

Towards applicability of agile software development methodologies

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Abstract – Agile software development has been an active research area for more than a decade. Nevertheless, straightforward application of agile methods in real practice is hampered by some challenges which need to be resolved both by academia and industry. One of the biggest issues in this respect concerns the lack of structured guidelines for application and deployment of agile methods and techniques. Usually this is performed in an ad-hoc manner, depending on the particular project that is being executed. In this paper we present the initial framework of our ongoing research work on empirical research of applicability of agile software development methods and how to develop a methodology for their deployment.

Keywords – Agile software development, Organizational values, Software processes, Software engineering.

I. INTRODUCTION

Recently in software engineering emerged a trend in research of how to organize the development efforts (in terms of design, programming, testing, etc.) in order to receive predictable results within time and budget limits of the organization. In this respect, the software processes define different kinds of activities, artifacts, roles, etc. needed for successful execution of a software development process.

A classical example for software development process is given in [6]. In this case, activities that software developers should undertake when building software intensive systems, are rigorously divided into five core workflows: requirements capture, analysis, design, implementation and testing. However, real practice has shown that the multitude of strict and formal procedures of classical process, in many cases put an extra burden and actually impedes software development. An alternative of such strict and formal processes are agile

processes and methods for software development [7]. The latter do not insist on strict policies or planning of the software development process from long term point of view. Instead, they focus on collaborative work between members of the development team and on adaptability of process to the specific needs of the project during life-cycle. Moreover, agile methods put focus on availability of executable software and interaction with stakeholders.

Generally speaking, in order to define a software development method as agile, it should conform to the main values and principles of the so-called agile manifesto [8]. This has been an active research area for more than a decade and it is still a hot topic to work on [1], [2]. The reason for that might be found not only in its potential to overcome the shortcomings of the traditional methods of software development, but also in the wide acceptance of its principles and techniques from the industry [1], [2], [3], [4]. Referring to some recent industrial reports [3], [4], the tendency towards the increasing number of organizations, interested in or already adopting agile methods and practices, is strong and is likely to stay for the coming years. Therefore, the research in this field has both the potential to impact significantly the software development industry and the perspectives for a promising future.

There are many challenges to be addressed in regard to agile software development [1], [2]. Some of them address development of new methodologies, practices and tools to support application of the methods. Others, which are the main interest to us, touch the topic of successful adoption and assessment of agile methods and practices [2].

In this paper we are going to present the initial framework of our ongoing study on empirical research of applicability of agile software development methods. This study should end up with development of a methodology for deployment of agile methods in particular software development companies.

The remainder of the paper is organized as follows: Section 2 describes the motivation that backs our research efforts; Section 3 presents our ongoing research work in applicability of agile software development methods; Section 4 presents the research that directly relates to ours and finally, Section 5 concludes the paper and states the main directions for further research in the area.

II. MOTIVATION

The main motivation of our work is to raise the opportunities for application of agile methods, specifically in Bulgarian companies.

Main principles and values that serve as a basis for agile methods are focused on software development in a concurrent

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business environment. Projects in such environment usually have very fast-changing requirements and limited time for implementation and deployment of the final software system. This way, the final goal of agile methods is to improve organizational processes and to maximize both the profit and the quality of the product. One of the last industrial surveys [9] about applicability of agile methods, made by VersionOne in 2010, points out that software development time is decreased in 66% of the cases, when agile methods are applied and only 5% of the projects suffer from increased development time. Moreover, 87% of the participants in the same survey claim that agile methods has improved management of the dynamic and changing user requirements.

Despite the obvious advantages of agile methods, the problem of low level of reuse in their deployment hampers the broad applicability of this approach [10]. It is very common to adapt the development method (or process), according to the specifics of each software project, even within the same organization. Besides this, the adaptation is made in an ad-hoc manner without well-defined approach and rules. To summarize – deployment of agile methods is a tedious task and is determined by factors as: previous experience, skills and knowledge of individuals. This way many authors in the community identify the need of structural approach towards the knowledge, used in agile methods deployment as a challenge that requires a lot of research efforts [11].

In next sections we present our approach towards solving the problem specified above.

III. A PROPOSED METHOD FOR RESEARCH IN APPLICABILITY OF AGILE SOFTWARE DEVELOPMENT

In our research work we are focusing on examination of current state of the art and improvement in applicability of agile software development methods in Bulgarian companies. For this purpose we focus on and make the so-called notion of *organizational value* a main driving force for adoption of agile methods and techniques (fig. 1). Organizational values are usually defined as *latent constructs that refer to the way in which people evaluate activities or outcomes and in the same time they drive and regulate both means and ends of the organization* [12], [13].

Organizational values, as a core cognitive element of the organizational culture [7], have been studied in the context of agile software development. As stated in [14], a main driving force towards successful adoption and deployment of agile methods in a wide number of companies is to focus on understanding and appreciating the relation between organizational culture (including organizational values) and agile methods.

