The Confidence of Agile Assessment Methods in the Context of Software Process Improvement

Célio Santana
Universidade Federal Rural de Pernambuco, Unidade Acadêmica de Garanhuns. Garanhuns. Brazil. Celio.santana@gmail.com

Cristine Gusmão
Universidade Federal de Pernambuco, Núcleo de Telesaúde (NUTES). Recife, Brazil. cristine.gusmao@nutes.ufpe.br

Danilo Caetano
Universidade Federal de Pernambuco, Centro de Informática (Cin). Recife, Brazil. dcms@cin.ufpe.br

Alexandre Vasconcelos
Universidade Federal de Pernambuco, Centro de Informática (Cin). Recife, Brazil. amlv@cin.ufpe.br

Abstract— with the advent of CMMI in the late 1990s, software companies tried to use a kind of score to rank themselves in the market. Being a CMMI level five company for a long time represented the epitome of highly qualified company. This phenomenon is also emerging in the agile software development with the emergence of methods such as Nokia or comparative test agility. This paper presents an analysis of how these methods are placed in the context of agile software development and its contribution to the improvement of software process in the same context from a case study developed in real companies.

Keywords—Agile Assessment Methods; Software Process Improvement; Agile Processes.

I. INTRODUCTION

The success of the Capability Maturity Model for software, called from now SW-CMM, at the end of the 1990s was not only obtained by the proposed improvement of process maturity, but mainly because a particular company could assign a score to your own process.

This score was relative to the level of maturity that the process of an organization could achieve, which was the most immature level called the initial or also called level 1, and the more mature level known as the "Optimization" or Level 5 [1].

From then, any company could plan its process improvement toward SW-CMM maturity level five. This improvement could be achieved gradually since the division of the process in about twenty key process areas (KPAs) and each could be improved in a manner almost independent of the others [1].

However, more than one mechanism for Improving the Software Process, the score of a process of a company in the CMM has become a criterion for classification. And the reference of this model was so strong that a company SW-CMM Level five was considered better than a SW-CMM Level three for almost all market segments without the need for other indicators [2].

For agile development to first draft evaluation was given by Paulk (2001) where an assessment was made of an agile method called Extreme Programming and its partial adherence to the SW-CMM model [3].

Using traditional models such as SW-CMM, lack the needed reference information for agile based Software development efficiency evaluation [4].

One problem is that, even if the traditional assessment is often seen as an opposite to the agile thinking, the agile software development should be based on the best software development practices. Simplifying does not mean not documented or not existence processes [1, 5].

Looking at the context of Software Process Improvement (SPI) where Salo (2007) states that agile software development provides new possibilities for conducting SPI, which may well provide grounds for meeting some of the central challenges of traditional SPI [6].

Agile software development provides a highly untraditional approach to SPI, in which the process improvement knowledge of software developers and software development teams is acknowledged and valued. In this context using traditional models of assessment could not consider these aspects [6].

Thus, Agile Assessment does not need to be a complex evaluation including the full analysis of CMMI base practices. It should be light-weight and based on agile principles, such as face-to-face communication, rapid feedback to interviewees and organization management and include the simple documentation [7].

The first documented clue for an agile assessment was given by Boehm and Turner (2003) [8] and since then other agile approaches to assessment have been suggested.

However, the agile community not seems interested in the idea of assign a score in the capacity of both individual and teams because this behavior decreases collaboration and increases competition [8].

The motivation of this research is to investigate the role of the Agile Assessment Models (AAS) considering the context of software process improvement in industry. Since there is no interest to determine a rating for comparative purposes, then the research question being asked is how these models can assist in improving the process in agile development.

The objective is to determine how the AAS Models help teams and organizations to improve their processes. To this end, case studies will be conducted to collect empirical evidence on real organizations using agile methods in their application.
After this introductory section, the section 2 explores SPI, the section 3 explores the AAS, the section 4 shows the research structure, in section 5 final considerations are exposed.

II. SOFTWARE PROCESS IMPROVEMENT (SPI)

A software process can be defined as the sequence of steps required to develop or maintain software aiming at providing the technical and management framework for applying methods, tools, and people to the software task [9].

The SPI aims providing software development organizations with mechanisms for evaluating their existing processes, identifying possibilities for improving as well as implementing and evaluating the impact of improvements [10].

Traditionally, the ultimate goal of SPI in organizations is to provide a Return on Investment (ROI) for the organization through the improvement activities yielding more money than is spent on them [11].

ROI has been reported for various SPI achievements, such as improved efficiency of the development process and reduction of total software costs, increased quality of the end product, higher predictability of cost and schedule, and increased level of reuse [12].

