

# Framework to mitigate dynamic and static risks with respect to agile

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**Abstract--Software plays a decisive role in present industrial environment. Businesses that are based on software continue to rise and simultaneously risks of all kind that causes software failure also rises. Risk management is becoming a crucial area for software practitioners. For better management of risks in current style of development risks are classified into static and dynamic risks. This study develops a framework to identify, compare static and dynamic risk and mitigate them using agile risk management practices.**

**Key words: Risk management, dynamic risks, static risks, agile**

## I. INTRODUCTION

Risks are generally unstated as a probability of threat, damage, liability, loss or other negative occurrences that are caused by external or internal vulnerabilities that deviates the expectation of an outcome which may be neutralized through proper action.

As the software complexity grows exponentially there is a need of new management models for risk management [1]. Even though risk management is used in different fields for many years, its application in software projects has increased drastically from the past decade. Risk management in software product is to identify the risks, their severity of impact and to find proper solution to eliminate them in order

**Table 1. Performance of development projects**

	1998	2000	2002	2004	2006
Succeeded	26	28	34	29	35
Challenged	46	49	51	53	46
Failed	28	23	15	18	19

Source: The Trends in IT Value Report by Standish Group, 2008

to complete the project in a defined time, budget and quality [2, 7].

As a practice risk management is controlling the uncertainties combined with the events, and making decisions to reduce the brunt of adverse events on a process. So researchers refer risk as a possibility of loss which is the factual meaning of risk.

The risk management framework referring to static and dynamic risks which are between the two interactors and the two types of risks are described below. The following are a few important queries which are answered through this study.

- What are the static and dynamic risks?
- What are agile risk management practices to mitigate static and dynamic risks?

This paper is organized in this pattern, section II analyzes the overall conceptual bases of risk management process, section III framework to compare static and dynamic risk, section IV gives the mitigations of risk and finally conclusion are drawn in section V

## II. CONCEPTUAL BASES

To provide a new framework of identifying, comparing and mitigating the static and dynamic risks of project. This study draw upon the following streams in the literature: (1) Risk identification (2) Risk analysis (3) Risk assessment (4) Risk control (5) Risk management in Agile.

### A. Risk Identification

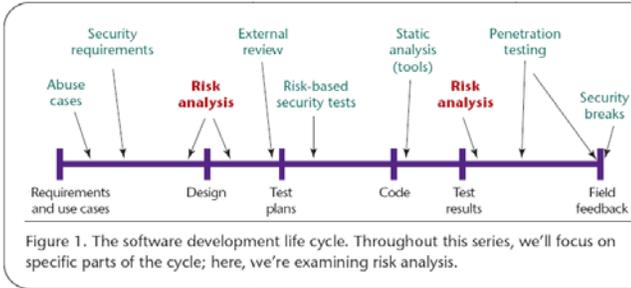
Risk identification [4] is the first step in risk management process where risks are identified and added to the list of known risks. These lists of risks have the potential of compromising the project success. There are many

$$[ r_i, l_i, x_i ]$$

techniques for identifying risks including interviewing, reporting, decomposition, assumption analysis, critical path analysis and risk taxonomies.

### B. Risk Analysis

Risk analysis is a process to determine what security is appropriate for it. Risk analysis methodologies for software usually fall into two basic categories as commercial and standard.



A classic risk analysis method expresses risk as a financial loss or annualized loss expectancy (ALE) based on the following equation.

$$ALE = SLE \times ARO$$

Where SLE is the single loss expectancy and ARO is the annualized rate of occurrence.

