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Procedia Computer Science 104 (2017) 43 – 50

Procedia Computer Science

ICTE 2016, December 2016, Riga, Latvia

Method for Adaptation and Implementation of Agile Project Management Methodology

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Abstract

Agile methodologies are widely implemented and used around the world. There are over 20 different agile methodologies and their types. Choosing and adaptation of the methodology depends on project types, company and its employees. Employee characteristics, their mutual relations and motivation is one of aspects that can seriously impact success of the methodology implementation. So, these factors also need to be evaluated and considered during the adaptation of methodology. The purpose of this paper is to introduce a method for adaptation and implementation of the agile project management methodology according to the project team specific. The proposed method includes the best practices from change management, methodology adaptation and implementation and uses sociometric and motivation research methods. The method is evaluated with industry case study.

Peer-review under responsibility of organizing committee of the scientific committee of the international conference; ICTE 2016

Keywords: Agile project management; Agile adaptation; Sociometric methods; Restructuration

1. Introduction

Lot of projects fails because of the low project maturity level[1] so it shows that well-defined and tailored PM methodology is needed for the enterprise. Implementation of an agile project management (PM) methodologies is one of top trends of the software development process restructuration[2]. Different applications of the agile PM methodologies have been attempted since publication of an agile manifesto and different researches have been performed about successful or failed implementation (e.g. [3,4]). The success factors of the agile PM methodology

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Peer-review under responsibility of organizing committee of the scientific committee of the international conference; ICTE 2016
doi:10.1016/j.procs.2017.01.055

implementation have been related to people factors, training, customers, team (size, capability, motivation), company culture, planning, scheduling, etc.[5]

There are wide variety of the different agile methodologies and their types. Some of popular and often analyzed in literature are Scrum, extreme programming, Kanban, lean software development, feature driven development, agile unified process, dynamic systems development method (DSDM) and others. The agile methodologies try to define following disciplines: PM, project life-cycle, team management, engineering and delivery[6]. Not all methods cover all disciplines. For example, DSDM describes all disciplines but Scrum only team management and project life-cycle. Focus to the team management and it importance is in all agile methodologies. Without effective and self-organized project team, composed of empowered and motivated individuals, implementation of the agile methodology has been challengeable[7, 8] . Other success factors of the agile software development have been related to organizational, people, process, technical and projects factors[9,10].

Implementation of methodology includes following steps: identification of appropriate methodology, identification of enterprise specific requirements, adaptation and implementation of methodology[11]. The adaptation of the agile PM methodology has been widely analyzed with different focuses. Approaches that can be used for the adaptation of the agile PM methodology vary from agile specific[12] (e.g. [13,14,15,16, 17]), software development specific[18] to general engineering methods[19]. Adaptation has been done by identify roles, practices, artefacts and processes that need to be suitable for current situation. Situation is identified with different factors related to team, internal and external environment, objectives, maturity levels and previous knowledges[12,20]. As team factors are analyzed size, distribution, turnover, previous cooperation, good cooperation, domain/tool/technology/process knowledges[20]. Aspects of the project team such as internal relationships and motivation have not been reviewed in existing adaptation methods of the agile PM methodology[21] has been recommended to be prepared to tailor the processes to each project team. Therefore, as the purpose of this paper is to introduce a method for adaptation and implementation of the agile PM methodology according to the project team specific. The proposed method includes the best practices from change management, methodology adaptation and implementation and uses sociometric and motivation research methods for analysis of employees of the project team. Main contribution of this method is integration of internal relationships and motivation of the project team in the adaptation process of the agile PM methodology with target to improve team effectiveness and seft-organization. Evaluation of the proposed method has been done with the case study research in IT company.

The rest of the paper is structured as follows: Section 2 presents an overview of the proposed method. Case study is described in Section 3. Conclusion and future work is presented at the end of the paper.

2. Method

The proposed method for adaptation and implementation of the agile PM methodology based on the best practices in change management, methodology adaptation and implementation, and uses sociometric and motivation research methods. Process of method development based on the design science research[22] including problem identification, design of the proposed method and evaluation with the case studies. An overview of the method has been given in Fig. 1 and detailed review of the phases is further in this section.