The goal of the traditional software process is to provide high predictability, stability, and repeatability using highly managed and quantitatively monitored software development processes. On the other hand, agile principles highlight the need for the software process to be flexible, to be able to rapidly respond to the constant changes and context specific needs of software development [6].

As a result, traditional software development emphasizes up-front contract negotiations where the requirements, cost and schedule of the product development are fixed and the end product will be delivered at the end of the project lifecycle.

In this mode of software development, traditionally, extensive documentation and quantitative monitoring of the product development process plays a central role while. The principles and practices of agile software development, in turn, address the constant changes. [6]

It should be emphasized that Agile SPI still intended to improve organizational indicators and not just fit better to Scrum or XP or any other method chosen. That is, reduce bureaucracy although an agile solution it is not the main result expected by Agile SPI.

III. AGILE ASSESSMENT METHODS (AAS)

Boehm and Turner [8] present five factors that influence the performance of an agile team, these factors are critically, personnel, dynamism, culture and project size. Although the recognition of these factors is a good starting point for agility evaluation, the authors does not address any specifics regarding the application of an agile method. After this, the following AAS were proposed in chronological order.

A. Assessing Agility

Lappo & Henry [13] in 2004 proposed the concept of measurable goal that is different from the metric itself. So when you set goals for the process and these targets are set by the company is perceived an improvement-oriented approach that does not rank the teams, but have quantitative targets from which to arrive.

B. Agile Assessment Approach

Pikkarainen & Passoja [7] in 2005 proposed an agile approach to evaluate the goals using agile practices in agile or traditional projects. The Agile Assessment approach helps organizations to find the best suitable agile practices to improve a specific aspect of the software development work.

C. Nokia Test

In 2005, Bas Vodde was coaching Scrum teams at Nokia in Finland and developed the Nokia test based on Scrum practices. The test was administered to teams in order to assess whether the team members were with the basic knowledge of Scrum consolidated [14].

Each staff person should get a piece of paper and prepare to calculate the score of the nine questions on a scale of zero to ten, and at the end, you should make a mean score [15].

D. Comparative Agility

In 2007 Kenny Rubin and Mike Cohn proposed the Comparative Agility Survey which is based on a simple but powerful concept of determining how good a company is compared to its competitors. Rubin & Cohn assumed that agile teams and organizations are always looking to make the best compared to its competitors and its own past. The possible range score of this test is from -2 (worst) until 2 (best) score [16].

E. Others Approaches

Other methods proposed in academia that were not deeply surveyed are: The Agile Hybrid Assessment Method for Automotive (AHAA) proposed in 2008 and used in automotive industry [17].

The Quantitative Agile Assessment [18], where each member of the team answer a questionnaire and one score are provided based on answers.

In the industry we can also find the Agile Assessment¹ provided by the thoughtworks.

IV. THE RESEARCH STRUCTURE

The structure of the research is summarized in Table 1, where it is shown the methodological reference frame. The research is based on a case study to evaluate whether the AAS are linked to the results of organizational indicators. Other information about the research is showed in the following subsections.

A. Premises

Since SPI is closed related to ROI, is expected that when occur these improvements, they are reflected in the final results of an organization. This means that a change in the process should not only bring a greater suitability to the method used, but also increased productivity, profitability,
return or any other social indicator that an organization should set as a goal.

<table>
<thead>
<tr>
<th>Methodological Reference Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach Method</td>
</tr>
<tr>
<td>Variables Nature</td>
</tr>
<tr>
<td>Method of procedure</td>
</tr>
<tr>
<td>Objective</td>
</tr>
<tr>
<td>Scope</td>
</tr>
</tbody>
</table>

This research will be taken as a premise that the improvements made in the way of developing software, when bring a better result in ROI, will also bring an increase in the classification of AAS.

For example, a company that uses Scrum Nokia test evaluated by averaging 6.0, while performing an action of process improvement, not only will your Nokia Test average but also increased its productivity (or other indicator of ROI).

Different companies will present different measures, different ways for measuring, different goals and, of course, different results. Whereas any action of SPI is reflected in the ROI and also on adherence to agile approach used, it is possible to perform a correlation between the two indicators and assess the impact of change scores on the method and the result obtained by the company.

It is unlikely that changes in the way of developing software do not change the final results of the indicators of an organization, as well as their way of realizing the SCRUM or XP.

The use of multiple metrics is not, a priori, a bias because it is not being investigated the influence of a specific indicator, but a Boolean relationship between the outcome in AAS and the indicator of ROI. That is, if the evaluation scores of the assessment increases, the ROI also increase?

The AASs chosen are Nokia Test for scrum teams and Comparative Agility for XP hybrid scrum teams. These methods were chosen because they provide a final score, 0 to 10 in Nokia Test and -2 to 2 in Comparative Agility.

