Challenges of Applying Scrum Model and Knowledge Management for Software Product Management

Boraq Ahmad Abed Ammourah and Sakinah Ali Pitchay

Abstract This study aims at identifying the major challenging encountered by software practitioners when using scrum model alongside with knowledge management in software product management. In accomplishing the research purpose, questionnaires are administered to software practitioners from different companies. Data gathered from the questionnaires are analyzed to draw conclusions from the study. This study indicate that software practitioners are facing challenged of compromise product backlogs on time due to the complex tasks, rapid changes requirement by clients, and sharing the knowledge. Thus, the study is essential in establishing the importance of the scrum model and knowledge management teams in software product management. In this study, software practitioners with different work experiences and knowledge are involved in identifying the encountered challenges and elaborate the rational solutions.

Keywords Agile methods · Scrum model · Knowledge management · Software practitioners

1 Introduction

Agile development models are fundamental in software projects that involve collaborative working environments [1]. Software practitioners who apply agile development models work in diversified teams that enhance learning and quality production. In agile development, scrum model enhances the productivity of software practitioners in their projects. However, software development teams encounter several hitches while applying scrum model in the work places. Problems encountered by software practitioners may be challenging to tackle. As a result, the level of experience of the

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software practitioners determine how they tackle the difficulties [2]. Theoretical foundations gathered through education tend to equip scrum model users in tackling the problems that arise. In this study, workers with different education levels and work experiences are involved in identifying problems encountered and possible solutions. Application of scum model in software product development and knowledge management is usually accompanied with difficulties that may vary from organization to organization [3]. Some of the agile development methodologies applied in scrum model comprise of Kanban Model, Adaptive Software, Agile RUP as well as DSDM [4]. Knowledge management strategies in scrum model are implemented in different levels of the project development process. Essentially, software practitioners require knowledge in workflow diagrams, activity diagrams, use case diagrams, entity-relationship diagrams, class diagrams and sequence diagrams [5]. Due to the significance of these knowledge management tools, software practitioners have to work in collaborative teams in order to ease the whole process [2]. In using scrum model, software practitioners require sufficient knowledge that incorporates basic programming, product backlogs and software development principles.

Scrum model supports knowledge management in different ways. The model simplifies the software development process for the expert software practitioners [6]. This model aids software developers by providing reliable estimates of cost and time for the whole software development lifecycle. As a result, software practitioners are in position to forecast the time taken for completing the software project. Accordingly, it enables then to prepare for the crucial resources that will be required in the whole process [7]. Significantly, these explains the importance of the scrum model in reducing the efforts of software project planning tasks.

The major challenge involved in software development entails the comprehensive program codes and the overall documentation [8]. As a result, software practitioners need to prepare for the intensive long source codes and documentations. Consequently, the task of debugging and correcting the program errors is usually complex. Apart from wring and debugging huge source code lines, software developers face challenges in responding to rapid changes in the software projects. Therefore, software practitioners are entitled to making necessary amendments in the software projects.

1.1 Theoretical Statement

Software practitioners handles challenges at workplaces basing on their working backgrounds and the level of training. Scrum model enhances the knowledge management skills and effective communication among the team members. For instance, the model supports Test Driven Development (TDD), which encompasses developing and testing software products for functionality [4]. Software testing is essential in guaranteeing the functionality of the modules. In scrum model, software developers conduct both sprint backlog and product backlog using Scrum Poker and pair programming respectively.

2 Methodology

The aim of the research is identifying challenges faced by software practitioners in the process of applying Scrum model in software product management. In accomplishing the research purpose, different data collection methodologies are applied in gathering data from respondents with different backgrounds. The main data collection tools employed in this research are questionnaires and interviews. Interviews will be carried out by involving online respondents. The research engages respondents from several companies from different countries. However, due to related works sample that different companies with different countries, after looking at scrum practice and knowledge transfer among software practitioners team may have challenges during project development which may influence team context [9].

The questionnaires and interview questions are precisely designed to assist in identifying challenges software practitioners tackle. In order to accomplish the research purpose, the research study will focus on the type of organization, employees in knowledge management section, population of employees and education level of workers. Moreover, the respondents vary in terms of business, geography, culture, and size. Furthermore, respondents in the research study hold different roles in their work places, therefore, display different levels of experience in agile software development. A total of 98 respondents were involved in completing the survey in a duration of 4 months. Data collected in this research is analyzed by using statistical mechanisms. The results are presented in both tabular and graphical techniques.

