



Using Risk Management to Balance Agile Methods

A study of the Scrum process

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Abstract

This study seeks to answer three main questions: How can Risk Management be used to effectively balance an agile method (particularly Scrum)? What are the benefits or limitations that could be encountered during the application of Risk Management as a successful procedure during Scrum projects? What other processes can be applied by organizations to effectively manage their risks during Scrum projects? The mixed methods of interviews and focus group discussions with Scrum/Agile practitioners and experts in three UK IT sectors were conducted to investigate the farragoes of assumptions on how the Scrum process in particular deals with risks. Results of data analysed suggest that most organizations using Scrum do not implement any risk strategy for their projects under the assumption that the 'agile aspect of Scrum' will mitigate risks, however, all respondents agreed that this would most likely introduce other risks that could impact the objectives of the project.

Keywords: *risk management, agile methodologies, Scrum framework, Scrum process.*

I. Introduction

A. Research Objectives

The aim of this study was to examine the use of the four components of Management of Risk (MoR) process to balance Scrum during software development. The study examined Scrum with the aim of identifying how to further improve the management of risk during projects while using the framework. The research (part of an MSc project) also provided recommendations on how to effectively apply the core components of Management of Risk to Scrum without affecting the latter's ability to respond to business change.

The research objectives were:

- To critically analyse the core components of Management of Risk while using Scrum to deliver project solutions and how they can be used to enhance Scrum process.
- To evaluate the benefits, drawbacks, limitations, and application of risk management as a strategy for successful applications of Scrum for projects.
- To recommend the process changes that can be used to effectively manage risk during Scrum projects.

B. Research Questions

The research aims is to answer the following questions:

- How can Risk Management be used to effectively balance an agile method (particularly Scrum)?

- What are the benefits or limitations that could be encountered during the application of Risk Management during Scrum projects?
- What other processes can be applied by organizations to effectively manage their risks during Scrum projects?

II. LITERATURE REVIEW

All the agile management frameworks, according to Walczak and Kuchta [1] and Beck et al. [2], have common characteristics that align with 'The Agile Manifesto'. The authors describe agile frameworks as increasingly becoming popular over the past twenty-five years. The frameworks have simultaneously induced a significant amount of literature and debate. This includes the suggestion in practice that agile processes, if strictly followed, could often by themselves, be used to mitigate risks in project development [3,4,5]. As a result of this supposition, the agile methodologies, particularly Scrum, are often considered as not requiring another layer of the traditional structured management of risk.

A. What is Agile Risk?

Moran [6], describes agile risks in projects as an "uncertainty that matters", while Sommerville [7]; De Bakker, Boonstra and Wortmann [8] and OGC [9] define it as "an uncertain event or set of events that, should it occur, will have an effect on the achievement of objectives." All the literature agrees that risk is an exposure to a potentially negative (threat) or positive (opportunity) outcome, and depending on the value of its impact, it will affect one or more objectives of the project in numerous ways.

Moran [6], suggests "there is advantage to be found in embracing risk." There are project risks that are inherent, residual and secondary, with all three at times intertwined in a complex web. And in Scrum, according to Moran [6], it is common in a project that more risks are exposed immediately after the first iteration.

B. Does Risk Management Matter in Scrum Projects?

A frequently asked question by several academic scholars, such as Padayachee [11]; Sommerville [7]; De Bakker, Boonstra and Wortmann [8] etc., is: "Does risk management improve the chances of having a successful project?" This question is relevant to both scholars and practitioners particularly within the field of Information Technology (IT) [6]. A study by The Standish Group [11] shows that there is still a high number of unsuccessful projects in the various IT sectors with this resulting in a lot of interest in the usefulness of structured risk management in projects. Nyfjord and Kajko-Mattsson [12], in a study, conclude that the "possibility of effective project development can be improved by defining the major risks during each phase of the development procedure, and formulating approaches for handling all prospective incidents."

