

Longitudinal ROI Measurement with Agile *or* “How do we know it’s working?”

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BLUF

Goal: Support ACG members who get pushed by their management to provide ROI.

Where have we been successful so far at measuring Agile effects?

- There have been good studies on specific agile practices
- There have been surveys of industry (showing mostly positive ROI)

But: No clear documentation of ROI compared to other approaches, in the large.

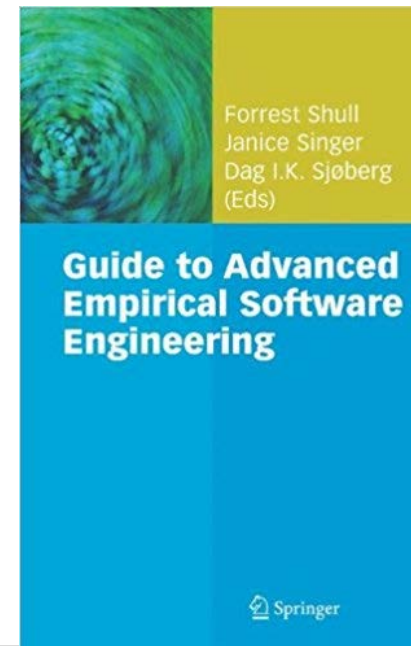
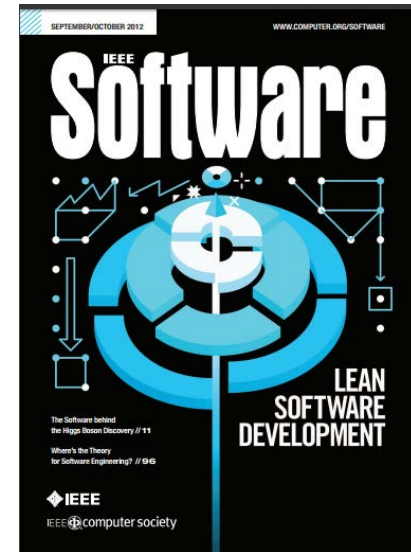
What can be done?

- Suggestions as to what kinds of data need to be gathered
- Opportunities / challenges in a DoD / federal case study

I would like this to be the start of a conversation – looking for your feedback.
(That means: *Come to the Q&A this afternoon...*)

A Bit about Me...

- Currently: Asst. Director of Empirical Research, Software Solutions Division, CMU/SEI
- IEEE Computer Society Board of Governors, 2015-17
- Editor in Chief, *IEEE Software*, 2011-14
- Editor, *Guide to Advanced Empirical Software Engineering*, 2007



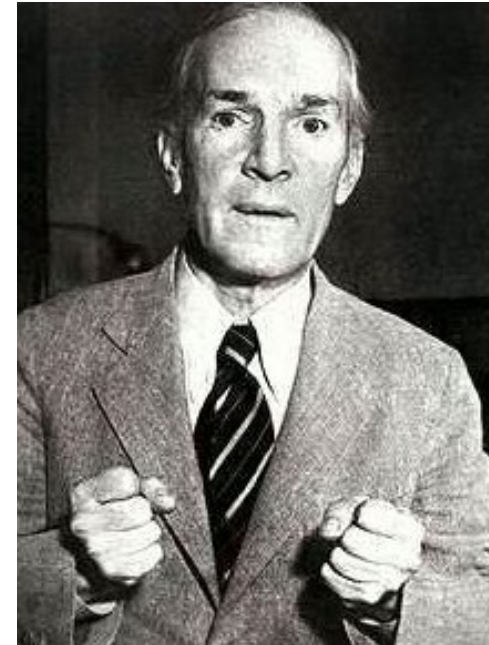
Why Measure Agile?



Wikimedia commons

“Measure what can be measured, and make measurable what cannot be measured.”

- Galileo Galilei, Italian



“It is difficult to get a man to understand something, when his salary depends on his not understanding it.”