Most risk analysis process description is of identification, ranking and mitigation as continuous process but not as single step to be completed at one stage of the development life cycle. During the risk analysis step each risk is assessed to determine, likelihood, impact, time frame

### C. Risk assessment

A risk assessment is a strategy for prioritizing and sharing information about the security risks to an information technology (IT) infrastructure. The phases of risk assessment are:

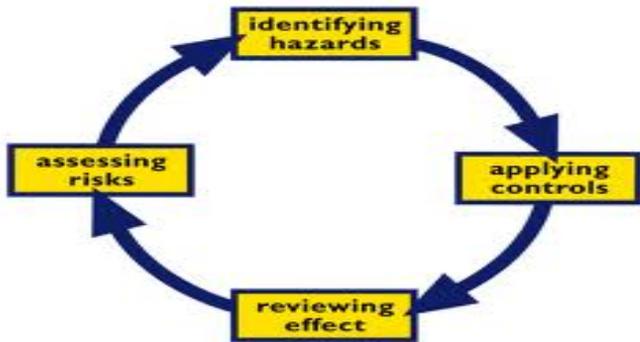


Figure2. Phases in risk Assessment

In assessment we further examine the accuracy of he estimates that were made.

Where  $r_i$  is risk,  $l_i$  is probability of risk and  $x_i$  is impact of risk

1) Identifying the hazards: A threat is the potential for a particular threat-source to successfully exercise a particular vulnerability. Vulnerability is a weakness that can be accidentally triggered or intentionally exploited. A threat-source does not present a risk when there is no vulnerability that can be exercised. In determining the likelihood of a threat, one must consider threat-sources, potential vulnerabilities and existing controls.

2) Applying Controls: The goal of this step is to analyze the controls that have been implemented, or are planned for implementation, by the organization to minimize or eliminate the likelihood (or probability) of a threat's exercising a system vulnerability.

To derive an overall likelihood rating that indicates the probability that a potential vulnerability may be exercised within the construct of the associated threat environment, the implementation of current or planned controls must be considered.

3) Reviewing Effort: The next step in measuring level of risk is to determine the adverse impact resulting from a successful threat exercise of vulnerability. Before beginning the impact analysis, it is necessary to obtain the following necessary information.

- System mission (e.g., the processes performed by the IT system)
- System and data criticality (e.g., the system's value or importance to an organization)
- System and data sensitivity.

4) Assessment of Risk: Assessment of risk constitutes threat-sources and vulnerabilities identified, risks assessed, and recommended controls provided and, the results should be documented in an official report or briefing.

A risk assessment report is a management report that helps senior management, the mission owners, make decisions on policy, procedural, budget, and system operational and management changes.

### D. Risk Control

Risk management is the planned control of risk. It involves monitoring the success of a project, analyzing potential risks, and making decisions about what to do about potential risks.

### E. Risk management in Agile

Risk Management processes may have the air of a traditional, process-driven project management activity. However, agile methods are great risk reduction vehicles, and are actually very well aligned for rapid risk identification and reduction.

Risk is handled in Agile [5, 12, 13] by the following phases where the responsibility for risk management is shared by all people who are involved. The phases are:

1) Identify a risk: In Agile environments [7], the team shares responsibility for identifying risks that might affect a sprint, project or program of development.

The Scrum [14] meetings provide a strong forum for identifying risks on a daily basis. Also, as most meetings take place before any commitments are made, the Product Manager and the team are able to mitigate/remove Scope-related risks before they're allowed to enter a sprint.



Figure3. Agile risk management

2) Assess a risk: Risks may be attributed to Political, Environmental, Societal, Technological, Legal or Economic factors [9].

Mike Cottmeyer has described an alternative way to categories risk:

- Business risk – e.g. value, priority, satisfaction
- Technical risk – e.g. code complexities/technical uncertainties
- Logistical risk – e.g. scheduling, resourcing

We use two measures to grade a risk:

- 1) The probability/likelihood of it being realized
- 2) The impact it will have if it is realized

3) Respond to a risk: Agile Project Management has Risk Management built into its core. The meetings that take place in the run up to Sprint Planning offer numbers opportunities to mitigate/avoid Business, Technical and Logistical risk realization.

If and when we do need to accept a ‘risky’ story into a sprint OR if we’re concerned about an alternative risk of disruptions, then we need to respond in a way that will enable us to:

- 1) Accommodate the potential outcome and
- 2) Make the potential outcome work to our advantage (if possible!).