Moran [6], equally in a recent study, posits that Scrum team members are rarely capable of expressing the aspects of their roles which relate to controlling risks even as it is the norm for them to have information about what business solutions they are developing, and what will establish a successful project conclusion. Yet Boehm and Turner [13] and Chow and Cao [14], suggest that identifying and assessing risks, and defining suitable steps to manage these risks, are important. Leau, Loo, Tham and Tan [15] add that inadequate management of risk in Scrum Projects could result in:

- Inability to make knowledgeable risk identifications and project resolutions.
- Inability to effectively establish the suitable risk response.
- Absence of effective risk monitoring resulting in unsuccessful or incompetent management of risks.
- Inadequate knowledge of when to participate in risk operations.

All these authors agree that, although risk management is important, it is frequently overlooked in many projects.

C. Possible Risks in Scrum Development Projects

McConnell [16], revisiting the study by Boehm [17] and Jones [18], created a list of the general risks inherent in Scrum software development projects. These consist of three categories, namely, people, organisation and processes. Chow and Cao [14] also studied the Critical Success Factors in agile methodologies, and listed similar sets of risks that could be encountered during Scrum projects.

Ceschi, Sillitti, Succi and Panfilis [19], in their study, recommend that some of the possible risks that may be encountered when using Scrum are likely to be identified before the commencement of the project. Several articles also suggest that ten possible signs of agile development project failure, while at least seven of these indicators are noticed prior to the beginning of the project. Koch [20], appear to agree with Ceschi, Sillitti, Succi and Panfilis [19], mentioning that an effective risk management prior to the commencement of a project using a risk framework can contribute to the project being successful.

A study by Boehm and Turner [21] highlights a major risk common to all agile approaches, which is a lack of, or dwindling, management commitment. The authors state that this can have a negative impact on the outcome of projects, as management commitment is a key factor during Scrum and agile projects. Nerur, Mahapatra and Mangalaraj [22], similarly, in a study on the challenges of migrating to agile methods from the traditional frameworks, provide a synopsis of not only the risks related to the management aspect, but also the risks related to people, process, and technology.

Nerur, Mahapatra and Mangalaraj's classifications of these risks are similar to that by McConnell [16]. In an earlier study, titled 'Using Risk to Balance Agile and Plan-Driven Methods', Boehm and Turner [13], mention that agile projects face major technical risks, such as the ambiguity of agent-based systems and the presence of several independently developing networks that have to be effectively managed. Both Dyba [23] and Calo, Estevez and Fillottrani [24], identify inefficient change management as an aspect of risk in Scrum projects.

Similarly, Boehm and Turner [13] state that integrating a project's intrinsic diseconomies of scale with the plan to preserve system reliability across continuous modifications and incremental deliveries could be difficult to achieve. In addition to this, [1] Paige, Charalambous, Ge and Brook [25], who studied the use of agile frameworks in high integrity systems, conclude that the issue of risk management is inherent at every stage of any of the agile methods, as each stage has possible risks, and the lack of risk management in one stage could influence the outcome of other stages and the entire project.

III. RESEARCH METHOD

A. Methods

1) **The Interview Technique:** One of the elements of the qualitative method used during this study was the interview technique that aided this research by providing salient information. The interviews conducted for this study consisted of face-to-face semi-structured discussions, and it allowed personal interactions and meaningful conversation, which would have been harder to obtain through other research methods [26]. Furthermore, the interviewees were seasoned and competent practitioners of many years standing in agile project management. This helped this study to gain an organizational perspective of how core components of Management of Risk were applied or not applied during Scrum process. The interviews were mostly the face-to-face; however, in situations where the distance between the participant and the researcher did not permit this, the interview was conducted with the use of Skype. Each of the three interviews was recorded as audio and lasted about 20 minutes, with transcription occurring at a later stage.