- Upton Sinclair, US author

Measuring Agile Practices (Test-Driven Development)

External quality:
Yes, TDD generally helps

Type	BETTER	NO-DIFF	WORSE	
Controlled Experiment	✓	✓ ✓ ✓	✓ ✓	6
Pilot Study	✓ ✓ ✓ ✓ ✓ ✓	✓ ✓		8
Industrial Use	✓ ✓ ✓ ✓ ✓ ✓	✓		7
ALL STUDIES:	13	6	2	21

Code quality:
Mixed results

Type	BETTER	NO-DIFF	WORSE	
Controlled Experiment	✓	✓ ✓		3
Pilot Study	✓ ~ ~ ~	✓ ✓	✓ ~ ~ ~	7
Industrial Use	✓ ✓ ✓		✓	4
ALL STUDIES:	6.5	4	3.5	14

Productivity:
LOTS of variation

Type	BETTER	NO-DIFF	WORSE	
Controlled Experiment	✓ ✓ ✓	✓		4
Pilot Study	✓ ✓ ✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	14
Industrial Use	✓	✓	✓ ✓ ✓ ✓ ✓	7
ALL STUDIES:	10	6	9	25

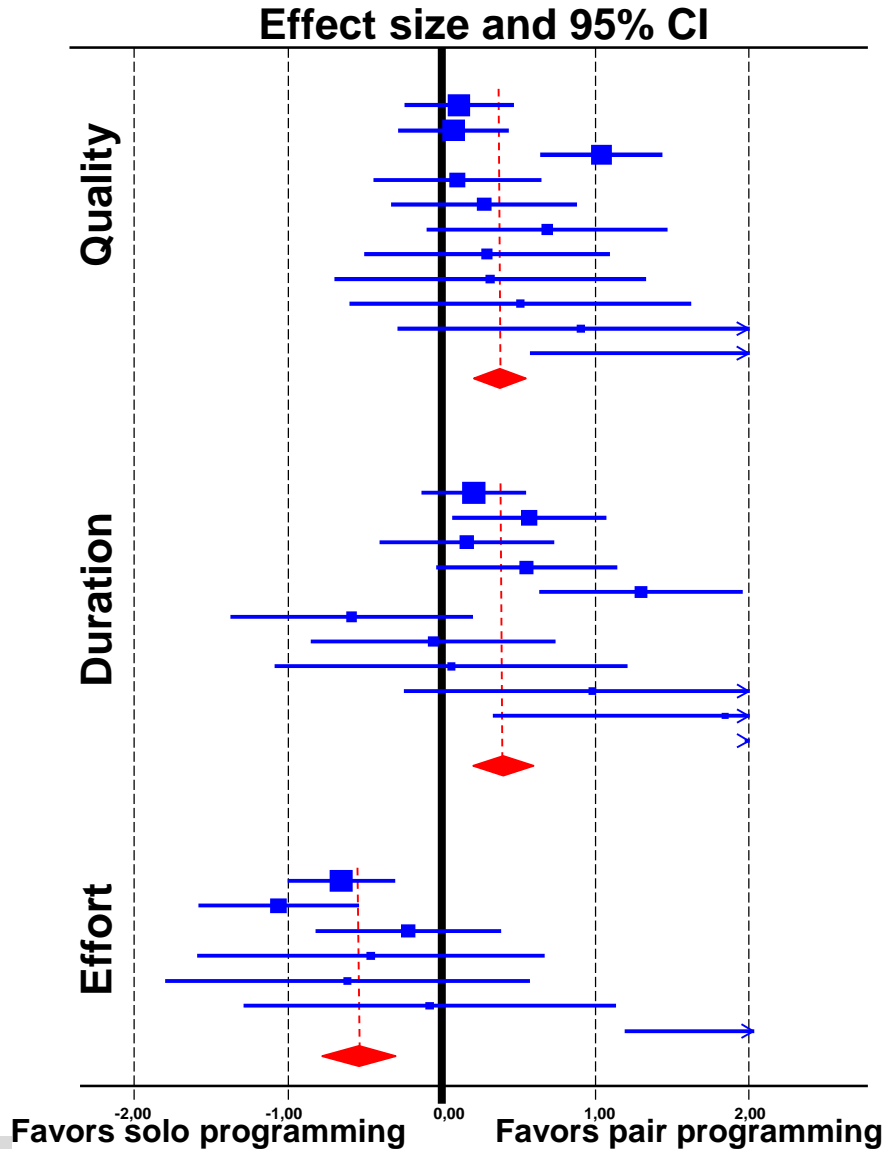
Measuring Agile Practices (Pair Programming)

Effects on:

– Quality: PP leads to a medium-sized increase in quality.

–Duration: Studies are mixed, but PP seems to help.

–Effort: Medium-sized negative effect.



