USABILITY OF AGILE METHODS IN SOFTWARE DEVELOPMENT OUTSOURCING: A SYSTEMATIC LITERATURE REVIEW PROTOCOL

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ABSTRACT: Agile methods are the mixture of iterative developments, with the set of best practices to easily handle software changes and increase client satisfaction. Agile methods offer is quick, active and responsive software development. It promotes adaptive planning, evolutionary development and delivery. However a number of factors can directly and indirectly influence the development projects in agile framework and adopting this methodology has a positive impact on both productivity and Quality. We have developed Systematic Literature Review (SLR) protocol as the first phase of SLR Methodology. To find out challenges in the adoption of agile methods in outsourced project. The expected outcomes of the review will be a list of challenges and motivators in the adoption of agile methods in outsourced projects.

Keywords: Agile methods, Software Development Outsourcing, SLR protocol

1. INTRODUCTION

Different methods and models have been introduced by researchers with the passage of time for software development. A software process can be considered as set of tools, methods and practices we use to produce a software product [1]. From the beginning different software methodologies have been introduced and used by the software engineering community [2]. In 1998, for the first time the word “Agile” was used in combination with “software process” [3]. Agile methods have become prevalent since the Agile Manifesto emerged in the early 2001 as in response to the inefficiency of existing software development methods in rapidly changing environments [4]. “Agile means swift, active and responsive and this is what agile refers to” [5]. This method represents a major departure from traditional plan based approaches to software engineering [6]. Williams and Cockburn [7] state that agile development is “about feedback and change”, that agile methodologies are developed to ‘‘embrace, rather than reject, higher rates of change” [8]. The definition mentioned that agile methods are the mixture of iterative development, with set of best practices to cope software changes and increase client satisfaction. In recent years many organizations are moving toward adopting agile software development methods [9]. Accordingly, this is driven by the continuous need of developing better, quicker and economically efficient software solution which will also satisfy the clients’ needs [10]. Conventional software development methods are not too much efficient to convene with the speedy amendment in requirements and short iterations that are required for efficient product delivery [5].

The paper is organized as follow. Section 2 demonstrates background. Section 3 & 4 illustrates methodology; sections 5 & 6 discuss data extraction and synthesis. Section 7 describes conclusion and our vision for the future.

2. BACKGROUND

Agile methodologies, as a relatively novel concept to software engineering, are becoming popular in both industry and academia [11]. Quicker response is usually produced by the people involved using agile methodologies which in turns improves the overall system’s performance and speedup the development process [12]. Though the standardized modern practices, advanced tools and technologies have changed the development scenario but the industry is still unable to yield the successful growth being expected [13]. A number of researchers have worked on agile methodologies. Some of these include (Jeffrey et al. [14], Tore et al. [15], Ahmad et al. [5]).

- A survey, conducted by Jeffrey et al. [14], reveal that there is a significant correlation between successful methodology implementation receiving training on the methodology [14].
- Tore et al. [15] mentioned that developers were mostly satisfied with agile methods. Companies that were using XP (extreme programming) have reported that employees were more satisfied with the product. The findings regarding pair programming’s effectiveness were mixed. Several developers regarded it as an exhausting practice because it requires heavy concentration.
- A survey was done by Ahmed et al. [5] which showed that most commonly used methodology in Pakistan is Scrum, about 31% of the industry practices scrum or tailor version of 50% projects are don with “active stake holder participation”. There are number of factors that can directly and indirectly influence the development projects in agile framework, adopting agile development methodologies has a positive impact on both the productivity and quality.
- Tore et al. [15] articulated that agile software Development has had a huge impact on how software is developed worldwide, a 2005 survey of the US and Europe for example revealed that 14 percent of the companies were using agile methods and 49 percent of the companies aware of agile methods were interested in adopting them.
- Sutherland et al. [16] have used case study approach and have identified best practices of project management for agile teams in GSD environment. They have enhances the existing scrum methodology to a distributed scrum to be adapted by the organizations involved in GSD. Sutherland et al. [16] argue that although a lot of work has been done on outsourcing and GSD in isolation. However little attention
has been paid to the use of agile methods in outsourcing or GSD.

2.1 Agile Methods: A comparative study

Agile methods are a reaction to traditional ways of developing software and acknowledge the need of an alternative to documentation driven, heavyweight software development process [17].