2) **The Focus Group Technique:** Focus groups have become increasingly popular as a tool for collecting primary data in recent years. They are viewed as fast and cost-efficient. In several publications by scholars such as Kitzinger [27] and Morgan [28], focus group interviews are identified as a method of obtaining data through moderated group discussion that centres on participants' perceptions and experience of a topic. Reed and Payton [29], in describing focus group interviews state that it is a group discussion planned to examine a certain research topic. In a similar fashion to the interview procedure, the participants for the focus group were practitioners that have participated in, or are currently managing, Scrum projects. The four members provided pertinent

information from experience on how a risk management process could be used during Scrum projects.

B. Data Sources

The data sources for the research were both primary and secondary data. The primary data was obtained from interview transcripts and focus group transcripts. A professional transcriber was contracted to ensure that all interviews and focus group discussions were correctly and precisely transcribed, to avoid any form of errors or inaccuracies during data analysis.

In addition to the primary data obtained from the transcripts, information was obtained through secondary data. According to Andersen, Prause and Silver [30], secondary information is a highly valued source of information for researchers, as it provides the opportunity to thoroughly explore a research area. In order to accomplish the aims and objectives of the study, previous studies, implementations and case studies on Scrum development framework were thoroughly examined. This helped to provide adequate information for the foundation of the study. Information was obtained from key journals and proceedings from the Institute of Electrical and Electronics Engineers (IEEE), the Association for Computing Machinery (ACM), and other research-focused databases.

IV. Analysis

A. Research Question One (RQ1): How can Risk Management be used to effectively balance an agile method (particularly Scrum)?

Based on the shared viewpoints of the respondents of the interviews, and participants in the focus group discussion conducted during the research, this study has been able to identify certain factors that increase the effectiveness of Risk management as a balance for the Scrum methodology. One is the application of a risk management framework (agile risk identification, agile risk assessment, agile risk response, agile risk review and monitoring). As suggested by interviewees, the application of these stages of risk management has a major positive influence on the outcomes of a Scrum project, and further improves the chances of having a successful outcome. An interviewee also indicated that all the stages of this framework are equally vital, with no stage having a higher priority than the others.

These findings resonate with previous studies carried out in the compatibility of various agile project frameworks, including Scrum, with Management of Risk [6,17,31,32,34]. Mateos-Garcia and Sapsed [33] went further, stating that the application of risk management to agile methods could be conducted using either a structured or an unstructured approach. In an unstructured setting, 'risk identification is mostly conducted by the managers and experienced team members of an organisation, without any supporting practices'; simply put, the Scrum Master and team members can have a discussion based first, on their knowledge of the Scrum process, and second, on their previous experiences. Such discussions can then be harnessed to create a wide-ranging risk list that can be monitored all through the course of the Scrum project. A more structured approach would comprise of Delphi practices or brainstorming meetings, which could include various project stakeholders [8]. This view by Coyle and Conboy [35] is similar to the opinion of an interviewee, who mentioned that:

"... if there is a lack of documentation about inherent risks in a project, the project team put on 'business analyst hats' to further brainstorm about the project and the possible risks that can be encountered during the course of the project".

Rubin [5], however, suggest that, 'there is no single or general risk management procedure, implying that there isn't a single method of risk management that is applicable to every form of project being developed by all types of industries'. The author, in agreement with Coyle and Conboy [35] further said that, 'there are various dissimilar kinds of projects, and similarly, there are varied types of risk management approaches'. This notwithstanding, risk management basics are the same and are constant, regardless of the kind of project or the industry developing the project. It is also posited that the application of the steps identified above (agile risk identification, agile risk assessment, agile risk response, agile risk review and monitoring), in all industries, will positively impact the outcome of any Scrum project being developed.

B. Research Question Two (RQ2): What are the benefits or limitations that could be encountered during the application of Risk Management during Scrum projects?