3 Results and Analysis

3.1 Statistical Results

The statistical results of the survey are summarized in Table 1 shows that all variables of Using Scrum, Modeling Notation, Management Strategy, and Challenging During, How Useful have a significant impact which all of its significant values is 0.000 and it's less than 5%.

3.2 Years of Working Experience

Table 2 below summarizes the results of respondents on their years of working experience in the companies, also that most of respondents have 6–10 years of experience with a percent of 40.8%, and the lower percent for 3 years of experiences with 12.2%, which indicate that the respondents in most are highly experienced.

Table 1 Statistical results

Variables	Mean	Standard deviation	Sig
Ease of getting advice from experienced workers	4.4082	0.82283	0.000
Usefulness of dashboards to team members	4.3061	1.04938	0.000
Using scrum	**4.3571**	**0.80591**	**0.000**
Diagrams and charts	4.3163	0.79427	0.000
Use case diagrams and specifications	4.3878	0.78165	0.000
Modeling notation	**4.352**	**0.65491**	**0.000**
Easy access to expert users	4.2143	0.85253	0.000
Scrum stand-up meeting	4.2347	0.72937	0.000
Estimation time and cost in point of software product development cycles	4.1531	0.87758	0.000
Scrum poker	4.163	0.94916	0.000
Sprint backlog	4.244	0.9201	0.000
Pair programming	4.193	0.8330	0.000
Product backlog	4.214	1.007	0.000
Test driven development (TDD)	4.173	0.8737	0.000
Set a different knowledge creation and sharing needs among the team	4.285	0.8248	0.000
Self-organizing team	4.275	0.7966	0.000
Management strategy	**4.215**	**0.522**	**0.000**
Interactions and dashboard tools	4.3265	0.9056	0.000
Documentation	4.2245	0.92537	0.000
Contract negotiation	4.3571	0.81544	0.000
Response to rapid changes	4.3163	0.86866	0.000
Challenging during	**4.3061**	**0.64069**	**0.000**
Project development	4.2857	0.95248	0.000
Product backlog	4.3673	0.8297	0.000
Automated code documentation	4.3571	0.86454	0.000
Automated quality assurance	4.3061	0.77869	0.000
Scrum project management	4.3878	0.8076	0.000
Tool integration dashboard	4.2857	0.86155	0.000
Software configuration management	4.2959	0.91052	0.000
Drawing on whiteboards or using dashboard tools	4.398	0.71421	0.000
Do you consider this training to be adequate?	4.4592	0.91006	0.000
How useful	**4.3492**	**0.55107**	**0.000**

Using scrum that means the software practitioners have been used the scrum model along with knowledge management for software development.
Modeling Notation that means the software practitioners have been used the modeling notation such as Entity-relationship diagrams (ERDs), State chart, Work flow diagrams, also that agile methods are effective in enabling software practitioners to create models.
Management strategy that means Challenging during scrum developing project along with Knowledge Management strategies.
Challenging during Challenging during scrum developing project along with Knowledge strategies.
How useful that means How useful do recommend agile scrum development practice used on the project.

Table 2 Years of working experience

Years of working experience in the company		
Respondent	Frequency	Percent
3 years or less	12	12.2
3–5 years	21	21.4
6–10 years	40	40.8
11 years or more	25	25.5
Total	98	100

