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An Approach for Assessing Suitability of Agile Solutions: A Case Study

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Abstract. Dynamic market situation and changing customer requirements generate more demands for the product development. Product releases should be developed and managed in short iterations answering to the rapid external changes and keeping up a high quality level. Agile practices (such as the best practices in Extreme Programming and Scrum) offer a great way of monitoring and controlling rapid product development cycles and release development. One problem in product development projects, however, is how to apply agile methods and principles as a part of the complex product development. The purpose of this paper is to describe, how Agile Assessment was conducted in a case company in order to support product development and customer support improvement. During the experiment it was found that Agile Assessment is an efficient method to clarify what agile practices are suitable for the organization's product development and customer co-operation. Another finding was that the use of the best suitable agile practices would improve incremental development monitoring and traceability of requirements.

1 Introduction

Agile SW development and Agile methodologies (e.g. XP [1] or Scrum [2]), used to improve organization or project team ability to manage projects, have been widely discussed in literature [3]. Changing customer requirements, dynamic market situation and new technical challenges generate more demands for the product development [1]. Therefore, functional increments in the faster development cycle can be seen as one solution for the efficient product development. The purpose of Agile Project Management is to develop products based on customer demands, iteratively, simply and using the team experiences [4]. Incremental agile development with iteration planning [4] and Post-Iteration Workshops [5] offers the practices for monitoring the project status and for making sure that the customer requirements are obtained in the project. Many organizations have already utilized the agile methods

and principles in their SW development [3, 4]. However, only few organizations can take a specific agile method (e.g. XP) and use it as such. The purpose is rather to apply the best agile practices as a part of the organization's current SW development practices [6]. This would need evaluation which charts the areas of the improvement of the organization's current SW development mapping with the most suitable agile practices. This is the starting point for our study on defining an Agile Assessment Approach. Agile Assessment is SW development evaluation which is done in agile way, focusing on finding the most suitable agile practices for the SW development organizations.

The purpose of this paper is to describe the approach to Agile Assessment and practical experiences of Agile Assessment in Hantro. The goal is to find possibilities how to improve Project (PM) and Requirements Management (RM) processes of the case company with agile practices. This paper presents the empirical data from the case study and suggests an approach conducting Agile Assessment.

This paper is composed as follows: section 2 presents Agile Assessment Approach. The third section provides a description of the main results; what benefits the agile methods have and would bring to Hantro's product development, and what kind of experiences we got from Agile Assessment. The last section concludes the paper with final remarks and outlines for future actions.

2 Agile Assessment Approach

The agile community has widely reported the assessments of the agile SW development needs [7, 8]. Existent methods are, however, mainly focused on the metric data based comparison between the traditional and agile SW development. For example, Boehm and Turner present five agility factors (critically, personnel, dynamism, culture and project size) which affect the agile or plan-driven method selection [8]. The Boehm and Turner's model [8] provides a good starting point for agility evaluation but does not address any specifics regarding the application of an agile method. The main challenges for the organizations are still how to tailor agile methods as a part of the product development [6] and how to assess product development agility [8]. Agile Assessment provides a solution for these challenges.

Agile practices described in this paper include both agile principles and methods. The focus of the agile principles is customer satisfaction, rapid answer to changes and close co-operation with motivated business people and programmers. Agile methods (e.g. Scrum and XP) aim at answering the challenge of the rapid development and changing customer demands [8]. Typically, agile methods require close collaboration with the external and internal stakeholders including the processes that employ short iterative life cycles and self organizing teams [8].

The traditional assessments as well as an Agile Assessment is possible based on some well known assessment models (e.g. CMMI [9] or SPICE [10]). In fact, assessment models provide the principal requirement for the assessment planning. These models, however, lack the needed reference information for the agile based SW development efficiency evaluation [11]. One problem is that, even if the traditional assessment is often seen as an opposite to the agile thinking, the agile SW development should be

based on the best SW development practices. Simplifying does not mean not documented or not existence processes (e.g. the question of the CMMI 2 level achievement with XP development are recently argued in many studies [12, 13]). 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.

The agile assessment approach is based on well-known SW process improvement paradigms (e.g. QIP[14]) which have a strong theoretical and practical background in improving the project performance. Agile Assessment includes 1. Goal definition utilizing agile practices; 2. Interview planning based on agile practices; 3. Interviews and improvement analysis; 4. Improvement idea mapping with the best agile practices; 5. Workshops and learning steps (Figure 1).