4) Reviewing risks: The meetings that take place in the run up to Sprint Planning offer numbers opportunities to

mitigate/avoid Business, Technical and Logistical risk realization. These meetings also offer an opportunity to review risk realization and improve Risk Management techniques.

The ‘Review’ stage in the Risk Management life cycle is three-fold:

- 1) Reviewing active risks to ensure that responses are delivered in a timely/efficient manner
- 2) Reviewing the risk management process to ensure that it is optimized
- 3) Reviewing the impact of risks and risk realization on project and company objectives

### III. COMPARITIVE FRAMEWORK

In this study, we propose a framework for agile risk management which identifies and compares the static and dynamic risks through interaction analysis among variety of elements in current mode of software development and mitigate the static and dynamic risks that are identified.

Risk management in software industry is a multipart [8] implementation. The management of risks is more complex with scattered recourses which are differently organized in all aspects causes dynamics of project risks. But this dynamics of project risks may not be in all cases because projects under agile development are smaller projects that may not always come under the concept of multiplicity, and then static nature in project risks [4] may arise. But what is the intensity of dynamic or static cannot be determined because project development in terms of environment is not constant.

In this study, we suggest a framework to identify static and dynamic risks in all kinds of projects by applying an interaction outlook to some elements that are common to all types of projects considering their size into account.

TABLE I. DIFFERENT INTERACTIONS, WITH DYNAMIC AND STATIC RISKS

Interaction Types	Dynamic Risks	Static Risks
People- People Interaction	Knowledge sharing. Multi-stakeholder relations. Language barriers	Practitioners left. Time to train is consumed
People- Process Interaction	Multi-tasking distribution and coordination. Multi-team knowledge management	Time is taken to ad her to new process. Training is need to use new process
People- Technology Interaction	Multi-development platforms with different standards. Fears of multi- technologies	Lack of skills in new technology. Expensive to train.
Process- Process Interaction	Coordination of multi workflows. Misalignment of business processes and project management	Customer involvement is not guaranteed. Chance of deviation in requirements.
Process- Technology	Task-technology fit Misalignment between	Tools to measure new process. Lack of skill in

Interaction	business and it strategies	measuring quality
Technology-Technology Interaction	Integration of multi-technologies platform. Misalignment of IT strategies among distributed teams	Lack of skills in multiple technologies
Internal-External Interactions	Project continuity compliance. Market positioning and time to market	Inputs from external sources. Accuracy is not maintained

In this framework first we discuss about interaction among internal elements both in multi and non multi environments, i.e., people, process and technology that leads to certain types of dynamic risks and static risks.

*A. People-people Interaction*

Dynamic risk vs. Static risk: In exacting, for the people-people interactions, multi-stakeholder relation is a common complex risks in multipart [6]. This type of risk may be due to literary difference, improper understanding of requirements, lack of clearness in communication, differing individual wellbeing [2]. Following this, difficulty of knowledge sharing among multipart and individuals, the language barriers and different perceptions of hierarchy in both official and non official settings [6].

This type of risk is common in non multipart where the availability of the practitioners throughout the development of the project is considered more complex. For any cause if the practitioner allotted for the project leaves then it is hard to find out the replacement immediately and on the other hand training required to handle the work is considered as a time consuming risk.

*B. People-process Interaction*

Dynamic risk vs. Static risk: Here in this type of interaction project teams can experience the complicatedness in setting and implementing institutional knowledge management policies and structure, the more difficulty in distributing and coordinating various responsibilities among distributed teams in different places.

In this type of interaction it is difficult to make a transform from the existing process to a new process where everything is to be known from the ground-up. In such situations a major aspect is train the people of different levels to adapt to the new process.

*People-Technology Interaction*

Dynamic risk vs. Static risk: Here in this type of interaction leads to conflict of diverse participants against integrating or standardizing different development platforms or collaboration technologies. This conflict may be due to fear or loss of command or lack of interest in learning new techniques resulting team suffers compatibility issues.

