



Stepping Towards Explicit Risk Identification In Agile Software Development

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Abstract- Managing risks takes a remarkable role in the better performance of any software project. However, Agile Software Development (ASD) does not proffer dedicated risk management mechanisms. Identification of risks is the predominant phase in assessing the risks and only fewer research works exist in improvising the risk identification process in ASD to detect risks as much as possible throughout the software development process. Therefore, this study gives a better understanding of the popular risk identification practices by a comparison and analysis and can be wield as an aid for further enhancements in future.

Keywords – Agile Software Development, Risk Identification, Risk Assessment, Risk Identification in ASD

I. INTRODUCTION

Risks treatment is a crucial branch of project management science, which focuses towards increasing the reliability. Risk identification and classification is one of the categories of a systematic risk management process [1].

Risk is not a bad thing, and it performs a huge role in the betterment process. It is essential to know how to balance the threats against the opportunities [2]. Risk management strategies should be as simple as possible such that all team members find them as effortless to follow [2].

Software risk management is an advanced area whose main focus is to identify, handle and mitigate risks before they become serious issues or originators of costly software alterations [3]. In software projects, the same procedures applied for managing risks in non-software projects can be implemented [4]. For utmost efficacy, risk management process must be instigated throughout the stages of the software development [5]. The risk identification phase places prominence on the project threats, and aims to follow proactive risk management strategies [5].

Risk management is recognized as the least applied sector in software project management [6]. No matter what the result is, identification of risks and evaluating the probability of risks and estimating the impact of risks is essential [6]. Organizations prefer Agile methodology due to its quickly responding nature, reality-based requirements, Win-win philosophy by customer collaborations and adaptability to change at a reasonable cost [7]. It is evident that the success rate of agile projects are twice than that of the traditional methodology projects and the failure rate of the former type of projects is one-third lesser than that of the latter [8]. In traditional model, risks reduction is considered at project management stages, whereas in Agile, the initial phases of software development involve the process [7].

Agile Software Development (ASD) overcomes traditional approaches in several aspects like providing better quality, transparency, short incremental and iterative releases, flexible to changing requirements, continuous integration, and foreseeable costs [9]. However, according to the CHAOS report in [9], agile methodology based projects still fail due to various reasons.

Risk management is done by sprint meetings, close customer collaborations, daily standup meetings and sprint retrospectives in agile projects. It is very essential to identify the risks before addressing them. Since structured approach for managing risks is absent in agile processes, there is insufficiency in identifying, analysis, and mitigating activities of risks [10].

In this paper, we have made an effort to answer the research questions such as, “how risks are identified in Agile projects? (RQ1)”, “are the current risk identification techniques efficient?” (RQ2), and “how can the current strategies for risk identification be improved?” (RQ3).

The remaining portions of the study are put together as follows. In Section II, the background and motivation to do the research work is presented. Section III deals with the risk identification practices in ASD projects. The problems of the existing system are identified and elaborated in detail in section IV. The overall proposed work of our research module is discussed in section V. The conclusion and scope for future enhancement follows in section VI.

II. BACKGROUND AND MOTIVATION

Agile handles risks implicitly by shorter and frequent delivery iterations, good collaboration with customers, and so on. Most of the agile practitioners use the traditional waterfall methodology for risk management using practices like brainstorming, risk matrix, probability impact matrix, SWOT analysis etc. and risks are mitigated based on their priority. Without explicit tackling of risks, crucial risks can be ignored which are highly dangerous for the organization projects [10].

In [11], agile risk identification was mentioned as one of the fundamental processes in risk management to identify the events which can have unpropitious drawbacks in the project. The survey results indicate that the risks can be identified in but not limited to the daily scrum, sprint planning, and during the sprint. Through this we understand the significance of risk identification in the project lifecycle.

The study conducted by [12] reveals that majority of agile practitioners in their survey faced schedule related risks, and changing requirements by the Customer, which can highly influence the *Time* and *Cost* factors. This survey helped us in our research giving a little insight about how much importance is given to risk management activities in the companies.

Discovery of risks is the most crucial phase of risk management, and the importance of risk identification in ASD projects is well explained by [13], which applies the Trust Game of Game Theories concept in order to boost the participants and identify more risks resulting in a Win-win situation. This is a catchy idea to encourage the team members to work as a group in order to achieve the objectives with a motto of “Everybody wins when the whole team can identify risks”.