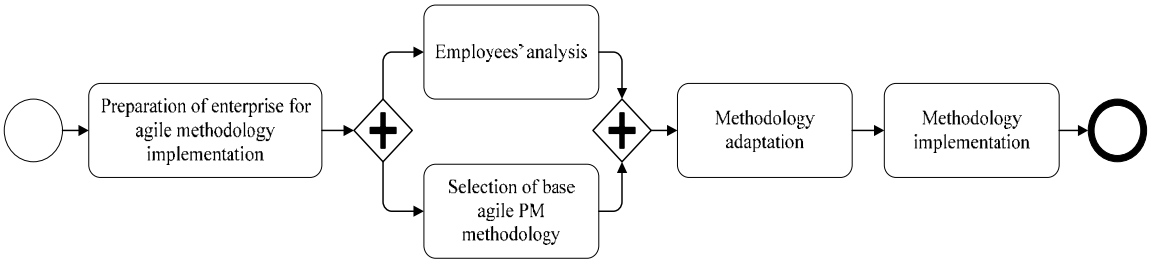


Fig. 1. Overview of basic method phases.

2.1. Preparation phase

The preparation phase helps enterprise or the project team to prepare for methodology change. Implementation of the agile PM methodology includes changes in physical processes and also in thinking of employers[23]. Each employer involved in change process need to be persuaded about abilities of the agile PM methodology and it usefulness in achieving of the project goals. One of the recommended restructuration method for preparing to implementation of the agile PM methodology is *ADAPTing* that includes following steps: Awareness, Desire, Ability, Promotion and Transfer[24].

2.2. Employees' analysis phase

The employees' analysis phase gives information about employees' motivation, interpersonal relationships, micro groups, formal and informal leaders and the possible agile methodology roles. The employees' analysis based on two methods: sociometric and motivation. The sociometric method[25] uses survey that focusses on quantitative measurement of interpersonal relationships and analysis of small social groups. Survey fixes employees given advantages to one of the other team member in given situation (formal and informal). The motivation research method also uses survey to analyze motivation factors and problems based on a Maslow hierarchy of needs[26].

Both methods follow basic steps for surveys[27]: preparation, data collection and data analysis. Full process has been given in Fig. 2 and detailed description of surveys and analysis has been provided in[28] . Tailoring of the questions to current situation and survey design has been done during the preparation steps. The data collection can be done with different survey types but one of recommendation is to explain survey location and circumstances for participants[27]. The sociometric data analysis includes design of sociomatrices[29] and sociogramms[29,30], calculation of different sociometric indexes[31,32] and analysis of internal relationships groups and origin of it structure using the social network analysis[33]. Summary of methods used for the sociometric data analysis has been given in Fig. 3. The motivation data analysis identifies groups of motives (transformation, communication, utility-pragmatic, cooperation, competition and achievement) based on Maslow hierarchy of needs[26] from responder answers and analyzes reasons.

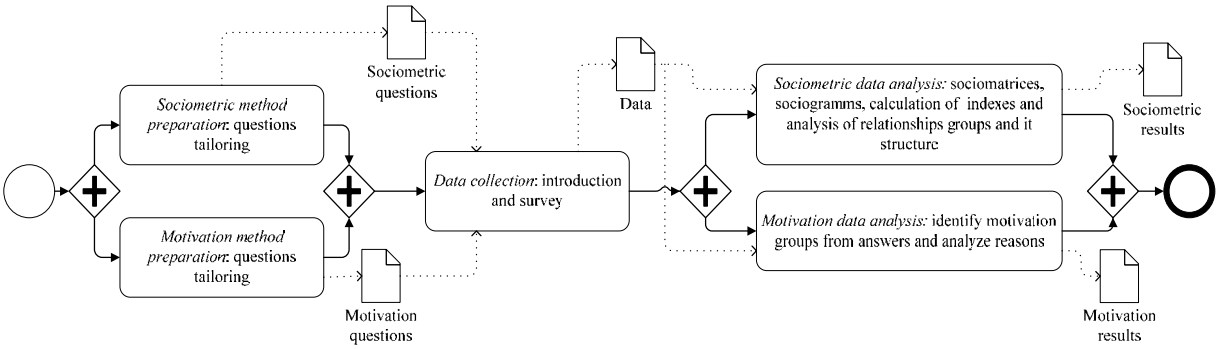


Fig. 2. Overview of the employees' analysis phase.