In this type of interaction it is not easy for the practitioners always to be familiar with new and upcoming technologies and it is expensive and a time consuming activity for the existing practitioners of the firm to for them.

*Process-Process Interaction*

Dynamic risk vs. Static risk: Here in this type of interaction it may leads to misalignment between business

processes and project management methodologies and difficulty in coordinating multi-work flows among different teams

In this type of interaction in traditional software development process models direct customer involvement is not possible, only at the initial stages customer is involved in meeting to gather the requirements and not any more. so the output may not be guaranteed that it may be up to the expectations of the customer

*Process-Technology Interaction*

Dynamic risk vs. Static risk: Here in this type of interaction it may be challenging for business strategies among multipart teams or various organizations and can also result in supporting the teams with mismatched or unsuccessful technical tools.

In this type of interaction it is necessary to have new tools to measure new process for better quality which is needed for the projects. To use the new tools the people should have skills, for which proper training is needed.

*Technology-Technology Interaction*

Dynamic risk vs. Static risk: Finally in this type of interaction it may lead in conflicting IT strategies and IT investment priorities between multipart teams or various development platforms and applications.

In this type of interaction it is not always possible for the practitioners to have skills in different technologies either they may be the old or new technologies.

Now as a second part of interactions we go for interactions between internal and external elements.

*Internal-External Interactions*

Dynamic risk vs. Static risk: Here in this type of interaction it may lead to the lack of skills in defining market location and time to market the local and global necessities and competitions. It is also unsuccessful in gaining fulfillment to each restricted polices and values.

In this type of interaction it is not easy to gather the exact information in the form of inputs, so accuracy is not maintained. So it will not produce accurate results that are expected as per the requirement and needs of the customer.

**IV. MITIGATION STRATEGIES**

Considering the current trend of software development we make our attention on agile project management practices [11, 12, 18, 19], we put forward mitigation strategies for the dynamic risks as well as static risks identified through the multiplicity interaction study in earlier section.

TABLE II. MITIGATION STRATEGIES FOR DYNAMIC AND STATIC RISKS

Risk Types	Risk Mitigation Strategies for Dynamic risks	Risk Mitigation Strategies for Static risks
People-related	Role of Agile People Management Skills •Localization skills	Role of Agile People Management Skills •Reserve practitioners are to be maintained •Frequent

	<ul style="list-style-type: none"> <li>•Joint venture management skills</li> <li>•Multi-culture management skills</li> </ul>	review system shares knowledge
Process-related	<ul style="list-style-type: none"> <li>Role of Agile Project &amp; Process structure</li> <li>•Modular Approach</li> <li>•Decentralized knowledge management</li> <li>•Agile task plan</li> </ul>	<ul style="list-style-type: none"> <li>Role of Agile Project &amp; Process structure</li> <li>•Train all the team members</li> <li>•Sharing of knowledge</li> </ul>
Technology-related	<ul style="list-style-type: none"> <li>Role of Agile IT policy &amp; IT structure</li> <li>Loosely centralized IT strategy</li> <li>Standardized IT platform</li> </ul>	<ul style="list-style-type: none"> <li>Role of Agile IT policy &amp; IT structure</li> <li>•Continuous training programs are to be conducted</li> </ul>
External-related	<ul style="list-style-type: none"> <li>Role of Agile Environment Management skills</li> <li>•Building market analytical capabilities</li> <li>•Vendor management</li> <li>•Centralized supervision</li> </ul>	<ul style="list-style-type: none"> <li>Role of Agile Environment Management skills</li> <li>•Query log is maintained</li> <li>•Frequent meetings in initial stages</li> </ul>

*A. People interrelated dynamic and static risks*

It is suggested that project teams develops and use agile management skills to mitigate people interrelated risks.