[Dybå07]

Measuring Agile Effectiveness in Context

David Rico reports on eleven industry surveys which generally show positive results for Agile. [Rico]

E.g., a 2006 survey by AmbySoft with 4,232 responses showed: [Ambler06]

- 41% of organizations used agile methods
- 44% reported improved productivity, quality, and costs
- 38% reported improvements in customer satisfaction levels

Positive indications but potential issues with:

- Bias
- Self-selection of respondents
- Unknown quality of underlying data

Measuring Agile: A Few Basic Principles

A Few Basic Principles

Published studies are helpful, but the best way of demonstrating ROI is to pilot the approach in your environment.

There is no *one* way to measure ROI / effectiveness.

Think of your project as a case study.

Elements of a good case study:

A clear description of the {practice, tool, technology}

+

Hard evidence describing its effects in practice

A Few Basic Principles

Need to be clear on what you are measuring...

“Agile” encompasses a lot.

- What is the specific approach you are evaluating?
- Do you have confidence that the practices being enacted are the ones you expect?

A Few Basic Principles

Think of your project as a case study.

Elements of a good case study:

A clear description of the {practice, tool, technology}

+

Hard evidence describing its effects in practice

A Few Basic Principles

Keep the focus on **business value** and **delivered capability**,
not size / complexity / other internal attributes.

You will need a basis of comparison. Consider:

- Prior iterations of the same system
- Sister projects
- Company baseline
- Selection of other components

[Kitchenham95]

Challenge: End product will be different depending on the approach used.
The issue is not comparing different paths to the same end.

Measuring ROI in Context

Measurement Considerations: Pre-Agile decision

Do you have a baseline?

Are you clear on the objective / dimension of interest?

Which team / which project will be used for the pilot?

Possible to estimate what the output would be using a “traditional” approach?

Measurement Considerations: Preparing for Implementation

Conduct an initial ROI estimate: [Banks07]

- Gather initial requirements, add to product backlog
- Estimate sizes for the requirements (high-level, quick take)
- Estimate starting velocity, and work first couple items to verify
- Extrapolate from initial velocity the total time required
- *Continually re-visit and re-assess*

Measurement Considerations: Implementation on Projects (1)

Velocity

Time to first delivered capability

Technical debt / architectural quality

Rework

Traditional: Late, expensive rework from phase delay...

Agile: Change of direction from one iteration to another?

Measurement Considerations: Implementation on Projects (2)

Include factors that influence interpretation – although they don't represent where benefit is expected:

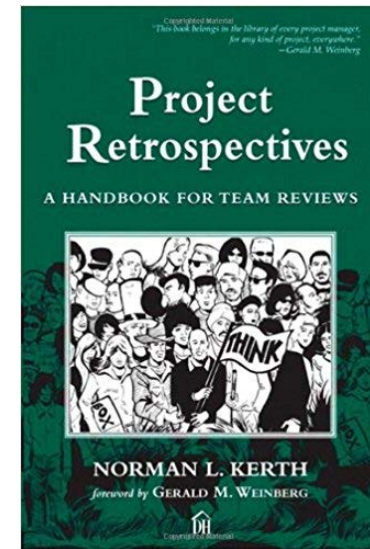
- Measure / monitor to ensure the agile approach is being applied as expected
 - Find the right balance between **proscriptive** and **descriptive**
- Effort / burn rate

Measurement Considerations: Evaluation of Success (1)

Retrospectives have a critical role to play.



Interviews with
Linda Rising – [Rising08],
[Rising14]



[Kerth01]

How can you assess this product against what would have resulted from another approach?

Don't fall into the trap of measuring size.

Other code attributes (complexity, branching...) are part of the story but tend to be less convincing if not tied to business goals.