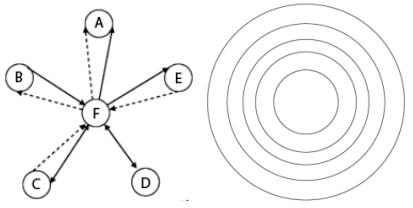
2.3. Base agile PM methodology selection phase

During the base agile PM methodology selection phase chooses the existing agile PM methodology that are the most suitable for enterprise based on characteristics of enterprise, team and project. In most cases is easier to choose existing methodology and adapt it then create own methodology. Existing methodologies have already been applied on different projects so it advances and disadvantages in different situations have been known. There are different existing methods/guidelines for selection of the PM methodology that can be used in this phase[34,21]: McConnell[35] etc.

Mutual relation index $= \frac{R}{N-1}$	Calculated depending on the number of mutually positive choices (R) and count of respondents (N).
Group cohesion degree $= \frac{P}{((N-1)/2)}$	Calculated in accordance with number of mutual positive choice pairs (P) and count of respondents (N).
Group integration index $- \frac{1}{S}$	Calculated in accordance with number of respondents who do not receive any choice (S).
Intragroup consolidation index $= \frac{R*(1-(\frac{d}{N-1}))}{U*(\frac{d}{N-1})}$	Calculated in accordance with number of mutual positive choice pairs (P), number of unilateral choices (U), number of choices permitted to be made by one respondent (d) and count of respondents (N).
Referral index $= \frac{P}{A}$	Calculated in accordance with number of positive choices (A) and number of mutual positive choice pairs (P).

		Respondent (to)		
Respondent (from)		1	..	N
1				
…				
N				
Number of received choices	C^+			
	C^-			
Total	C			

Sociometric matrix



Sociogramm

Target sociogram

Fig. 3. Methods for analysis of sociometrics data.

2.4. Methodology adaptation phase

The methodology adaptation according to requirements of project and team will help to get better results of methodology implementation[21]. During the methodology adaptation phase (see Fig. 4) conflicts between the selected methodology and enterprise principles or employees' characteristics have been analyzed and needed adaptations of the methodology have been implemented. Following elements of the agile PM methodology are need to be analyzed during the adaptation phase: roles, artefacts, processes and practices.

Adaptation of the agile roles can be organized in three ways: reorganizing existing roles to agile roles; add agile roles to existing roles and adapt agile roles to existing roles[36]. Before new role implementation, need to carefully examine chosen role and it implementation possibilities[5]. Similar adaptation approach is used also for artefacts, processes and practices. There are different existing methods/guidelines for adaptation that can be used[12-20] etc.

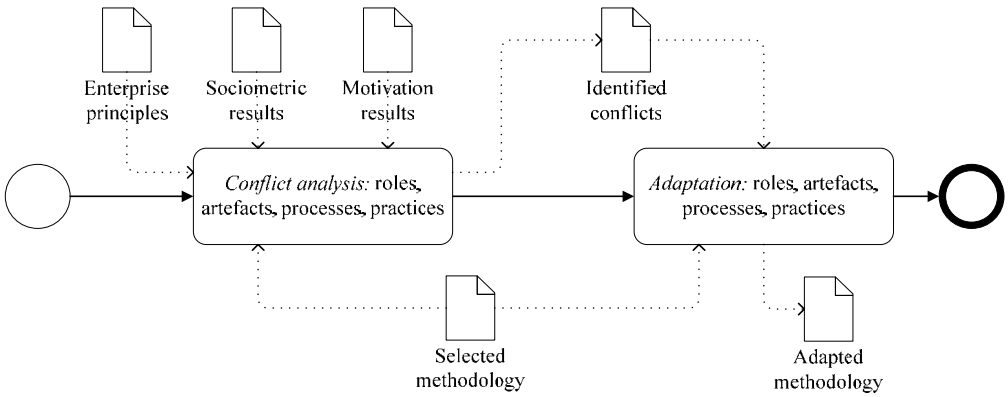


Fig. 4. Overview of the methodology adaptation phase.

2.5. Methodology implementation phase

The methodology implementation phase (see Fig. 5.) ensures methodology implementation according to the chosen implementation model: start small or go all in and with public display or stealth[24]. For successful implementation of new methodology is recommended to follow Deming cycle[37] or ShuHaRi principles[38] that helps in quality improvement of the implementation process.

