorized, analyzed

-User story size

-On-site customer's effort use

-Development time defect-density

-Task size

-System-release defect-density

-Integration sizes, times, # of files

-Cost of SPI in XP

-Developers', customers', management's thoughts

RESULTS: BODY OF EMPIRICAL EVIDENCE

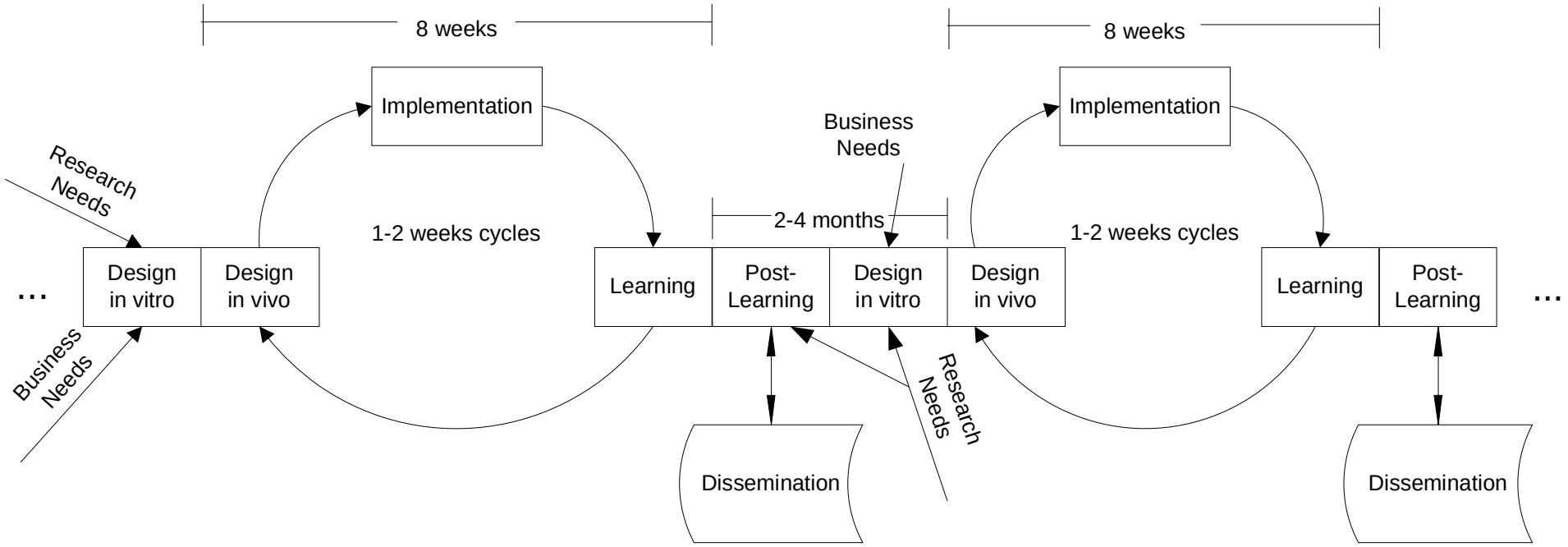
Id	Collected data	Release 1	Release 2	Release 3	Release 4	Release 5	Correction release	Total
1	Calendar time (weeks)	2	2	2	1	1	0.4	8.4
2	Total work effort (h)	195	190	192	111	96	36	820
3	Task allocated actual hours	136 (70%)	95 (50%)	118 (61%)	51 (46%)	42 (44%)	27 (75%)	469 (57%)
4	#LOCs implemented in a release	1821	2386	1962	460	842	227	7698
5	Team productivity (loc/hour)	13.39	25.12	16.63	9.02	20.05	8.4	16.90
6	Code integrations (integrations/day)	8.1	10.1	7.9	10.5	8.2	8.5	8.9
7	Avg. time between integrations (minutes)	26	21	40	31	27	30	29
8	Avg. number of files per integration	1.7	2.4	3.1	2.6	3.0	3.0	2.6
9	# User stories implemented	5	9	9	4	3	4	34
10	# User stories postponed for next release	0	1	0	1	2	0	4
11	User story effort (actual, median, h)	10.1	8.3	7.6	5.9	5.2	2.8	6.8
12	User story effort (actual, max, h)	63.1	26.9	41.7	21.8	15.9	7.6	63.1
13	# Tasks defined	10	30	18	21	19	9	107
14	Task effort (actual, median, h)	11.7	2.9	5.9	1.7	2.6	0.7	2.7
15	Task effort (actual, max, h)	32.3	8.8	14.0	8.8	5.3	3.4	32.3
16	# post-release defects	4	5	4	4	11	-	28
17	Post-release defects/KLoc	2.19	2.10	2.04	8.70	13.06	-	1.43 (3.75)
18	# post-release enhancement suggestions made by testers	17	13	5	3	0	-	38
19	Pair programming (%)	81.7	76.3	73.0	78.8	54.2	90.4	75.9
20	Required customer involvement (%)	4.9	5.8	5.7	7.2	6.5	7.7	6.3
21	Rework costs (%)	-	8.7*	11.8	11.6	2.6	61.5	9.8