For dynamic risk mitigation Localization skills including customizing or adjusting a local management structure, workflows and development platforms to gather the requirements of the local teams. For successful localization key technical and managerial skills, cultural backdrop and language preferences are to be developed. Then partnership management skills as well as building and sustaining the strategic relationship to distribute goals and look for common benefits among the teams, are to be developed. Then multi-culture management skills are required to handle the ethnically distributed team members. These skills are to inspire the project team and know their tasks, roles and relationships within the multipart project teams, by these above discussed mitigations dynamic risks can be controlled

For static risk mitigation reserve practitioners are to be maintained in order to overcome the dependency. One should not depend only on a particular person there should be practitioners available where ever a practitioners left the team. Then frequent review system between people shares knowledge among all the practitioners in and out of the team by these above discussed mitigations static risks can be controlled

*Process interrelated dynamic and static risks*

To overcome the process-interrelated risks agile project and process infrastructure can be used as strategies.

For dynamic risk mitigation modular approach is used to build a system with individual components [17]. According software engineering literature, modular approach has been discussed as the key to assemble and line up unlike pieces of components based on the user necessities [10]. Then decentralized knowledge management in a multipart project can be achieved through efficient coordination skills at technical, product and process levels. This allows flexibility

to individual team members to include their knowledge to the local knowledge base of their team or organization. Then as per agile project planning is characterized by iterative, adaptive and extreme strategies as described by Wysocki [16]. Usually necessary tasks cannot be designed exactly in the beginning of the project. Hence, agile task planning can be well engaged to manage the dynamic risks associated with task planning by these above discussed mitigations dynamic risks can be controlled

For static risk mitigation Training to all the team members is a good activity to acquire extra skills and knowledge and can be utilized at adverse conditions. Then apart from training sharing of knowledge between the practitioners can be helpful in gaining confidence at various levels by these above discussed mitigations static risks can be controlled

*B. Technology interrelated dynamic and static risks*

These technology interrelated risks can be handled by agile IT approach and agile IT infrastructure [15].

For dynamic risk mitigation loosely centralized IT strategy makes globally scattered development teams to spotlight on local specific IT goals and strategy to accomplish those goals. This strategy fosters sharing of organizational top practices that are harnessed by an agile project team to free a software product more rapidly than ever [12]. Then use of standardized IT platforms involves agility by design. This allows organizations to experiment with different technological alternatives and thus it helps organizations seek a range of configurations at a low cost and in a short period of time [14].

For static risk mitigation there should be continuous training programs at different levels for the practitioners by especially skilled people from different organizations, which makes the practitioners a good exposure in different technologies and helps them to gain confidence, by these above discussed mitigations static risks can be controlled.

*C. External interrelated dynamic and static risks:*

For dynamic risk mitigation the logical capabilities to sense market competition involves gathering on hand information about local and global contender movement. Then vendor management to put up planned networks with well-built industry players enables the project team to respond to contender movements. Then the centralized supervision over the disaster recovery practices, with predefined strategy and backup systems. The central project management team should give the proposal for overall project continuity plan as well as feasible backup and recovery measures by these above discussed mitigations dynamic risks can be controlled

For static risk mitigation a query log is to be maintained such that the problematic points will be pointed in that log and that will be passed to different people where they can make possible suggestions on the problems that are quoted in the log. Thus we may get a variety of solutions for the problems. Then at initial stages itself frequent meetings are to be conducted to gather the overall requirements of the

customer, by these above discussed mitigations static risks can be controlled.

## V. CONCLUSION

This study provides innovative and useful approaches in risk management. In risk management framework two types of risks are discussed. The short comings of the dynamic and static risks are compared. For decision makers it is make decisions by using the comparative study of the risks. The mitigation strategies are discussed related to dynamic and static risks, by this analysis decision makers can expect the type of risks and strategies to avoid the risks. The strategies are derived by considering agile agility to avoid the risks. In the future extension of the study we intend to expand the current framework to CMMI levels and the work may be practiced with different case studies. In particular, we try to extend the framework for individual methods of agile like scrum, XP, lean agility.

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