Apart from insisting on the importance of requirement management phases like categorization of requirements, handling small and large change requests, prioritization of requirements etc, the Change Requirement Management (CRM) model proposed in paper [14] emphasizes on extending the framework by including the risk identification phase as their future work knowing its importance.

As a first step, we proceed towards analyzing the literature papers related to the topic and convey our findings in a description. The research methodology used is, comparison and analysis method of research. As a future work, we aim to develop an assistance mechanism for brainstorming dedicated for risk identification in agile projects, which has even further scope of research. The developed mechanism can be used for further phases of risk assessment such as risk analysis and prioritization.

III. RISK IDENTIFICATION IN AGILE

Risks need to be addressed explicitly in order to mitigate them effectively as soon as possible. For successful mitigation of risks, explicit risk identification and analysis are essential. Risks can be effectively identified only if some amount of time is spent on it [15].

Paper [16] depicts on the techniques used for discovering risks using a proposed taxonomy. Several reactive, predictive and proactive mechanisms were categorized with respect to the decades of invention and the models implemented. Models like the descriptive models, logic diagram models, inter disciplinary models, mathematical models, computer-aided models and so on were brought into discussion with their respective pros and cons and the suitability of the project. The authors insisted on using proactive risk management techniques, which require very less human intervention and capable of discovering new risks rather than the past risks.

Risk identification is the process of discovering, interpreting, narrating, filing, and conveying risks before they turn into serious issues and affect the project badly [17]. Risk identification process uncovers and ascertains the possible risks and is carried out by the inspection in all ways and at all the levels by the organization [18].

Efficient risk identification procedures help to gain even more information about the improvement status of the project and thereby reduce the uncertainty level [19]. Many organizations use the conventional risk identification techniques like brainstorming and checklists because, using new and unfamiliar tools may incur additional time, cost and effort [19].

The starting point of risk assessment phase is the discovery of risks. The resultant outcome is a registry of potential uncertainties [20]. The authors highlighted the Sprint reviews which include opinions from all stakeholders, deciding the list of crucial risks and managing them in repositories for future reference. Also the risks can be identified at any time during the Sprint. Risks should be identified and mitigated as earlier as possible, especially for agile software development projects [21].

Risk identification is carried out throughout the Scrum projects using the backlog, Sprint plannings, reviews and retrospective meetings [22]. A survey study reports that Daily Meeting and Sprint Planning are the vital events for an efficient way of managing the risks, especially in risks identification [23]. From [24], it is clear that risks are identified in Scrum projects in an iterative fashion during the Daily Standup Meetings (DSM) or other meetings. Figure 1 illustrates the procedure in detail.

IV. PROBLEM IDENTIFICATION

The two most common methods used for identifying risks are brainstorming and interviews [17]. Some of the other popular tools and techniques include Documentation reviews, Checklist analysis, Diagramming techniques, Cross functional teams, Delphi technique, Surveys, and so on [17]. Let us discuss about a few of them.

Brainstorming: Brainstorming is a multi-stage process involving collection of data followed by data assessment, and a group discussion in the end. The main focus is decreasing the cognitive bias and to consider the variety of ideas offered in the focus of achieving a solution for the given issue [25]. A digitalized version of sticky note tool was proposed in [25] to enhance the traditional method of brainstorming process; however, it will not be suitable for small and medium enterprises where the budget invested should be minimal and affordable.

Interviewing: These are effective in identifying the basis of the risks. However, it is limited by the potential of the facilitator and the queries interrogated. It can be conducted either before or after the brainstorming meetings [17].

Checklist: The checklist is a fast and cost-effective way to identify the risk factors and determine the risk exposure [3]. However, they are not suitable for projects which are substandard, new and unique [17].

Delphi technique is a multilevel technique for collecting and combining responses from anonymous participants through sequential questionnaire [17]. However, it suffers from major drawbacks such as: long time to set-up, and the absence of team thinking [19].

Though various tools and methods support the risk identification process effectively, people involved in the project play a crucial role in the success of the risk identification process [17]. Intrinsic motivation is very necessary for an individual than the external rewards in order to foster creative ideas [26].