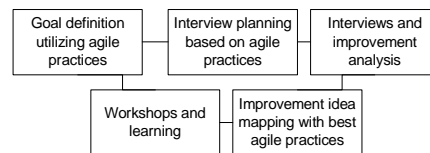


Fig. 1. An Agile Assessment Approach

Agile Assessment is started with the **goal definition utilizing the agile practices** (Figure 2). The first additional task of which, compared to the traditional assessment, is to define what agile methods and principles the organization already uses. Another point is to notice that the planning of Agile Assessment differences if the assessed projects are at high agility level. Maturity of the high agility level project could be difficult to define because the idealized list of the agile practices has not been proven to work. The goal of the agility evaluation is to examine how (and if) the project can be improved applying the agile practices. **The interviews are planned by studying the agile practices** (Figure 1) in the selected process areas (e.g. RM, PM). The idea is to use the agile practices as a basis for the “ideal” Agile Situation definition. **Interviews and improvement analysis** (Figure 1) are mainly developed using the traditional interviewing techniques. However, on Agile Assessment, the aim is to discuss possible agile practices and their using possibilities in the company. The “ideal” Agile Situation definition is used as background information in the improvement analysis. The purpose of the Agile Assessment is to find the improvement ideas and analyze how the projects can be improved by applying suitable agile methods for the assessed organization's current needs (Figure 1).

Table 1. PM and RM challenges that can be answered with Agile PM and RM [4]

Challenges	Agile Project Management Answers
Requirement changes	Priorisation in iteration planning
Unpredictable effort	Short scheduled iterations and technical excellence
Continuous innovation	If you want to innovate then iterate
Changing technology and architecture	Short iterations, innovative team, dynamic architecture, technical excellence
Complex documentation	Simplicity

Challenges	Agile Project Management Answers
Customer interface	Deliver customer value, deliver early benefits
Requirements traceability	Requirement status discussion in the end-of-iteration reviews
Risk management	Risk discussions in the end-of-iteration reviews
Project visibility	Status and requirement discussion in the end-of-iteration reviews

The analysis of most suitable agile practices resolving the problems requires much background information about the benefits of agile practices in different situations. In table 1, an example of the project and requirement management challenge “agile tool box” for the agile analysis is described.

The main results of Agile Assessment are defined in the **workshops** (Figure 1) where the best suitable agile practices are analyzed. The workshops can be prepared presenting possible problem solution alternatives in the organization's previous process descriptions and guidelines based on the agile assessment results. After Agile Assessment, the improvements and defined agile practices are prioritised and further analysed in the internal meetings. Suitable practices are piloted in projects the selection of which could be based on projects' agility.

3 Experiences and Key Findings

Hantro develops video technology for mobile devices to enable multimedia applications. Typically, product development to mobile devices includes the changing of operational environment and fast time to market that could be well supported with “agile thinking”. Hantro has been developing its embedded product development processes continuously for three years. Recently, agile principles and methods have been taken actively into account in the development work.

3.1 Focus of Agile Assessment

The purpose of Agile Assessment was to objectively bring out the most critical improvements in Hantro product development and customer integration projects. Another aim was to analyze, how the improvement ideas could be supported with the agile methods and principles. The scope of Agile Assessment was to evaluate the PM and RM in product development and customer integration projects and to define which agile practices would best support the Hantro RM and PM work in practice. Assessment was made for three projects which had a different agility level (Figure 2). In the evaluation, the Boehm and Turner agility dimensions were tailored based on our needs¹.

¹ Dynamic[many changes 1p-Stabile 5p], Size[Under 10/1, 10-20/2p, 20-50/3p, 50-100/4p, more 5p],Critically [Not critical 1p-Critical for human life/5p] Experience [more than 7 years/1p,3-7 years/2p, 2-3 Years/3p, 1-2 Years/4p, trainers/5p],Cultural [Based on agile principles 1p- traditional 5p])

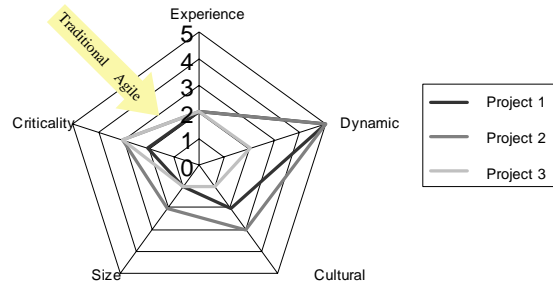


Fig. 2. The Agility of the Hantro projects according to the tailored agility dimensions [8].