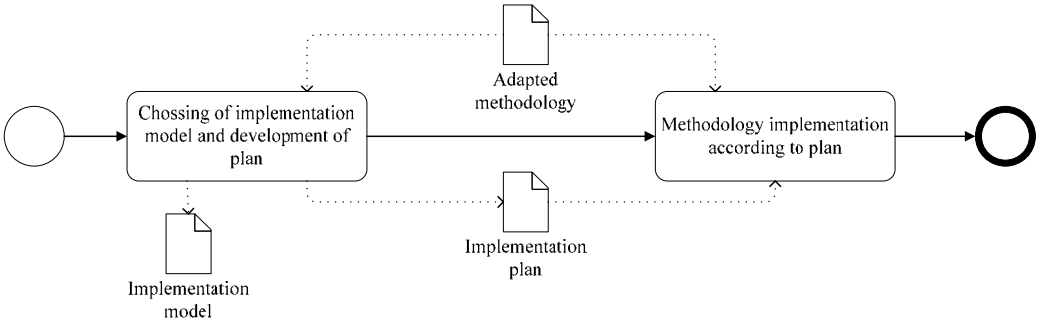


Fig. 5. Overview of the methodology implementation phase.

3. Case study and evaluation

The proposed method has been implemented and initially evaluated with one industry case study. The case study has been done in IT company with average team size 10-15 employees. The agile development ideas with some Scrum PM methodology elements have been used in company before the case study but no well-defined methodology. Detailed description of the case study process and results is further in this section.

3.1. Case study design

Adaptation and implementation of the agile PM methodology has been organized according to the proposed method. Scrum methodology has been chosen as the base PM methodology. The employees' analysis has been done (before results in Fig.6.) and following adaptations have been added to Scrum methodology:

- Based on the enterprise principles: 3 new artefacts (tender, business requirement, test scenarios), 3 roles (business owner, stakeholder, analyst), 2 processes (requirements analysis, risk management) and 2 practices (planning poker, Kanban board)
- Based on results of the employees' analysis: 1 role (project manager), 2 processes (personal retrospection, motivation events) and 1 practice (pair analysis/programming/testing)

The detail description of the employees' analysis and the methodology adaptation of the case study is beyond the scope of this paper and additional details are provided in [28]. The chosen implementation model was go all in with public display. The implementation time was 8 weeks or 3 sprints.

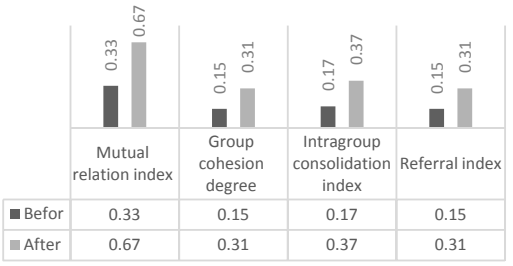
Evaluation of usage benefits of the adopted agile PM methodology has been done 6 months after implementation based on two types of data:

- Changes in the results of the employees' analysis with target to evaluate if the employees' analysis related adaptation of the agile PM methodology gives improvements for team member relations, self-organization and motivation. The second employees' analysis has been performed for the same core team and results have been compared with the results of the first analysis
- Changes in project performance statistics with target to evaluate benefits of well-defined and the project team tailored agile PM methodology. The project performance statistics have been collected and evaluated for four

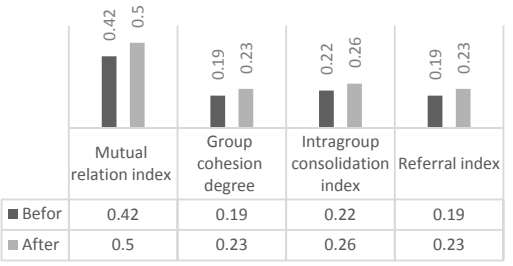
projects (3 before and one with the new methodology) in three different views: number of development tasks vs. bugs, the risk analysis and number of meetings. Projects are similar and related to software development for one client. Only one project has been finished for chosen client during 6 months after implementation of the adapted agile PM methodology. Core project team is the same for all four projects and amount of work in projects is measured with count of tasks in project (see Fig. 7).

