

# SOFTWARE DEVELOPMENT AND RISK ANALYSIS IN AGILE DISTRIBUTED ENVIRONMENT

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**ABSTRACT** - *In software development risks are very common in centralized as well as agile distributed environment. In agile distributed software development environment the requirements, principals for understanding risks, prioritization of risks and agile distributed environment risks are key elements of risk analysis. In our research the survey is based on 20 Pakistani software companies working on agile methodologies in a distributed environment. In our study, we analysis different risks those are specific for agile distributed software development environment. Our study concluded that if these risks are analyzed and handled carefully, then the successful completion of software development in distributed agile environment is very easy and it also helps to improve the quality of software.*

*In our research, we used Questionnaire and interviews for the collection of data. We interviewed employees of different organizations to gain knowledge about their objectives, and to evaluate associated risks in distributed software development in Agile. Our survey results shown that the software development process quality can improve 90% if all the associated risks are analyzed during the development process in a agile distributed environment.*

**KEYWORDS:**Software Development, Agile Methodology, Distributed Environment, Risk Analysis, Pakistani Software Companies.

## 1. INTRODUCTION

In software development risks are very common in centralized as well as agile distributed environment. This will cause a huge cost to the organization. The risks can effect on the product quality studied by others[1]. Agile is generally believed to be a productive approach and are effectively used in the software development process [2]. The main reasons for the failure of software development projects have been claimed to be the challenges of transition and migrating to agile, misunderstanding and unfamiliarity with the method, the additional cost of user involvement and the required training, dependency of agile method on high-level technical skilled developers, etc. [3].

Distributed software development has its own dimensions, which add the general cost, or make it risky to be used. The main problems in a distributed software project is the problem of communication, finding related experts for a specific problem, cultural differences, working in different time zones, integration of tasks, lack of trust, etc. [4]. The level of importance, either related to agile or a distributed development method. As a result, evaluating the current situation of an organization and also resources available for a specific project, there is a need to identify all the risk that may face in the distributed agile software development environment.

It is frequently observed that companies move to more simple such as near shoring or onshore site once they are over with the stage of focusing on labor costs. Some studies have collected risks and techniques for managing risks [5]. Regardless of the distribution, because of quick development, recruiting less people, etc. agile is considered as a cost and time efficient method. Emphasizing on agile communication, both structured and informal communication, and the need for communication in agile because of required continuous integration could mitigate the problems of missing face-to-face communication. It's also helpful for building trust between team members and increasing the transparency over the project.

## 2. LITERATURE REVIEW

In agile distributed environment, the software development process is connected with various risk factors. In software development the absence of support of the top management may corporate to the major risks [6]. It is explored that the support of senior management is very necessary for the success of any project. The top management should frame some principles that must follow in the working environment of the software development [7]. Organization should select some suitable tools for development and efficiently utilized the available team skills for the successful completion of a project. The project failure risk may come if there is insufficient amount of time for the given project [8, 9].

In a distributed environment, communication is a big risk. As many stakeholders are involved in the development process and are located at different locations, leads toward the communication risks. For best result there is need of user regular communication with the team. Documentation of new software is a very key part of software development. In practice, during development it was observed that documentation is generally neglected [10]. In agile distribute environment video chats, skype and teleconferencing services can play a major role for better communication during the software development process. In the same context the replacement of IT team member will also cause much on the overall performance of the organization due their experience values. The rapid changing in the technology has a major impact on the employee turnover [11].

With the success of development process of a software, especially in agile distributed environment, the manager role is very important [12]. Understanding about the issues and risks in working environment, the manager must have adequate control and know all the methods and techniques to get override them. It is a big characteristic of a manager that he must provide a good working environment to his team.

Manger must face the problems and solve them according to the needs.

Boehm [13] studied the vendor risks, those are low compatibility of software with the new hardware in the market. This will show poor functionality of existing software and can affect the performance of the organization. More dependence on the foreign companies for new hardware supply can slow down the project progress. Schmidt *et. al.* [14] prove that if an organization has not a good control over vendor and suppliers, this will leads problem with low outcomes and poor specification of contract.