Veerapaneni et al. [2] consider the agile technique as a family and reported several different methods include in this family

- eXtreme Programming (XP)
- Scrum
- Dynamic System Development Method (DSDM)
- Adaptive Software Development (ASD)
- The Crystal Family
- Feature Driven Development
- Test driven development (TDD)
- Traditional methodologies

Agile software development methods such as scrum and XP have been embarrassed by many software companies because of their light weight nature [18]. The novelty of XP is based on the way the individual practices are collected and lined up to function with each other [19]. XP is successful because it stresses customer satisfaction and allows the software developers to confidently respond to changing software requirements even late in the life cycle [2].

Scrum is an empirical approach applying the ideas of industrial process control theory to software development resulting in an approach that reintroduce the ideas of flexibility, adoptability and productivity [2]. Hossain et al. [20] have identified 7 challenging factors in total while using scrum methodology in global software development environment.

The fundamental idea behind BSDM is that instead of fixing the amount of functionality in a product, and then adjusting time and resources to reach that functionality [2].

Adaptive Software Development (ASD) was designed for projects that are characterized with high speed, high change, and uncertainty [2].

The crystal family of methodologies includes a number of different methodologies for selecting the most suitable methodology for each individual project [2]. It is a toolkit of methodology elements that organizations combine into methodologies to suit individual projects, with crystal methods organizations only develop and use as much methodology as their business needs demand [14].

Feature Driven Development was made for bank projects, which require an iterative that was both easy to use and provided accurate progress reporting [14]. It is performed in five steps.

Test driven development is an approach to software to software development in which tests are written first then the actual development is done in iterations on the basis of those tests [21].

Agile differs from traditional of waterfall development process in two ways: Agile methods are adaptive rather than predictive. Agile methods are people oriented rather than process oriented [18, 22, 23].

2.2 Research Questions

The following research questions were formulated:

RQ1. What are the challenges, faced by outsourcing vendors, in adoption, execution and governance of agile methods in outsourced projects?

RQ2. What are the factors to be considered by outsourcing vendors, for successful implementation of agile methods in outsourced projects?

RQ3. What are the practices, as identified in the literature, to be adopted by outsourcing vendors for successful implementation of agile methods?

3. CONSTRUCTING SEARCH TERMS FOR SEARCHING

3.1 Trial Searching

Details on the course of these steps are described in the following subsections. The following details will help in designing a search string relevant to our research questions.

POPULATION: Agile Software Development Methodologies, Software outsourcing vendors

INTERVENTION: Challenges and success factors

OUTCOME OF RELEVANCE: Adaption of Agile Software Development Methodologies in Outsourcing projects.

Experimental Design: SLR, Exploratory study, Case Study, expert opinions

An Example of the research questions containing the above details is:

RQ1: [What are the challenges?] Intervention [Implementation of agile methodologies in outsourced projects] Outcome of relevance

3.2 Search Strategy

3.2.1 Trial Search

A trial search will be conducted using the following search string using ACM and IEEEExplore digital libraries.

(“Agile software development” OR “Software development using agile methods”) AND (“Challenges OR Barriers OR Issues”)"

The paper(s) retrieved through this search string will be used as a guide for the development and validation of the major search terms.

3.2.2 Identifying the search strategy

The following search strategy is used for the construction of search terms.

(a) Use the research questions for the derivation of major terms, by identifying population, intervention and outcome;

(b) For these major terms, find the alternative spelling and synonyms;

(c) Verify the key words in any relevant paper;

(d) Use the Boolean operators for conjunction if the database allows, in such away, to use ‘OR’ operator for the concatenation of alternative spelling and synonyms whereas ‘AND’ for the concatenation of major terms.

(e) The modified form of Search Strategy for Research Questions.
4.1 Inclusion Criteria
- The inclusion criteria we use to determine which piece of literature (papers, technical reports, or gray literature etc) found by search string(s) will be used for the data extraction. Only those papers will be included having described outsourcing/distributed development using agile methods and fulfill the following criteria.
- Studies that describe agile methods (e.g. Scrum, XP, etc)
- Studies that have comparative studies of agile methods
- Studies that describe challenges/risks/def-motivators in agile methods
- Studies that describe motivators/success factors in agile methods
- Studies that illustrate agile methods implementation processes
- Studies about factors in implementations of agile methods
- It should be noted that those publications will be selected which are written in English Language.

