

Measuring Agility

A Validity Study on Tools Measuring The Agility Level of Software Development Teams

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Introduction

Agile methodologies adoption has increased a lot [1, 2, 3]. Many teams believe they are agile although they are not [4].

Agility transition problem

- agile methodologies are easier to misunderstand [5]
- agile methodologies are often applied to the wrong context [6]
- organizations modify practices before implementing them [7, 8]
- 13% of companies are at odds with core agile values [9]
- different perception of agile practices when they are adopted is very worrying [10] since even people in the same team understand them differently [11]

Based on the above it is evident there is a huge need for tools measuring agility to verify the level of transition.

Tools measuring agility problem

For over a decade, researchers have been constantly coming up with models and frameworks in an effort to provide a solution. Unfortunately, the multiple tools have created a saturation in the field, resulting in being used only by the organizations that participated in the empirical studies for their creation [12, 13]

Research Purpose

See if tools claiming to measure agility will yield similar results.

Related Work

Many tools for measuring agility have been created which we have separated into two categories.

- How agile the agile methodologies are
- Agility level of software development teams

Agility of Agile Methodologies

- 4-Dimensional Analytical Tool
- XP Evaluation Framework
- Comprehensive Evaluation Framework for Agile Methodologies (CEFAM)

Agility Level of Teams

1. Team Agility Assessment (TAA)
2. Perceptive Agile Measurement (PAM)
3. Objectives Principles Strategies Framework (OPS)
4. Sidky's Agile Measurement Index (SAMI)
5. Thoughtworks
6. Comparative Agility

Tools Selected

- Perceptive Agility Measurement (PAM) [14] (validated with a large sample)
- Team Agility Assessment (TAA) [15] (used in industry)
- Objectives Principles Strategies (OPS) [16] (covers many agile practices)

Research Questions

1. Will PAM, TAA and OPS yield similar results?
 - 1.1. Does convergent validity exist among the tools?
 - 1.2. Will the questions that are exactly the same among the tools yield the same results?
 - 1.3. What is the coverage of agile practices among the tools?
2. Can the tools be combined in a way that will provide a better approach to measuring agility?

Research Methodology

Study in Company *A*

United States company which activates in the Point Of Sales (POS) area. Development and QA departments (4 mixed teams).

Data Collection

Company *A* employees were asked to fill in the surveys created by PAM, TAA and OPS (Effectiveness part) during a 3-week period. The surveys were on 1-7 Likert scale except from the *Collocation* practice which was on a Likert scale 1-5. Practices which were not used by Company *A* were excluded from the surveys.

Data Preparation

Problem

All the tools have different amount of questions and cover different practices

Solution

1. Mapping of practices between tools — OPS covers more practices
2. Mapping of questions based on the OPS practices

Data Analysis

- "Spearman's rank correlation coefficient" for checking whether there is a correlation among the practices (convergent validity establishment)
- Identified which questions were the same among the tools and checked whether they had the same answer by the respondents.
Used "Mann-Whitney U test" and "Kruskal-Wallis one-way analysis of variance" for statistical tests
- Checked which of the tools cover more agile practices and have more questions for a practice by picking the most popular according to two case studies [17, 1]. In addition, made the checks for practices which were covered by the tools, but did not exist or were not popular in the case studies.

Practice	Participants	PAM	TAA	OPS
Practice1	Participant1	Score1	Score1	Score1
	⋮	⋮	⋮	⋮
	ParticipantN	ScoreN	ScoreN	ScoreN

Table 1: Collected Data Structure

Results

Correlations

- Only 8 out of 42 plots were monotonic and allowed the use of "Spearman's rank correlation coefficient"
- Low or negative correlations

Conclusion: Inability to establish convergent validity

Direct Matches

The hypothesis is

H_0 : *There is no difference between the groups of the same questions*

H_1 : *There is a difference between the groups of the same questions*

The p-values from the majority of the groups are more than the alpha level of 0.05. As a result, we cannot reject the H_0 hypothesis.

Nevertheless, as we see, the frequency of questions which are the same is low, thus, we consider the results as non-significant.

Conclusion: Questions which are the same among the tools don't yield the same results

Group	Frequency	p-value	Group	Frequency	p-value
G1	12	0.5271	G2	9	0.2404
G3	7	0.3837	G4	8	0.6715
G5	12	0.503	G6	16	0.01523
G7	13	0.1654	G8	12	0.2984
G9	10	0.1865	G10	13	0.6893
G11	19	0.3246	G12	16	0.2246
G13	30	NA	G14	18	1
G15	13	0.4957	G16	12	0.0007
G17	6	0.0522			

Table 2: Frequency and p-value of Same Answers

Tool's Agile Practices Coverage

Practice	TAA	PAM	OPS
Iterative and Incremental Development	2	5	3
Customer/User Acceptance Testing		5	
Appropriate Distribution of Expertise	2		5
High-Bandwidth Communication	4	8	13
Client-Driven Iterations		2	3
Minimal or Just Enough Documentation			4
Continuous Feedback		1	2
None	8		

Table 3: Agile Practices Coverage By Tools Excluding The Ones from Laurie Williams' Case Studies

Measuring Agility

Practice	TAA	PAM	OPS
Product Backlog	2		3
Smaller and Frequent Product Releases	1	1	4
Constant Velocity	1		
Iteration Progress Tracking and Reporting	17	5	5
Self-Organizing Teams	11	1	7
Daily Progress Tracking Meetings	1	5	1
Retrospective Meetings	5	6	4
Test Driven Development	3	3	4
Refactoring	2	1	4
Software Configuration Management	1		1
Adherence to Standards	3		2
Continuous Integration	5	5	10
Evolutionary Requirements			4

Table 4: Agile Practices Coverage By Tools Based on Laurie Williams' Case Studies

Ordered by practices	Ordered by questions
OPS (18)	TAA (52)
TAA (15)	OPS (49)
PAM (13)	PAM (26)

Table 5: Summary Of Agile Practice's Coverage

Conclusion: The tools don't cover the same agile practices and at the same extent

OPS Enhancement

Combine the questions of the three tools to create one which covers more practices and questions.

Excluded questions which concerned

- product ownership (Scrum oriented)
- iteration defects (software should be delivered to client)

	Indicators Introduced	Questions Introduced
Capability	3	7
Effectiveness	9	46

Table 6: Summary of Indicators and Questions Added

Answers to Research Questions

1. Will PAM, TAA and OPS yield similar results?

No. The tools measure the agility of teams in their own way

- 1.1. Does convergent validity exist among the tools?

No

- 1.2. Will the questions that are exactly the same among the tools yield the same results?

No

- 1.3. What is the coverage of agile practices among the tools?

Different practices are covered, while the number of questions is not the same for each tool

Reasons

- Few or no questions for measuring a practice
- The same practice is measured differently
- The same practice is measured by opposite questions
- Questions phrasing
- Survey answering
- Better understanding of agile concepts
- How people perceive agility

2. Can the tools be combined in a way that will provide a better approach to measuring agility?

They have been combined but it needs validation

Conclusions

- Tools claiming to measure agility do not yield similar results
- A measurement tool which satisfies the needs of one team may not be suitable for other teams

Reasons

- The perception of agility and the personal experience of the tool creators
- Teams have different needs and different transition to agile methodologies

Future Work

- Perform the study in other companies and compare the results
- Form the data samples in another way
- Use other tools for measuring agility to perform a similar study
- Validate the enhancements made in OPS

Questions?

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