*includes also enhancements

INDUSTRY-IN-LABORATORY

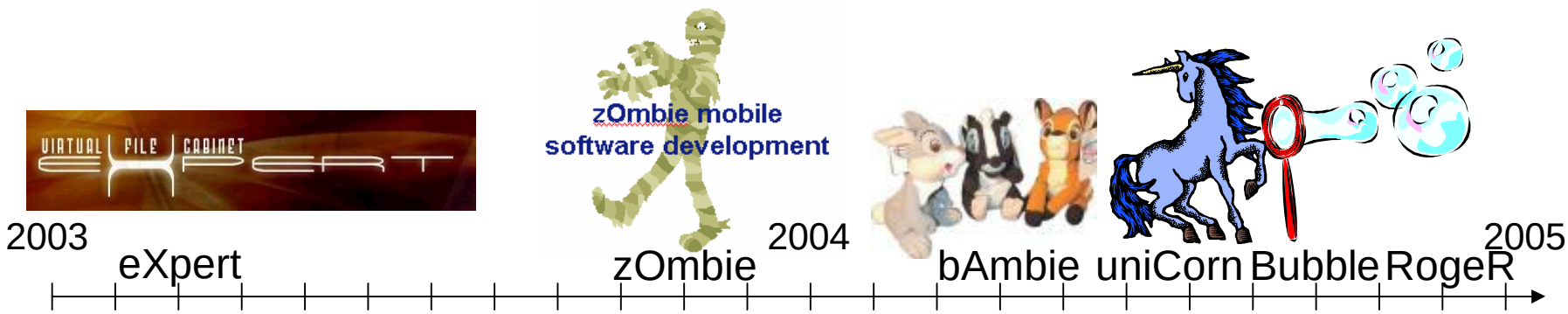
- A series of case studies at VTT 2003-2006
- Controlled Case Study Approach (Salo & Abrahamsson 2004):
  - Industry-in-laboratory research setting
    - Mix of Industrial & junior developers
    - Time-to-market matters
    - Real system, need, users, customer
  - Research approaches combined
    - Explorative: (No hypotheses set *a priori)*
    - Case study (In-depth data)
    - Action research (ability to learn)
    - Experimental (replication)
- 10th “replication” ongoing

VTT'S CONTROLLED CASE STUDY APPROACH



Key to success: Involve developers as co-researchers!

Industry-Driven Experimental Software Engineering Initiative (ENERGI)



02-03/2003: eXpert

1 team of four + one
8 mmonths
web-based system (java+jsp)
New product development

10-11/2003: zOmbie

1 team of six
10mmonths, mobile application (java)
New product development

03-04/2004: bAmbie

1 team of five
12 mmonths, mobile application (java)
Non-intrusive data collection, automated client tests, development of architecture lines
Build on existing base

05-07/2004: uniCorn

1 team of six
13 mmonths, mobile application (Symbian c++)
New product development

08-09/2004: Bubble

1 team of eight + one
12 mmonths, mobile application (Symbian c++)
New product development, soft real-time system

uniCorn

PAYOFFS

- For industry
  - The product (or a piece of it)
  - The empirical data
  - The development process
  - Increased understanding on the concept of agility and agile mode of development
  - à developers become coaches

- From the research perspective, the systematic approach yields several benefits:
  - Increased control of the development environment
  - Highly reliable research data
  - …

zOmbie

GETTING THOSE PUBLICATIONS: The eXpert CASE

Published
Submitted
To be submitted

Pair prog-ramming data

CMMI Analysis results

User-centered process Viewpoint

Product's usability

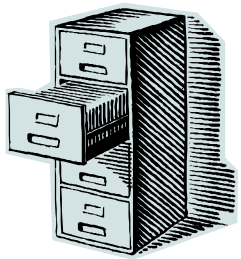
Test-first data

The development process

The product

1st results

Main empirical body of data



The research approach

SCM data

Requirements Engineering

Code quality viewpoint

Test coverage & quality

SPI in Agile SW development

On-site customer data

CHALLENGES

- Holistic responsibility
- Business pressure to deliver
- Takes a significant amount of effort to support the development
- Analysis of data lagging behind
- Developed technology & solutions are transferred but not the process, empirical research tradition or collected data
- While fixing the car engine, the big picture (e.g., a theory, rationale for the work) gets less attention

RECOGNITION

- In just three years, VTT has become one of the most known research institutes focusing on agile development
- One show of recognition is the invitation to host the XP2006 in Oulu, Finland (June18-21, 2006) (and Euromicro 2007…)