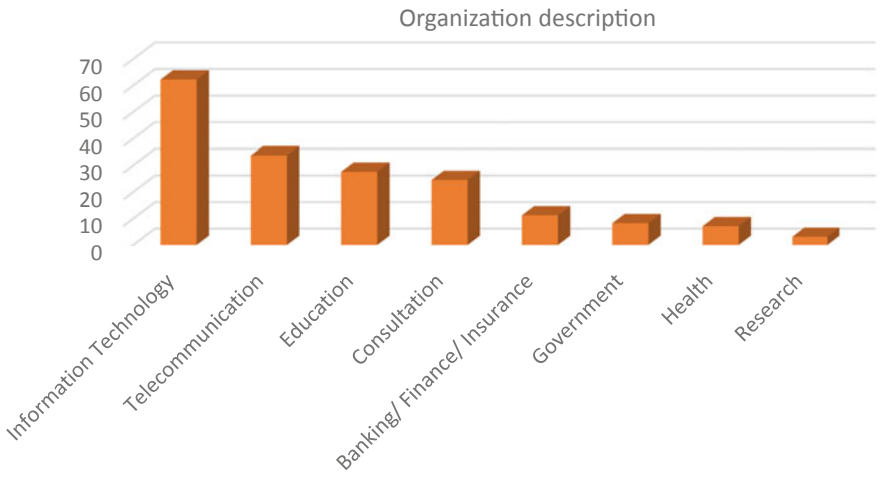

Fig. 1 Organization description

3.3 Description of the Organization

Respondents involved in the survey were from different organizations. The frequency distributions for the description of organization are summarized in Fig. 1. The results of respondents that descript their organization are presented in a bar chart below, to display the different organizations in which the respondents are engaged in

3.4 Number of Employees

The results for the number of employees indicate that most of respondents declared their organization has between 51 and 150 employees. This figure comprises of 30.6% of the total respondents. Accordingly, minority of the respondents covering 2% indicated the organization has less than 5 employees. These results are summarized in the frequency Table 3.

Table 3 Number of employees

How many people are working in company		
Respondent	Frequency	Percent
5 or less	2	2
5–20	10	10.2
21–50	27	27.6
51–150	30	30.6
150 or more	29	29.6
Total	98	100

Table 4 Use of agile method

How long have you been using agile method		
Respondent	Frequency	Percent
1 years or less	6	6.1
2–4 years	51	52
5 years or more	41	41.8
Total	98	100

3.5 The Use of Agile Method

The results for use of agile methodology indicate that a majority of about 52% of the respondents have an experience of between 2 and 4 years in the use of agile method. On the other hand, minority of respondents of about 6.1% have an experience of less than 1 year in the use of agile method. The results and comprehensively displayed in Table 4.

4 Discussion

4.1 Scrum Use

After analyzing the data using statistical tools, the results indicate that an average of 4.357 of the respondents use Scrum model. Out of these, an average of 4.408 are of the view that Scrum model enhances communication and collaboration among the team members. Accordingly, majority of the respondents show that dashboards are essential in the project management process. With a standard deviation of 0.806, the results in the study are close to the mean, thus, illustrate a normal distribution curve in the study.

4.2 Modelling Notation

Most of the respondents in the study agree that agile methods are effective in enabling software practitioners to create models. This is portrayed by a mean of about 4.352. In addition, majority of the respondents are of the view that Scrum model is useful in creating diagrams that are essential in project management. This is represented with a mean of 4.316 and a standard deviation of about 0.794.

4.3 Management Strategy

An average of 4.215 of the respondents agree that agile method is an effective management strategy tool. Accordingly, a mean of 4.214 and standard deviation of 0.853 of respondents agree that experts have an easy interactivity with the scrum model. Subsequently, an average of 4.163 of the respondents with a standard deviation of 0.949 indicated that scrum poker is applied in estimating the size of software development tasks. Accordingly, a mean of 4.245 with a standard deviation of 0.920 illustrate that sprint backlog is an essential component in software development. Through product backlog, resources in the software management are managed effectively before the project execution [10].

4.4 Challenges During Project Development

Software practitioners lack sufficient time required for holding meetings, exchange programs and discussions because they are involved in team work. This challenge is usually rectified using dashboards that enable communication through online discussions. Another problem arises in exchanging information since software program routines may be used in different projects. Thus, dashboards enable software practitioners to exchange program routines as well as subroutines. Moreover, software practitioners face challenges in handling software projects that may be intensive and time consuming. Thus, large projects require the practitioners to work in groups in order to effectively complete the tasks. Scrum model provides automation of the software development tasks, thus minimizing the overall problems encountered [8].

5 Conclusion

Software practitioners face varying difficulties in applying agile methods in the software management processes. These problems vary basing on the types of companies, software products developed, company's' cultures, and education and working expe-

rience levels. In solving the problems, application of tool integration and white boards are preferred solutions. Scrum model enhances the applicability of agile methodologies in knowledge management. Thus, scrum model and knowledge management aids in identifying the culture of the company. this study indicate that software practitioners are facing challenged of compromise product backlogs on time due to the complex tasks, rapid changes requirement by clients, and sharing the knowledge. In software product development, scrum model aids in an integration of dashboard tools, product backlog, and quality assurance.

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