B. Research Phases

The first stage of the research is the selection of companies where the case study will be conducted. From there, will be identified which ones use scrum and which ones use other methods at the same time will be also identified the key organizational indicators of each company for future comparisons.

The next phase is the preparation of forms that will be used in the data collections generated in each organization. This form must be unique for each company because it contains questions from the AAS chosen to that organization and its own indicators.

The next phase will be the creation of spreadsheets that will assist in analyzing the data received of each company individually, as well the consolidated of data.

C. Data Collection

The forms provided to the companies will be divided in two parts: The first contain the AAS questions, the quantity this part of the form can vary since that Nokia Test and Comparative Agility is answered by all the team. The second part contains the result of the indicators chosen to that organization. The number of this part of the form can vary based in how much teams produces that indicator, or how many time the indicator is collected.

The monitoring of these companies will be longitudinal, and then the end of each cycle the companies must deliver the completed forms. However, companies presenting weekly cycle may not have significant changes in the outcome of AAS, which can result in the two parts of the form being delivered at different times. These cases will be considered baselines of time as may be monthly or bimonthly for companies who use longer cycles.

D. Data Analisys

Data analysis will be performed using statistical correlation between the results of AAS and each indicator of the organization. Each individual analysis of this type represents the general results for an organization. The consolidation will take place from an analysis of quartiles to indicate the trend of results.

V. FINAL CONSIDERATIONS

The result of this research is not intended to be definitive, but rather intends to open the discussion about the validity and necessity of the existence of such methods. Other results can be considered depending on the population of companies obtained. One is to evaluate the behavior of the AAS in CMMI companies that have a measuring system mounted and can incorporate the result of this evaluation as indicator.

A. Discussion of Results

These results should be evaluated very carefully, first by not yet defined the selection criteria on which companies may or may not participate. But the main focus of the discussions of the results is inherent in the nature of the improvement process itself.

First observation is to discard the idea that the best result of the AAS does not allow us to bring more process improvement and consequently an increase in ROI. This is false, in first plane, because both AAS which were chosen have a finite number of predefined questions that do not cover all aspects of agile are involved in a software organization.

And also because the authors of this paper believe that the relationship between AAS and the ROI in the context of software process improvement has not a linear relationship.

In fact, there may be changes in the process which are so expensive that your return will be negative, i.e., the AAS score increases but there is a decrease in the final ROI.
Thus, the best result is obtained at the vertex of the parabola, but which companies are left or right of the vertex, which are near or far significantly likely to impact the final result. Probably the outliers should be identified and the taken off the sample.

B. Implications for Research and Practice

The implications of this work in the industry is able to provide organizations a quick way to assess their performance based on a quantitative indicator which is easy for be obtained.

Thus, even the goal of AAS is not being the rank of teams and individuals they could be used as guides for software process improvement within organizations.

In the research field the implication is to identify the usefulness of AAS as well as verification of alignment with SPI. The research result, whether positive or negative, open discussion about how it should be and what is the importance of a guide for improvements.

C. Limitations and Threats to Validity

In addition to the points raised in the discussion of results, others threats to validity are raised from the selected method which is the case study.

The first limitation aimed at this aspect is the no possibilities of indicating relation of cause-effect since the lack of control over the environment only allow describing the problem and not explain it. But this same phenomenon occurs only in real life industry, and it occurs in different way for each particular company, there is no other means to present a study about issue.

A threat identified is to validity is the amount of companies involved in the study. A number of small companies cannot bring the desired strength to the study. Another point also refers to the number of iterations evaluated in each organization. A small number of iterations can also disable the data of a particular company.

Another threat comes from the validity of the statistical method used in this work. The lack of previous attempts prevents to determine which type of method is most appropriate for conduct the case study. So the proposition of using statistic correlations may not be the best choice.

A final threat to validity identified is the way data are collected from the ASA. In the case of past events, important details may be forgotten. Another threat to validity is that these tests are susceptible to mood swings of an individual who may be positively or negatively influenced by external factors.

D. Future Work

If the correlation between AAS results and ROI results provides a strong correlation, both, linear and non-linear regression could be performed to identify the true relationship between the two variables. It is expected that the relationship shows itself as a non-linear. These regressions will be performed in each company individually, and they must be consolidated as well.

E. Acknowledgments

Célio Santana is a doctoral student at the Center of Informatics of the Federal University of Pernambuco where he receives the funding from the Brazilian National Research Council (CNPq), process #141156/2010-4. The authors thank CNPq for partially funding the participation in the Agile’2011 Conference.

REFERENCES


