Identification of Agile Software Risk Indicators and Evaluation of Agile Software Development Project Risk Occurrence Probability

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ABSTRACT

The usages of Risk indicators are useful in making plans for risk assessment in any agile software project which is planned to be developing. It is useful for optimization of processes and helps managerial decisions. In spite of the importance of risk management in software projects, it is in fact still usually overlooked by the organizations that develop agile software. One reason for this fact is that the concept of risk is nonfigurative and skewed, and its management does not bring visible immediate practical result.

In this perspective, this paper aims to define and propose indicators and evaluate the risk occurrence probability that are definite for environments of agile software projects in order to support risk elements identification. To achieve this objective, risk indicators and risk elements list was prepared with the help of literature review and a questionnaire was prepared to approve this list by the experienced program manager. A case study was conducted to evaluate risk occurrence probability for the agile software.

Keywords


1.0 INTRODUCTION

Agile Software Project management is now a popular area in the perspective of Software Engineering. Its practices, associated with logically changeable nature of the software, have promoted the need of new methodologies of project management which are supporter to software development environments. These methodologies have been planned with a unique goal: to make sure the projects successes, of the ways to underline the view of these factors is through the usage of risk management practices. In addition, the consequence of the usage of processes, techniques and tools of risk management is more familiar in software development environments. Some authors believe that managing projects is managing risks (EmamHossain et al., 2009; EdzreenaEdzaOdzaly, 2014).

This fact is appropriate, in part, by the accepting that an important part of projects failures could be allied to a poor risk management. Risk management is one of disciplines related to project management, and its usage becomes progressively more necessary as the size and complexity of agile software grows. It is currently a need for the companies that work in this field. In this radiance, we can say that there is a need of indicators and metrics that support risk management for agile software in the context and belief of software project management, even when we consider organizational factors (JuhaniIivari et al., 2011; Julio Menezes Jr et al., 2013).

In this background, this paper aims to present a set of indicators that support the risk assessment in environments of agile software development projects after this introductory section, this paper is organized as follows: Section 2.0 presents the study background; Section 3.0 presents the identification of risk elements; Section 4.0 presents the discussion and Section 5.0 draws the main conclusions and future work.
2.0 BACKGROUND
In the present day, a large number of studies are established in the area of Agile software development methodologies by comparing the dissimilar models as well as studies based on the risk factors and their consequence on software developments in different perspectives. But definitely, these studies are not absolute in the point of ruling the precise risk factors and how the models succeed from those effects. In (Julio Menezes Jr et al., 2013; Ruchi Agrawal et al., 2016), the author has indicated about the risk factors and its evaluation technique. (EdzreenaEdzaOdzaly et al., 2014) emphasizes on the notion of risk evaluation and management experienced in Agile Methodologies. Here, it is obviously revealed about the five diverse steps in simply managing those risks. In (John Quigley, 2016; Shrivastava et al., 2017) tries to make clear the major steps and techniques involved in software risk management.

3.0 IDENTIFICATION OF RISK FACTORS AND RISK ELEMENTS
In this paper a list of agile software development risk elements are identified for managing agile software project. For the fulfilling this task the allied literature reviewed and agile project questionnaires prepared and distributed to the different agile software project developers, project managers. On the basis of questionnaires and the allied literature survey the risk elements are collected for the different risk indicators which affect the success of the project. The Risk Indicators/Risk Element collected from the source (Ruchi Agrawal et al., 2016; Marly M. Carvalho, 2016; Tsun Chow et al., 2008; Viljan Mahnic et al., 2008; Zvonko Kremljak, 2014).

The identified risk element list for the agile project allows one to identify what risks to monitor for this project and from which data or indicator that the risks could possibly be triggered. At this stage, one can either add new rule or add an existing rule where the rule was created from a previous project. Figure 1.0 is describing the risk indicator identification process with the help of allied literature review and interview/questionnaire review. Finally the risk indicators and risk element list was produced.

Figure 1. Agile Software Development Risk Factors Risk Elements Identification Process
<table>
<thead>
<tr>
<th>S.N</th>
<th>Risk Indicators</th>
<th>Risk Elements</th>
</tr>
</thead>
</table>
| 1.  | Development Environment Risks (DER) | Large-scale, offshore and distributed.  
Insufficient training.  
Product owner role is not properly filled.  
Teams are not focused.  
Excessive preparation/planning.  
Lack of sponsor support.  
Product owner role is not properly filled.  
Teams are not focused.  
Lack of test automation.  
Allowing technical debt to build up.  
Fixed time, resources, scope, and quality. |
| 2.  | Process Issue Risks (PIR) | Staff members signed-up to the software process as it is Agile documented and willing to use it.  
Agile software engineering standards not provided for every software developer and software manager.  
Formal technical reviews of the requirements specification, design, and code not conducted regularly.  
Formal technical reviews of test procedures and test cases not conducted regularly.  
The results of each formal technical review not documented, including defects found and resources used.  
Mechanism not available for ensuring that work conducted on a project conforms to software engineering standards.  
Configuration management not used to maintain consistency among system/software requirements, design, code, and test cases.  
Configuration management not used to maintain consistency among system/software requirements, design, code, and test cases.  
Mechanism not used for controlling changes to customer requirements that impact the software.  
Procedure not followed for tracking and reviewing the performance of subcontractors. |
| 3.  | Staff Size and Experience (SSE) | The best people not available for self organizing team.  
People do not have the right combination of skills.  
Staff is not committed for entire duration of the project.  
Staff has not the right expectations about the job at hand.  
Staff does not received necessary training. |
| 4.  | Technical Issue Risks (TIR) | Facilitated application specification techniques are not used to aid in communication between the customer and developer for the agile software.  
Specific methods are not available for agile software analysis.  
Specific methods are not for data and architecture designs.  
Specific conventions for code documentation are not defined and used.  
Specific methods are not available for test case design. |
Software tools are not used to support software planning and tracking activities.