Risk identification helps the organization to know about the activities and spots where its assets are revealed to risks. The fundamental questions in the risk identification procedure include [18]:

- How the resources be frightened?
- What negative impacts can block the organization from reaching the goals?
- What commending possibility can be disclosed?

Table-1 provides an analysis of a few widely used risk identification techniques [33] in terms of Time, Cost, Easiness, Agility, and if they are applicable for SMEs and even startup software companies without transgressing the agile manifesto principles.

As we can see, Brainstorming satisfies the first three criteria and the fourth criteria to a certain extent and hence no wonder it is being a widely used mechanism. However, there is a necessity to upgrade for improvised performance.

Table-1. Comparison of widely used Risk Identification techniques

RI Technique	Fast	Cost-effective	Easy to follow	Suitability for startups
Brainstorming	✓	✓	✓	✓
Interviewing	X	X	X	✓
Checklist analysis	✓	✓	✓	X
Delphi Technique	X	X	X	✓
Surveys	✓	X	✓	X

V. PROPOSED WORK

Despite the fact that risk identification failures play a vital role in project failures, still it is considered as a useless activity and overhead by majority of the practitioners, because of the less availability of the assistance tools [27].

In order to make the risk identification process to be “light weight”, it is necessary to adhere to a stringent timeframe procedure, provide and train the team on the requisite mechanisms and tools, and supply the templates, risk statements and models to the teams [28]. The light weight risk identification mechanism covers review of past projects lessons, risk prompt lists, checklists and brainstorming [28].

During the risk identification process, the teams must give importance to group thinking, optimism bias, high regards to the experts, and elucidating the problems. Hence, it is essential for our risk identification assistance tools to keep in the mind the above constraints and smoothen the communication and collaboration between the participants [29].

In the process of identifying risks, it is vital to discover as many risks as possible, since omission of any significant risks cannot be forwarded for further analysis and treatment phases [17].

Historical data occupies our systems with easy-to-predict white swan risks. In order to predict the occasional but detrimental black swan risks, it is essential to research more on the tools and methods applicable [29].

Brainstorming implements group thinking and societal facilitation for producing constructive ideas. However, if the teams are small, the two features cannot be achieved up to the mark and hence identifying all the risk categories could be impossible. Hence, a structured approach is essential to capture all the potential risks associated with the project [30].

The software process is the source to create software. A risk occurred during the time of software process can influence the product reliability on various levels [3]. A risk at one level can produce risks at the other level, so identifying the links between these risks is essential [31]. Hence, paper [32] calls for developing a risk identification mechanism or a framework in order to recognize and point out as many risks as possible occurring in the project.