In order to achieve this, we plan to undertake the following steps:

- I. Develop a new organizational classification technique, and adapt it, in order to reflect the power of organizational values in driving and justifying organizational behavior;

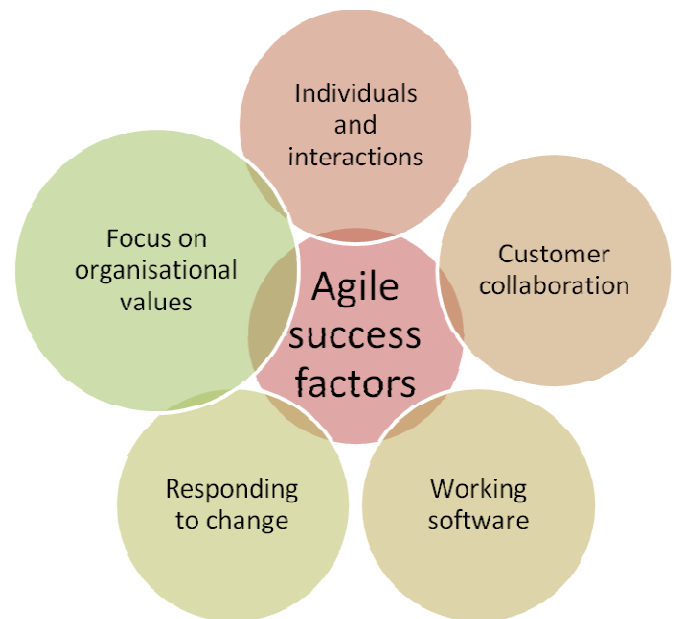


Fig 1: Importance of organisational values in succesful deployment of agile methods

- II. Develop a new method for building organizational culture, based on strong organizational values, which includes:
 - A predefined set of formalized and widely applicable organizational values.
 - A repository of organizational metrics, which is applicable in the context of software engineering and associated with concrete organizational values from the aforesaid set.
 - New techniques for the selection, prioritization, propagation and monitoring of organizational values.
- III. Develop a new structured method for the selection, introduction and evaluation of agile methods and practices, based on organizational values.

To be able to apply our approach to the Bulgarian software development sector we plan to carry empirical research as suggested by [15], [16]. This way we should inspect the real situation in software development industry, by executing the following activities:

 - Develop of a structured questionnaire to assess the extent of applicability of agile methods in each organization.
 - Develop a questionnaire to assess the organizational values of each organization.
 - Conduct the survey into appropriate number of Bulgarian software development companies.

Results of the surveys will be used to define metrics for organizational values and their correlation with deployment of agile methods in particular companies. This way, software development organizations will become able to measure the effectiveness and agility of their development methodologies. It will also become possible to improve methods within the organization and to assess the benefit and the extent of this improvement.

Together with this, the impact of organizational values over the behavior of a given organization should also be assessed. In order to do so, appropriate indicators for organizational values should be defined. Here we define an initial list of such of organizational indicators, which is shown in Table I.

TABLE I
ASSESSING THE POWER OF ORGANIZATIONAL VALUES

	Organizational indicator
I1	Number of organizational values, explicitly stated;
I2	Variety of organizational values, explicitly stated;
I3	Number of organizational metrics continuously measured and associated with concrete organizational values;
I4	The acceptance of organizational values by stakeholders;
I5	The percentage of organizational decisions aligned and consistent with the organizational values;
I6	Continuous organizational assessment of organizational behavior based on the level of adherence to organizational values;

IV. RELATED WORK

The next research direction that relates directly to ours concerns successful adoption and assessment of agile methods and practices. There exist a number of frameworks that address this particular challenge and some of them are briefly described in [5]. They include Agile Adoption Framework, Agile Software Solutions Framework, Objectives, Principles and Practices Framework, and some industrial instruments as Comparative Agility and Thoughtworks Agile Assessment Survey. These frameworks and tools have defined organizational agility as the degree to which an organization adheres to a specific agile method or a set of practices. As a result, their approach to agile software development adoption and assessment is driven by the motivation to apply as much as possible in terms of existing agile methods and practices, leaving organizational values aside.

Another related research direction concerns Adapting and tailoring agile methods and practices to best fit the organizational and project context. For example, in [17], the authors try to answer the question of *how are agile software development methodologies adapted for use in different contexts* and provide prescriptions for adapting agile development methodologies? This work, describes various sources of agile structures and examine how different structures affect organizations, project outcomes and etc., together with how individuals influence agile methods and practices. In [18], an approach for situational engineering of agile methods is proposed. It is based on current organizational knowledge in adopting agile practices in both internal and external projects. The approach also introduces a knowledge-base that supports the selection of agile practices that are suitable for a particular project. Further, the paper also presents how automated generation of appropriate software development process could be made. However, both these

works do not take into account how organizational values affect agile software development.

In our research we are going to focus on typical organizational values as a driving force for application of any kind of process, including agile methodologies.

V. CONCLUSION

Agile software development has proved to be an appealing alternative to classical software development processes. However, the lack of structured guidelines for application and deployment of agile methodologies appears as a serious obstacle in their adoption in industry. Usually this is performed in an ad-hoc manner, depending on the particular project that is being executed. In this paper we set the background directions of ongoing efforts in measuring, improving and streamlining the applicability of agile software development methods. The research will be based on a massive empirical survey of agile adoption in Bulgarian software development companies. The survey will use appropriate indicators in order to assess the impact of organizational values over the behavior of Bulgarian companies.

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