One focus in Hantro Agile Assessment was to clarify the most suitable agile practices in diverse projects. Project 1 was customer integration project, project 2 developed an embedded product with new technologies, and project 3 developed product parallel with integration work for several customers. Project 1 did not use any specific agile methods. However, it used the simplified development and rapid short release iterations for customers. Project 2 had successfully used Rapid 7 [15] method in specification and documentation work. The project was quite stable and its agility was quite low. According to this evaluation, the culture and amount of change in Project 3 supported the agile principles best. (Figure 2). Information of the project's agility (Figure 2) can be utilized when selecting the projects for agile assessment and for the most suitable agile practice piloting. Agile Assessment was planned by comparing the agile and CMMI practices in PM and RM (e.g. Table 2).

Table 2. An example of the agile practice and CMMI analysis

CMMI	Agile principles	Agile Practices based on literature
SG 1 Manage requirements	Customer satisfaction,	User stories definition and analysis for subsequent iteration. Product and sprint Backlog requirements analysis.[1, 2]
SG 1 Establish estimates in PM	Short iterations	Project planning including the working tasks and schedule estimations for subsequent iteration.[1, 2]
SG 2 Develop a Project Plan	Short iterations	Schedule, risks, resources, needed knowledge and skills definition for the subsequent iteration.[1, 2]
SG 3 Obtain commitment to the Plan	Face-to-Face communication	Iteration planning and reviewing together with the relevant stakeholders [15]
SG 2 Monitor project against plan	Rapid answer to change	Checking of the previous iteration status in Mobile-D planning days [16].Information Radiators (IR) [1] in the task definition and monitoring

According to this analysis detailed requirement definition for each increment as well as the product backlog lists are the key activities in the agile RM. Agile PM includes, for instance, the increment planning and face-to-face communication with developers (e.g. Scrum daily meetings). The analysis of the agile practices (Table 2) worked as a basis for the Agile Assessment question (Table 3) creation and result analysis.

Table 3. An example of Agile Assessment questions

Agile Practices based on literature	Questions
Requirements and change requests definition for subsequent iteration.	<ol style="list-style-type: none"> 1. How iterative is the product development? 2. How are the iterations and release development planned? 3. How is the requirement changes analysed? 4. How are the requirements and change requests defined for each release?
Product and sprint Backlogs Short iterations. Project planning for subsequent iteration. Requirement status review for the previous iteration	<ol style="list-style-type: none"> 5. How often are the releases delivered? 6. How are the project tasks and effort estimations defined? 7. How are the tasks for each release selected? 8. How is the requirement traceability ensured? 9. Who participates in the task and requirement definition?

Agile Assessment included five interviews for project managers, developers and product manager. Hantro's quality management participated in all interviews and overall agile analysis. In the assessment result analysis, the improvement ideas were evaluated based on defined Agile RM and PM situation. In this phase, the agile solutions for the improvements were defined, lightly documented and analyzed in the workshop together with the interviewees and management. The main results of the analysis were the definition of the best agile practices that would be suitable and useful for Hantro product development and customer integration projects.

As a result of Agile Assessment, it was found that Agile Assessment offered the agile based solutions for improving the organization's PM and RM. It took about one month working effort (two weeks from Hantro and two weeks from VTT) but gave the objective ideas (both agile and non-agile solutions) how to start to improve product development and customer integration work. After Agile Assessment, the improvement ideas and defined agile practices were prioritised and further analysed at Hantro's process improvement meeting. The practices will be tailored to suit Hantro processes and piloted in suitable projects. Their deployment will be supported by quality management. New practices and their benefits will be discussed in post-iteration workshops [5]. If new practices improve PM and RM, they will be deployed in other suitable projects. Later, when the new practices have been taken into use, new Agile Assessment to relevant process areas will be organized.

In future, it would be interest to repeat the assessment resulting in the difference on improvements that happened so far. Other experiences of the agile assessment approach creation are unfortunately out of the scope of this paper. It will be, however, discussed, analysed as a part of the future agile assessment research.

3.2 Findings of Agile Assessment at Hantro

Hantro's research and development culture supports agile principles. Hantro has technically experienced development employees, who all work at the same site, when face-to-face communication is the preferred way of communication. Project teams are relatively small in size and team members and teams seem to be co-operative. Specification workshops, using Rapid7 method, have improved the communication between the HW and SW teams in product development (Table 4). Close cooperation

with the business department and sales ensures taking the latest needs for change into account. Working releases are delivered to customers in short cycles. Requirements are specified on a proper level in the beginning of the project. Change requests are handled with change management flow. Dynamic architecture facilitates concurrent product development and integration work. Hantro has also effective quality monitoring practices. Quality audits before releases and at the end of the projects ensure the quality of the delivered releases and final products. Key findings of the agile assessment were improvement ideas that could be supported with certain agile practices. At Hantro, PM and RM are mostly done with traditional methods, where selected agile practices could bring some benefits. Improvement ideas were focused on incremental project monitoring, risk management in co-operation with customer, and requirement traceability (Table 4).

