A critical examination of recent industrial surveys on agile method usage

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ABSTRACT

Context: Practitioners and researchers often claim that agile methods have moved into the mainstream for the last few years. To support this claim they refer to recent industrial surveys which tend to report high rates of agile method usage. However many of these industrial surveys are conducted by agile consultants, tool vendors, professional societies and independent technology and market research organizations. This raises some important concerns about the possible conflict of interest and the overall trustworthiness of these studies.

Objective: In response to the above concerns, a secondary study was carried out. Its objective was to examine industrial surveys published in 2011 and 2012, determine the extent to which we could trust their reported high rates of agile method usage and provide recommendations on how quality of research could be improved in the future.

Method: Following a rigorous search procedure, nine industrial surveys on agile method usage published in 2011 and 2012 were extracted from both academia and industry. Their thoroughness in reporting and trustworthiness were evaluated using a newly proposed assessment framework based on Guba's four attributes of trustworthiness (truth value, applicability, consistency and neutrality) and a number of methods for assessing survey research in related fields as information, communication and management studies.

Results: The careful examination of the reviewed surveys shows that most of the studies have insufficient thoroughness in reporting and (subsequently) low trustworthiness. Only one (out of nine) study is considered as a scientific contribution in determining the current 2011/2012 rate of agile method usage.

Conclusions: The obtained results support our initial considerations about the trustworthiness of recent industrial surveys on agile method usage and suggest a number of recommendations for increasing the quality and value of future survey research in this regard.

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1. Introduction

Agile methods have emerged as an alternative to plan-driven software development methods more than a decade ago (Dingsøyr et al., 2012). Today, they are often *considered as the mainstream in software engineering.* This is often explained with their potential to overcome the *challenges of modern software organizations* which are expected to operate in highly dynamic and competitive environments. In such environments, speed, quality and cost of software development are crucial for organizational survival and agile methods seems to be successfully delivering on all three fronts through their customer focus, responsiveness to change, iterative and incremental delivery of working software and emphasis on individuals and their interactions.[1] To study the popularity of agile methods, many industrial surveys have been carried out. They have reported various *rates of agile method usage* in terms of (1) *the percentage of software professionals/organizations using or moving toward agile methods as compared to alternative methods* like lean methods, plan-driven methods, etc. and (2) *the percentage of software professionals/organizations using specific agile methods* as Scrum, Extreme programming, etc. These rates have being often cited by practitioners and researchers to prove and demonstrate the widespread adoption of agile methods. However, the majority of these surveys are coming from *agile consultants, tool vendors, professional societies and independent technology and market research organizations*

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[1] http://www.agilemanifesto.org/.

rather than from academics (Rodríguez et al., 2012). This could be quite *problematic* for at least two reasons: (1) agile consultants/tool vendors/professional societies might not rigorously follow the scientific method while conducting their surveys (e.g. due to time or budget constraints) threatening the trustworthiness of their findings (incl. internal and external validity, reliability, objectivity, etc.); and (2) agile consultants/tool vendors/professional societies might pursue their own private interests in conducting such surveys (e.g. as part of their customer/membership acquisition strategy) that could be in conflict with their findings. This could lead to omitting some important information (e.g. not publishing negative results), altering reported results, etc.

In response to the above concerns a *secondary research* was carried out. Its *objective* was:

RO: To carefully examine recent industrial surveys on agile method usage, determine the extent to which we could trust their findings in regard to the widespread adoption of agile methods and provide recommendations on how quality of research could be improved in the future.

To achieve this research objective, the study went through a number of *subsequent steps*. First, the *industrial surveys on agile method usage in 2011 and 2012 were extracted* following a rigorous search strategy. Second, the *extracted surveys were assessed for their thoroughness in reporting* – a construct proposed and operationalized by the author for evaluating the available information on how the surveys were carried out (incl. their survey methods, target populations, sampling frames and sizes, response rates, etc.) and used to *select the studies which would be (and were eligible) for further assessment of trustworthiness*. As there was no formal framework for assessing trustworthiness of survey research in software engineering (to the extent of our knowledge), an *assessment framework was proposed* based on Guba's quality model (Guba, 1981) and a number of methods from other related fields as information and communication studies and management studies. The framework was then used to *assess the trustworthiness of the selected studies* and to *provide valuable insights on the quality of survey research in regard to agile method usage*.