Configuration management software tools are not used to control and track change activity throughout the software process.

Quality metrics are not collected for agile software project.

Productivity metrics are not collected for agile software project.

5. Technology Risks (TR)

Technology to be built new to your company.

The customer requirements demand the creation of new algorithms, input or output technology.

The software interface with new or unproven hardware. The software to be built interfaces with a database system whose function and performance has not been proven in this application area.

The software to be built interface with vendor supplied software products that are unproven.

Specialized user interface demanded by product requirements.

Requirements for the product demand the creation of program components that are unlike any previously developed by your organization.

Requirements demand the use of new analysis, design, or testing methods.

Requirements demand the use of unconventional software development methods.

Requirements put excessive performance constraints on the product.

Customer not certain that the functionality requested is “do-able”.

6. Schedule Risk (SR)

The Schedule, resources, and product definition have all been dictated by the customer or upper management.

The Schedule is optimistic, "best case," rather than realistic, "expected case".

The schedule not approved by the specific team members who will play the key role.

Size of the product, specified in the time allocated.

Delay in one task causes cascading delays in dependent tasks.

The self-organizing team is not approved by the top level management.

The change occurs after completion the project and before deployment.

On the basis of above risk elements the risk probability can be calculated. The six risk indicators were identified and under one of these risk factors few more risk elements were identified. The existing risk element enhancing the risk occurrence probability of the particular risk factors.

Risk Probability (%) = (E/N)*100, Eq. 1

Where, E= risk element existing in a category, N= total risks identified in the same category.
4.0 DISCUSSION

On the basis of the risk element identification, which are given in the previous section a project manager can assess the probability of the risk. In this study six kinds of risk factors are identified, under these factors few more risk elements existing which causes the particular risk. Project manager decides the said risk element in the list is existing or not. One can understand this fact with the help of a case study.

Case Study

An agile software development risks was assessed by the project manager, Table 2.0 shows the risk occurrence probability of the risk factors identified for the agile software projects. Project manager finds out the existing risk element for the particular risk factors, further on the basis of risk occurrence probability of the Project risk factors the overall project risk can be evaluated.

<table>
<thead>
<tr>
<th>S. N.</th>
<th>Risk Factors Identified</th>
<th>Risk Element</th>
<th>Existing Risk Element in the Project</th>
<th>Risk Probability (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Development Environment Risks (DER)</td>
<td>11</td>
<td>7</td>
<td>63.64</td>
</tr>
<tr>
<td>2</td>
<td>Process Issue Risks (PIR)</td>
<td>10</td>
<td>3</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Staff Size and Experience (SSE)</td>
<td>5</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>4</td>
<td>Technical Issue Risks (TIR)</td>
<td>9</td>
<td>4</td>
<td>44.44</td>
</tr>
<tr>
<td>5</td>
<td>Technology Risks (TR)</td>
<td>10</td>
<td>5</td>
<td>50</td>
</tr>
<tr>
<td>6</td>
<td>Schedule Risk (SR)</td>
<td>7</td>
<td>3</td>
<td>42.85</td>
</tr>
</tbody>
</table>

In Figure 2, graph shows the six risk indicators occurrence probability which affects the overall project productivity. On the basis of the risk prediction program manager/agile team plan to mitigate the risk. Project Risk Evaluation = Risk Probability (DER+PIR+SSE+TIR+TR+SR)/6
\[
\frac{(63.44+30+40+44.44+50+42.85)}{6} = 45.12
\]

The overall project risk probability evaluated which is 45.12%; therefore it is need to mitigate the project risk for the successful project delivery on time and within estimated budget with good quality.

5.0 CONCLUSION & FUTURE WORK

In this study Agile Software Development Risk Elements were identified and categorized with Risk Indicators. The Risk Occurrence Probability was evaluated to predict risk intensity and impact. It is very necessary for any successful agile software project to evaluate the risk before starting the project and manage it. In future, there are need to define the risk elements weight to evaluate the risk indicators occurrence probability precisely. To evaluate the risk impact to improve this approach by adding knowledge therefore helping in automatic learning and, decision support regarding risks, as well extending to other risk management steps.

6.0 REFERENCES