Table 4. An example of the agile practice findings at Hantro

Improvements	Expected benefits of the agile practices for Hantro
Release planning in incremental development	Dynamic release plan (which is updated in co-operation with the product management, programmers and customers for the subsequent release iteration) answers in the challenge of the rapid change demands.
Project and risk management in incremental work	The iteration planning and post-iteration workshop meetings would make the project monitoring more effective. Risk identification and monitoring for each development increment would improve the risk management.
Requirement visibility and traceability	Use of the product backlog list would improve the requirement visibility (requirement status easy to find, requirements in the same place). Requirements definition and prioritisation for subsequent iteration and requirement status checking in post-iteration workshop would strengthen the requirements traceability.
Continue documentation team work	Specification workshops with Rapid7 method has already improved the communication between the both HW, SW and system and testing groups in embedded product development

The first improvement idea was to systematize the iterative release planning. For example, in XP [23] a customer defines user stories that are built for the next release. Programmers estimate the task efforts, communicate with the customer about technical risks and measure the progress to provide the customer a budget. The release plan is updated at the beginning of each increment. In Hantro's customer projects, releases were planned as a part of the contract. In the evaluated projects, release plan could not, however, answer to the challenges that new customers and technical requirement changes bring to projects. The solution proposal would be to create a product release plan which is updated in the increment planning meetings where developers would estimate the task effort for the changes and discuss the technical risks. (Table 4).

The second improvement idea was to emphasize iterative project monitoring and risk management. It could be done using, for example, the Mobile-D [16] where the status of the requirements, tasks, effort estimates and risks are discussed for the subsequent iteration in the iteration planning meetings. The third improvement idea was to improve the visibility and traceability of requirements. This could be done using iteration backlog lists in focusing the requirements for the subsequent release iteration or to checking the requirement status in the iteration planning meeting.

Agile assessment provided an analysis of what agile practices could fit the Hantro environment. At the moment, Rapid 7 method for the embedded product specification

has already been successfully used at Hantro. Unfortunately, empirical data on the other agile practices actually used in Hantro does not yet exist. Agile analysis was, however, the basis for process description updates and most of the proposed solutions will be tailored best to suit Hantro's working environment and current processes. According to an initial tailor plan, release plan will be a part of the project plan and it will be updated in connection with increment meetings. Increment reviews will be combined to milestone checks, where product management and possible external customer accept or give feedback about the release. To systematize incremental project management increment planning and post-iteration workshops will be combined and held internally after increment reviews. In addition, there will still be periodic project meetings and status reports. Requirements will be listed in an RM tool, where one parameter is a planned release to help incremental planning and status traceability. Implementation and piloting of the best agile practices in Hantro projects will require continuous support from quality management.

4. Conclusions and Further Study

Agile methods and principles offer tools to improve product management and development activities [1]. The purpose of agile practices is to answer the challenge of the dynamic market situation and late changes [8, 17]. The best suitable agile practices can be used to improve the workload estimations, product validation cycles and requirement change management time [1]. Only a few organizations can, however, use a certain agile method such as Scrum or XP as such. Rather, they may deploy the most suitable agile practices as a part of the organization's existing product development practices. An Agile Assessment is an approach that helps organizations to find the best suitable agile practices to improve a specific aspect of the SW development work. It does not take much work effort but provides an objective viewpoint and understanding of the needed improvements and available agile solutions.

The purpose of this paper was to introduce an Agile Assessment approach and to describe experiences and key findings from Agile Assessment work at Hantro. Based on experiences of the case study, the Agile Assessment is an efficient and objective way to find what agile practices would improve efficiency of working methods and what agile practices would fit the organizational culture and current working methods and environment. The findings of the case study support the assumption that the use of agile practices would improve project monitoring, risk management and requirement traceability in the incremental product development. The empirical data from the case study shows that the process assessment can be done effectively using close communication, rapid feedback, and simple documentation.

However, there is no experience available yet about validating the improvements in the assessed organization. Agile Assessment should also be researched using a deeper literature analysis of agile methods' view of agile suitability in different SW development processes and with more case study experiences from multiple organizations. One reason for this is that the existing study lacks important aspects of defining, how the specific agile methods and practices could be tailored in different

product development contexts. Also, it has not been defined earlier, how the assessment implementation can be done in agile way using the agile principles.

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