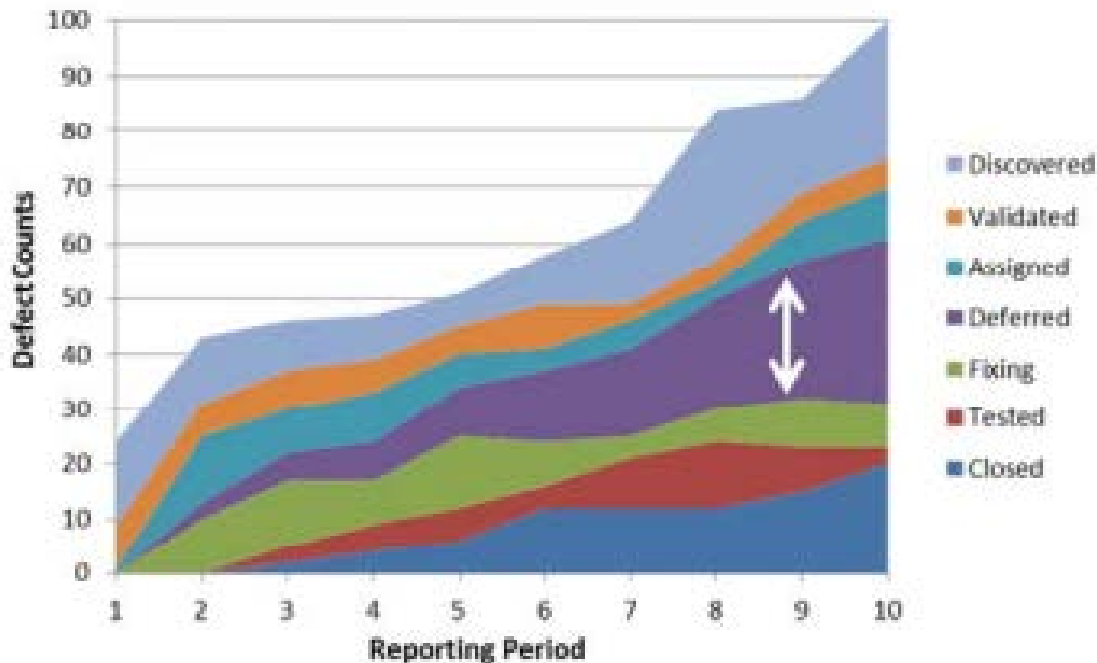
Measurement Considerations: Evaluation of Success (2)

Do focus on measures of business value:

- Acceptance test data
- Customer satisfaction
 - Subjective
 - Usage metrics
- Quality
 - Known / deferred issues
 - Change / defect reports
- Technical debt measures – if tied to business goals
- Development team buy-in and satisfaction – May be less convincing to external stakeholders. Still important!

Measurement Considerations: Evaluation of Success (3)

“Defects discovered and fixed during... testing activities provide a basis for metrics in much the same way they do in more traditional development approaches.” [Hayes14]



Discovered: The defect has been logged but no other action has been taken

Validated: The logged defect has been accepted as an issue that warrants action

Assigned: The person who will work on the defect has been identified

Deferred: Work on the defect was deferred to a later (unspecified) date

Fixing: The person working on the defect has reported they have begun to fix it

Tested: The solution to the defect has been tested – and the tests have passed

Closed: The defect is fixed, and the fix confirmed

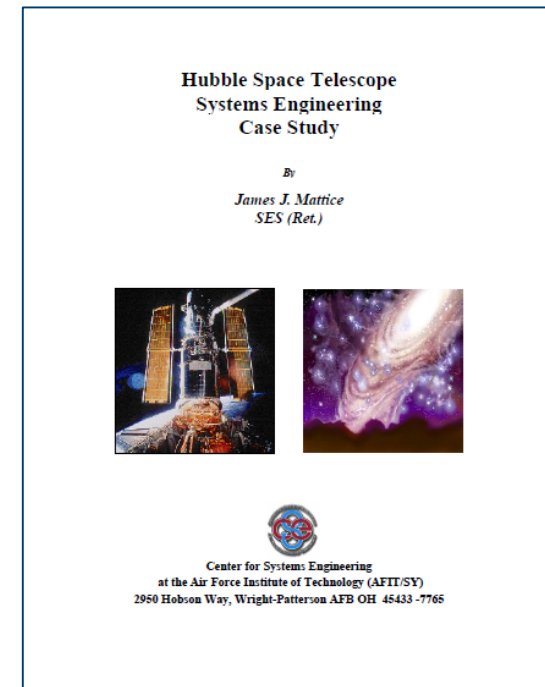
Thoughts on Agile Case Studies

Importance of Case Studies

Case studies have widely recognized utility as:

- Instructional Materials
- Exemplars
- Documentation

Could a federal / DoD case study help adoption?



Importance of Case Studies

Many claims have been made about Agile's importance in the federal space.

Need documented case studies showing ROI:

- For IT
- For embedded systems

This is the right time

- For the community to showcase the good work being done
- For reaching decision makers

Looking Forward to Discussion

Discussion Questions

Looking for your feedback:

- What have I missed?
- Does the community have access to partial / complete results that would help?
- Which pieces sound most useful? Most exciting?

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