Based on the research findings, it can be concluded that risk management practices during Scrum provide more beneficial outcomes than limitations. All respondents during the research had similar views on the benefits of applying risk management to Scrum projects, some of which are listed below:

- Risks and issues do occur during projects, a team can choose to either be reactive or proactive about these risks and issues. The proactive management of risks all through a Scrum project is significant for the project's success, and positively influences the outcome of the project.
- Risks management aids in providing an overview of the possible risks that could be encountered during a project and adequately prepare for such risks.
- Though Scrum is already risk-oriented due to its agile nature, the application of a risk management process further buttresses this method, by improving its delivery with regards to its critical success factors of time, cost and quality.

These benefits align with the benefits mentioned by Moran [6], who posited that the application of risk management to Scrum/Agile practices helps to improve capability in the handling of any unforeseen occurrences during a project, which could otherwise impact profits and hinder attempts to take advantage of any opportunities that develop during the course of the project. Thomas [36] points out that risk management aids in improving communication about the features and sources of the risks inherent in an organisation's project, and this results in an enhanced culture of cognizance and knowledge about the requirement to effectively balance Agile Scrum method with risk management.

OGC [9], point out that Scrum provides the benefit of indicating any possible challenges that could be encountered during project development, and at the point identification, a proactive organisation or Scrum Master/Team should decide to take these possible challenges into consideration and treat them as possible risks, so as to be adequately prepared if/when they occur.

On the other hand, one of the limitations of risk management in Scrum, which was determined during the course of the research, was that though Scrum process, if wholesomely followed, was a relatively simple agile methodology, the balance between transparency and short fixed-length sprints frequently reveals previous issues or inadequacies between project teams, an organisations' management and its stakeholders. However, with effective management by both the Scrum Master and Scrum team, this can be resolved with all focusing on ensuring that the Scrum project is successfully completed.

C. Research Question Three (RQ3): What other processes can be applied by organizations to effectively manage their risks during Scrum projects?

Based on the viewpoints by respondents and literature reviewed during the research, Scrum doesn't outline a particular risk management procedure or even identify a risk owner [5,37,38]. Nevertheless, each of the Scrum artefacts and ceremonies (meetings), possibly aids in establishing and moderating possible project risks. As mentioned by interviewees, Scrum/agile already have some inherent risk management features; project teams, in conjunction with the use of an appropriate risk management approach, to ensure project success, can further adopt these features and processes. An interviewee also emphasized that the Scrum Guide has a section for any project 'impediments'.

This implies any occurrences that could prevent a Scrum team from functioning effectively. According to Tomanek and Juricek [38], from a risk management standpoint, project impediments are same as 'issue', which is an emerged risk or a risk that has occurred. The authors add that the Scrum Master is accountable for ensuring that all identified impediments are resolved and the project team functions in a good environment. The traditional structured management of risk can also be used with Scrum artefacts and ceremonies, according to Layton [39], to mitigate some relevant risks.

Conclusions

This research was conducted to investigate how Management of Risk can be used to balance Scrum methods, i.e. how risk management is handled in Scrum projects to ensure efficient project delivery. In line with this, the research has been able to investigate risk management practices, in relation to Scrum process, and how these two sets of practices can be integrated to further improve project delivery. The research was based on the exploratory review of the level of risk management practices in agile methods, particularly Scrum. The evaluation included a breakdown of the stages of the components of MoR process, namely Agile Risk Identification, Agile Risk Assessment, Agile Risk Response, Agile Risk Review and Monitoring. Furthermore, Scrum meetings, which are known as Scrum Ceremonies, and Scrum artefacts have been discussed above, with the purpose of outlining how risk management can be integrated into these meetings or processes, so as to ensure that risk management is a constant and common thread all through the life cycle of the project development process.