4.2 Exclusion Criteria
The papers having the following criteria were excluded
- Papers that do not have agile methods descriptions
- Literature which do not have empirical study of agile methodologies
- Papers do not have discussion agile software development methodologies
- Publications which were not written in English were excluded

4.3 Selected Primary Sources
Initial selection of the primary sources will be performed by reviewing the title, keywords and abstract. The purpose is to exclude/ignore only those results which have no relevance to the problem/research questions. The primary sources chosen in the initial selection process will be checked against the aforesaid inclusion/exclusion criteria by reviewing carefully through full text of the studies. The source will be sent to the secondary reviewer, for review in case of any uncertainty regarding the inclusion or exclusion decision.

4.4 Publication Quality Assessment
The measurement of quality is performed after final selection of publications. The quality of publications is assessed in parallel at the time of data extraction. The quality checklist contains the following questions:
1. Is it clear how agile methodologies was measured/evaluated in software outsourcing projects?
2. Is it clear how the adoption of agile software development is difficult in outsourcing projects?
3. Is it clear how the factors for enhancement and improving agile methodologies were identified in outsourcing projects?

Each of the above factors will be marked as ‘YES’ or ‘NO’ or ‘Partial’ or ‘N.A’. A secondary reviewer will score a small subset for validation.

4.5 Define Paper Quality:
Based on our predefined criteria for publication quality we will analyze the results based on the proposed categories as listed below. The criteria settled below are based on our own experiences and discussions with other colleagues. However researchers can define their own criteria, based on their requirements.

1. Criteria for A-Quality papers:
In this category we list those papers which fulfill the following criteria’s:
1.1 Paper published in impact factor Journal
1.2 Having clear methodology
1.2.1 Having sample size of the following condition
   a. Case Study ≥ 3
   b. Interviews ≥ 12
   c. Survey ≥ 50
   d. Literature Review ≥ 50
2. Criteria for B-Quality papers:
In this category we list those papers which fulfill the following criteria’s:
2.1 Paper published in well reputed conference
2.2 Having clear methodology
2.2.1 Having sample size of the following condition
   a. Case Study = 2
   b. Interviews: ≥ 5 and ≤ 11
   c. Survey: ≥ 30 and ≤ 49
   d. Literature Review: ≥ 30 and ≤ 49
3. Criteria for C-Quality papers:
In this category we list those papers which fulfill the following criteria’s:
3.1 Experienced reports/ articles, published in less reputed venues (Journal, Conference)
3.2 Having clear methodology
3.2.1 Having sample size of the following condition
   a. Case Study: 1
   b. Interviews ≤ 5
   c. Survey: ≥ 1 and ≤ 29
   d. Literature Review: ≥ 1 and ≤ 29

5 DATA EXTRACTION STRATEGY
The review will be undertaken by a single researcher, who will be responsible for the data extraction. A secondary reviewer will be approached for guidance in case of an issue regarding the data extraction. The inter-rater reliability test will be performed after the data extraction process by the primary reviewer. The secondary reviewer will select few publications randomly from the list of publication already chosen by the primary reviewer. The secondary reviewer will independently extract the data from the randomly selected publication. The results will then be compared with the results produced by the primary reviewer.

6 DATA SYNTHESIS PROCESS
The extracted data will be synthesized with the help of secondary reviewer. The extracted data in the data extraction forms will be merged together to form different groups. Each group will be given a unique name. These groups will be further reviewed and merged together to find the refined list of challenges in the agile methods. The frequency for each of the group name (factor/challenge) will be documented. A similar format will be followed as we did in our previous research for SLR synthesis [24, 25].
For the Research Question1, the data will be synthesized by creating one summary table having the columns (S.No, Challenges, Frequency, Percentages) showing the list of all the challenges along with their frequencies and percentages. The complete detail of every challenges mentioned in the Summary table will be recorded in a separate table which will hold the following columns (challenge group name, S.No of reference, challenges subgroups, Paper reference/Paper title).
For the Research Question2, the same process will be performed as for the RQ1 mentioned above.

7. CONCLUSION
In this paper we discussed our study plan in the form of SLR Protocol for usability of agile methods in outsourcing. We are in the process of implementing this protocol and the finding of the systemic review will shed some light on the challenges involved in the implementation of agile methods in outsourced software development projects.

8. REFERENCES