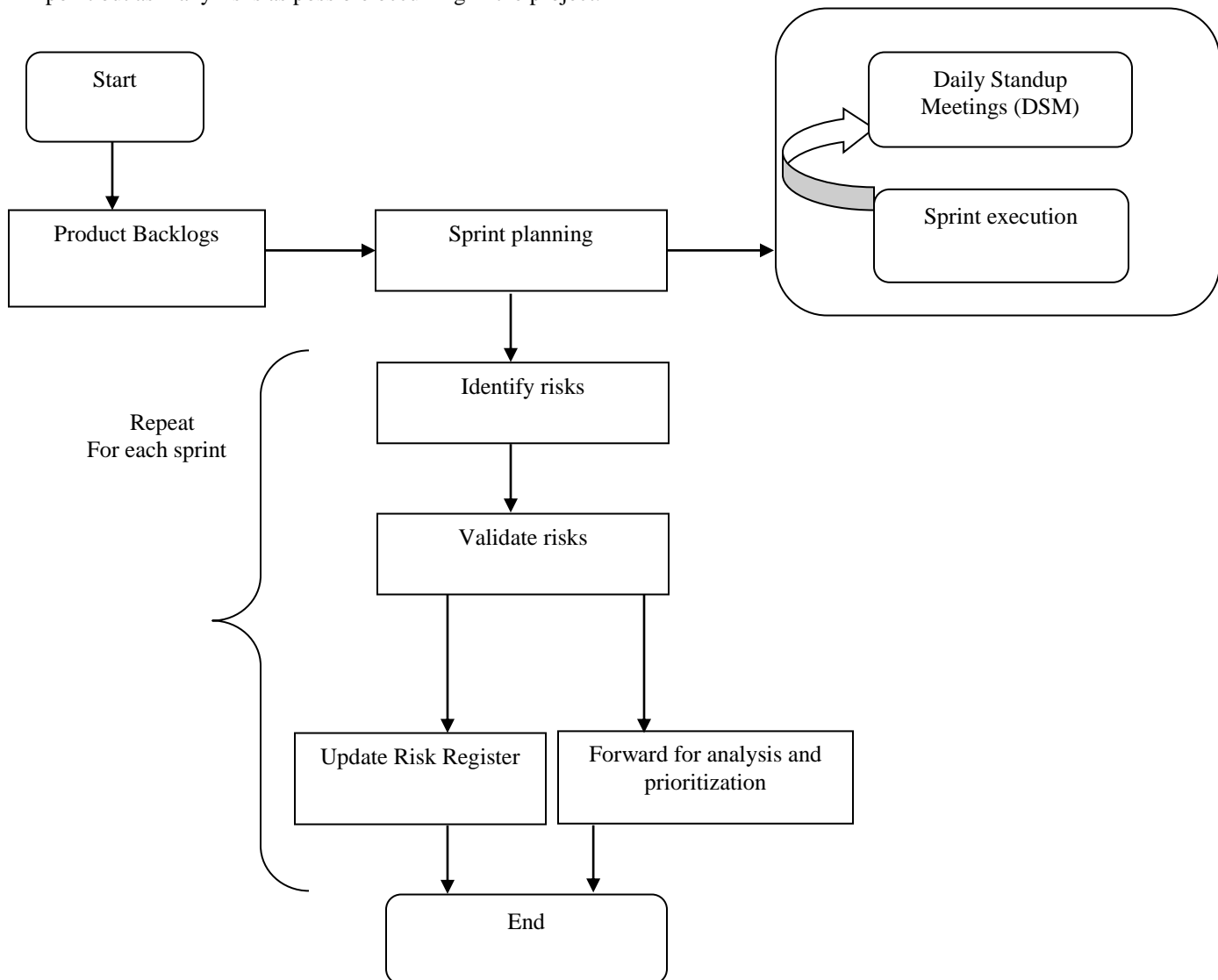


Figure 1. Risk Identification Procedure in Agile Software Projects

Since brainstorming satisfies most of the criteria in our comparative analysis in Table-1, we propose an assistance mechanism to enhance the traditional brainstorming process thereby increasing the quantity of ideas from the persons involved even if the teams are small, and therefore befitting for both SMEs and startups. Figure 2 depicts the overall outline of our research process. The objectives include:

1. To propose a mechanism to enhance the idea generating process of the team members in brainstorming for risks identification assistance.
2. To prove if the proposed technique is effective in terms of finding more number of overall risks, risks per category, and negative impactful risks.
3. To find how far the technique is effective without transgressing the agile principles.

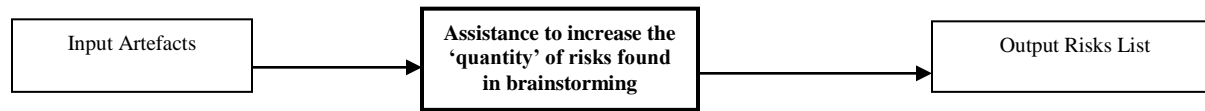


Figure 2. Research Procedure Outline

VI. CONCLUSION

There has been an escalation in the software projects which implement the Agile methodology for software development in the recent years. However, not much importance is given for the risk handling activities in ASD projects. Assessing of risks helps to understand and manage the risks much better for mitigation and control. To assess the risks better, they need to be identified first without neglecting the crucial risks which can create significant negative impact in the success of the project. Through several studies, we came to know that most of the Agile projects follow either the implicit Agile practices alone which will identify and eradicate most of the risks but not all, or else the traditional risk identification methodologies are followed without spending too much of effort and resources. This hesitation is because less assistance tools are available for the risk identification process. To overcome this impediment, we take a primary step in understanding the significance of risk identification and developing a dedicated mechanism for assisting the Agile practitioners to identify as much risks as possible throughout the software development process.

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