An evaluation of prior literature showed that there is a dearth of research on the application of risk management procedures to agile methods or Scrum method. Nevertheless, it is generally known that agile methodologies were initially developed in an attempt to improve upon the existing traditional methods of project delivery, and to resolve recognised risks related to projects, such as scope creep, budget overrun, response to frequent change in business requirements and time-frame concerns [31]. Features such as the application of incremental project development and consistent customer participation are all aimed at reducing the possibility of encountering these kinds of risks.

Nonetheless, as the findings of this research confirm, agile methods like Scrum still require adequate risk management practices, and Scrum projects should have a strong risk management structure in place to further improve project delivery. As mentioned by Layton [39], a Scrum Master, as well as his/her team, should establish the requirement for a structured risk management process during the course of a Scrum project, and encourage every member of the team to work cohesively towards ensuring that all forms of risks are mitigated and have minimal impact on the project. Furthermore, respondents who participated in this research shared similar views on the significance of risk management in Scrum projects, while also suggesting that risk management practices have to be taken more seriously, and Scrum teams have to focus on this aspect of the project more consistently, as they are of the opinion that effective risk management improves and balances the Scrum method.

V. Recommendations

A. Recommendations for Practice, Research and Theory

Risk management in Scrum methods is mostly based on the four stages, which that have been mentioned above; however, these risk management stages have to be applied in a manner that is consistent and aligns with Scrum or Agile standards and approaches, for them to be effective. Additional recommendations are given below:

1) Practice-Increase the Knowledge and Awareness about the Significance of Risk Management in Scrum Projects: "It is significant that though Scrum team members can discuss the current project being developed and how significant each task is or when the project will be completed, they are hardly able to express the risks factors of their projects, or how risks are being managed during the course of developing the project" [6]. Moran statement [6] aligns with the findings of this study, as it was discovered that risk is not the highest priority when conducting Scrum projects. It was also deduced from respondents during the interviews, that searching for information about risk management in Scrum projects brings up next to nothing, because no one is paying attention to this significant feature in project development. A participant in the focus group interview, mentioned that in her current project for a top-level organization in the UK, using Scrum and any other agile methods, risks were not considered but reactively dealt with issues on a daily basis, which has led to inefficient project delivery. Consequently, this infers that most Scrum teams or agile teams do not have any knowledge about risk management as a practice during project development. This has to be improved upon and it is recommended that organisations who develop projects constantly need to train their staff on risk management and the processes/stages of risk management, as well as how to conduct each of these stages.

2) Research - Implement a Distinctive Risk Management Procedure During Scrum Projects:

Based on the review of the literature and the primary data obtained, this research highlighted that most organizations do not implement risk management as a separate practice during Scrum development processes. There is the notion that agile methods, especially Scrum, already have inherent risk management and do not require additional practices. However, this notion can be problematic, as the lack of knowledge about risk management results in the inability to suitably handle risks while developing a project can result in:

- Incapability to make knowledgeable risk and return decisions.
- Incapability to establish suitable risk response approaches with regards to level of project risk.
- Absence of oversight of risk monitoring resulting in ineffectual or incompetent risks management
- Lack of proper knowledge about when to conduct risk processes.

Several researchers have furthermore concluded that applying the risk management processes to agile methods further balances these methods to ensure project delivery. It is apparent that identifying and evaluating threats (i.e. negative risks) and opportunities (i.e. positive risks), and establishing the suitable approaches to managing them, are fundamental, so as to balance risk management with the Scrum project. Encouraging risk monitoring further guarantees that there is feedback into the process, which enables all team members to learn from errors and to develop a wide-ranging risk management procedure. It is recommended that more research needs to be done to explain how the four core components of risk management can be implemented during projects when using the agile frameworks especially the Scrum process.

3) **Theory - Additional Organisational Factors:** Both cultural and social effects on risk management form a significant, though often ignored, feature of the response, review and monitoring of risk during projects within the organization. Considering the humanistic standards of Scrum, it is appropriate that these factors are considered when selecting the risk management approach that is suitable for a Scrum project.

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