3.2. Case study result

Fig. 6 summarizes changes in the sociometric indexes in formal and informal relationships in the analyzed project team. Results showed improvements in all indexes but better improvement was in formal relationships. The project team is more oriented to formal relationships and more united that is good characteristics for self-organized team[8]. Result of the motivation research analysis showed improvements in six motivation factors where three of it could be related to the new agile PM methodology: improve their qualifications, sense of belonging and new challenges.



(a) Formal relationships



(b) Informal relationships

Fig. 6. Summary of changes in sociometric indexes (a) (b).

Number of development tasks and bugs has been analyzed with target to identify percentage of bugs in the projects. Result has been shown in Fig. 7 and decrease of the bug percentage has been appraised that is good result after implementation of the agile PM methodology. One of pre-requirement from the company owner of the PM methodology change was to improve risk management and communication (internal and external). Result of the risk statistics has been shown in Fig. 8a. that demonstrates increase in amount of the risk management, i.e., detailed risk analysis with more defined risks and risk responses. Of course, also more known risks have been raised because of detailed analysis. Similarly, the amount of communication has been analyzed in Fig. 8b that shows increase in amount of internal and external communication (about two times). Increase in amount of internal communication together with improvements in the sociometric indexes (especially the mutual relation index of formal relationships) shows improvements in team communication.

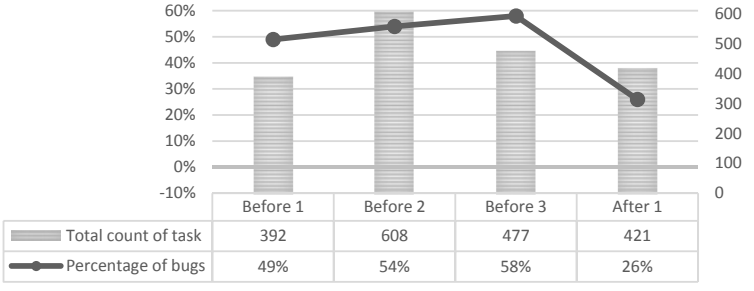
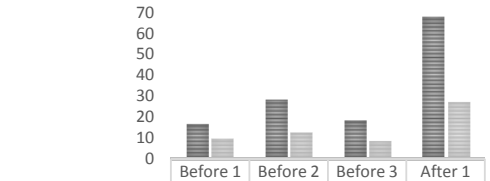
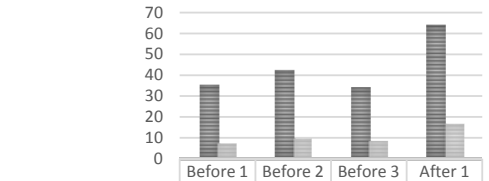


Fig. 7. Results of changes in amount of development tasks and bugs.



	Before 1	Before 2	Before 3	After 1
Number of defined risks	16	28	18	68
Number or risk responses	9	12	8	27

(a) Risk management quality



	Before 1	Before 2	Before 3	After 1
Total count of meetings	35	42	34	64
Number of meetings with client	7	9	8	16

(b) Communication amount

Fig. 8. Results of changes in risk management quality and communication.

4. Conclusions

Implementation of agile PM methodologies is related to improvement of development process: less bugs, faster delivery, more and effective communication, better quality, better risk analysis, less over costs etc. But analyzing results of existing researches have been concluded that there are lot of problems in the project team that may affect application of the agile PM methodology and successful implementation of the project. First of all preparation of team is needed before implementation of the new agile PM methodology. With the proposed method is possible to analyze the team structure and motivation and adapt agile roles, artefacts, processes and practices that are more suitable for the project team with target to improve team self-organization, motivation and effectives. Case study demonstrated in this paper is the first evaluation of the proposed method. Limitations of the proposed method are that it works for small team (10-16 personas) that have previous cooperation and the base agile PM methodology need to be chosen. This method doesn't include specific actions how to select and adapt methodology for the project team but reuse different existing solutions for these steps that requires some expert knowledge from the method user about agile roles, artefacts, processes and practices during these activities.

Future work includes analysis of additional characteristics or methods for the team analysis that can help during adaptation and implementation of the agile PM methodology; adding of guidelines how agile roles, artefacts, processes and practices can be used for improvement of the team self-organization and motivation; and application of the proposed method to new case studies.

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