The remainder of the paper is *structured* as follows: Section 2 details the search strategy used to identify the industrial surveys on agile method usage in 2011 and 2012. Section 3 presents the findings of the identified studies and discusses some incompatibilities (or inconsistencies) which negatively impact the consolidation (and comparison) of their findings. Section 4 introduces the construct of thoroughness in reporting and applies it in order to select the studies which would (and are eligible to) be further assessed for trustworthiness. Section 5 proposes an assessment procedure for assessing the trustworthiness of the selected studies and uses it to provide insights on the quality of survey research in regard to agile method usage. Section 6 discusses the limitations and threats to validity of the presented study and introduces the actions taken to address them. Section 7 outlines the contributions of the presented study and suggests some important recommendations on how to increase the quality of survey research on agile method usage.

2. Identification of recent industrial surveys on agile method usage

While identifying prior surveys on agile method usage we set *few limitations* (or inclusion/exclusion criteria). First, we focused only on *surveys published between 2011 in 2012*. The reason for this limitation was the actuality and relevance of such surveys in demonstrating and proving the claim that agile methods are currently the mainstream in software engineering. Due to this restriction some widely recognized agile adoption surveys were

excluded, including the ones conducted by Forrester Research/Dr. Dobb's (West and Grant, 2010) (probably the first to state that agile methods had joined the mainstream), Gartner (Norton, 2008), Dr. Dobb's and Scott Ambler surveys (Ambler, 2007; Ambler, 2006–2009), and others. Second, following our research objective we included only surveys which investigate *the rate of agile method usage* as compared to alternative methods (e.g. agile vs. lean vs. plan-driven methods) or as compared to each other (e.g. Scrum vs. Extreme programming). Based on this limitation many surveys were excluded although they were covering different aspects of agile usage as practices usage (Kurapati et al., 2012; Ambler, 2012), tools usage (Azizyan et al., 2011), team and developers perceptions of agile usage (Williams, 2012), enablers and barriers to agile usage (Asnawi et al., 2012; Sheffield and Lemétayer, 2012; McHugh et al., 2012; Vijayasarathy and Turk, 2012; Ambler, 2011), effects of agile usage (Rao et al., 2011; Rönkkö et al., 2011) and others. The third and last limitation was that surveys should be *industrial surveys*, meaning that: (1) they are targeted to software professionals and organizations from the software engineering industry (and not to university students for example); and (2) include at least a dozen of organizations (thus excluding single and multi-case studies). By applying this third and last limitation few more surveys were excluded as the one conducted at Nokia (Laanti et al., 2011), where the survey population was Nokia's employees and thus was covering only a single (although large and multinational) organization.

Two main *publication sources* where used to extract the surveys. The first one was the *Scopus electronic database*. Scopus is the largest abstract and citation database of academic literature and quality web sources, which ensured the coverage of nearly 20,500 titles from more than 5000 publishers. As such Scopus was mainly used to extract surveys conducted by academics. For surveys conducted by consultants (as Valtech, Xebia, etc.), tool vendors (VersionOne, ThoughtWorks, etc.), professional societies (as Agile Alliance, Scrum Alliance, etc.) and independent technology and market research organizations (e.g. Forrester Research, Gartner, etc.) we used *Google Scholar*. Google scholar allowed us also to cover gray (in the form of theses, technical reports, white papers, etc.) and unpublished literature (as part of web sites, blogs, etc.).

The included electronic databases were searched using the "*agile AND survey*" string. The total number of hits on Scopus (incl. title, abstract and keywords) was 117. Their titles and abstracts were further reviewed based on the exclusion criteria defined in the previous paragraphs. In result only one publication (RO) was eligible for inclusion. As for Google Scholar, the total number of hits was more than ten thousand (15,500). As it was impossible to review all of them, they were sorted by relevance (to the search string) and limited to the first one thousand on the list. From these publications, only eight were included (AL, AM, BA, SE, TW, VO, VT and XB). In order to further reduce the probability of omitting relevant literature (e.g. as we did not include other popular electronic databases as Engineering Village, Web of Science, etc. and limited the review process for Google Scholar), we did *backward* (using the reference lists of the initial publications) *and forward referencing* (using the cited reference searching functionality provided by Scopus and Google Scholar to retrieve publications citing the initial ones) on the final pool of surveys extracted from Scopus and Google Scholar. However, no additional publications emerged.

A total of *9 surveys* were identified to be relevant to the current 2011/2012 rate of agile method usage (excluding repeated instances of the same industrial survey). These studies are summarized in Table 1 ordered by their key alphabetically (formed by the names of its authors and sponsoring organization).

As seen from Table 1 the majority of the extracted studies (6/9) were coming from industry (and more specifically from agile consultants and tool vendors) and only three of them were conducted