The selection and use of inappropriate approach and technology in a candidate software development process will leads to the high chance of failure and it will unable to give the expected results/objective set in designing phase. In technology risks, the selection of software language, hardware, approaches and methods are involved which may create difficulties for developers [15]. Research has proved that organizations must be aware of the modern IT market and time to time it should change their techniques and tools. These are those risks that emerge because of issues that emerge in the innovation gained by the association. This includes the utilization of new innovation.

Some risks need to be considered for participating of users in the development process. Since, there are different layers of users, it's required to check if it's enough that high-level management and customers be involved in the development process. After completion of software development process users give their feedback after releasing the software [16].

It's important that the development team also has enough business knowledge and has constant communication with

the business team and customer. There is a problem that customers do not receive enough information about the software development, which will decrease customer satisfaction level. For both of these methods, sending a bundle of requirement and expecting to deliver the software after a while without working closely with the development team results to a low quality software [17].

Some problems happen with team communication and relationship in this structure while teams become specialized in particular components. It's not adjusted well with novel projects having uncertain requirements. Another practice for teams working with large time difference is to use a proxy who joins both meetings. The proxy should change his working time to be able to join both meetings [18].

**3. MATERIALS AND METHODOLOGY**

In agile distributed software development environment for risk analysis the key requirements are principals for understanding risks, prioritization of risks and agile distributed environment risks.

**3.1 Agile Software Development Requirements**

Garrabants et.al [19] to find a criterion that has to develop, and became the basis for development needs that we set for the development of the method, risk analysis were examined in terms of our own experience. In identifying and exchanging different perceptions and opinions during the analysis and combination of risk analysis results and should be shared with various stakeholders. We reframe some possible solutions for the software development requirements during risk analysis presented in Table 1.

**Table 1: Requirements For The Risk Analysis**

Requirements	Possible Solutions
Consistency	Individual users should be similar to the methods applied in the same situation and the same result.
Usability	Methods should be flexible to make it simple and easy to use.
Adaptability	The method should be concrete and feasible in practice
Feasibility	The method can be applied to different situations and projects
Completeness	This method must be compatible with all aspects of operations and risk management in a software development project
Credibility	The method will increase confidence in the validity of risk analysis results.
Validity	Real facts and results are used for easy validation.
Communications	Methods should be communicated about the risks
Cost-effectiveness	The method must generate added value for the project within a reasonable cost and effort.

**3.2 Principle For Understanding Risks**

Risk is a relative concept and objectives depends on the expectations and restrictions involved. Then risks are covered according to the situation in positive consequences. However, the focus is generally on managing the negative effects of risk analyzes. Identification and evaluation of effectiveness

depends on the situation or what the expectations of the objective are.

Risks, costs, deadlines, reputation, reliability and functionality can affect the various objectives of the project. In such cases, all these modeling effects to discover the truth for risk analysis and should be addressed. Many risk

management approach can be ignored due to expenses limitations. Even when the objectives are defined and expressed during the risk management activities of the project and the risks are the valuable interests of all stakeholders for prioritizing correctly. Understanding all the objectives related to stakeholders to be useful to take into account your preferences and document.

**3.3 Prioritization of Risks**

On the basis of scenarios prioritization of risks are necessary to find out the probability and possible loss in the specific risk. This process is slightly difficult as data may change in the agile distributed environment. For the calculation of utility loss it is very difficult due to multiple factors consideration depends on the nature of the stakeholders function in a particular project. These risks with estimation problems are discussed in the table 2.

**Table 2: The Risk Prioritization Process**

Purpose	Prioritize Scenarios
Description	With respect to seriousness, for each scenario utility and probability can be prioritized.
Entry criteria	Completed Risk Scenario OR As per new Scenario new risk can be defined OR incompatible information available but cannot compare with prioritization already exists.
Input	Scenario based Risk
Output	Risk scenario partially prioritized
Tools and Method	Pareto Technique i.e Riskit
Task Liability	Project manager
Resources	Personnel for specific project
Criteria to Exit:	Ranked the selected scenarios and access on available data.

**3.4 Agile Distributed Software Development Risks**

These risks are specific for agile distributed software development environment basis on our analytical study. These risks should be handled carefully for the successful

completion of software development in local as well as in distributed agile environment. These risks are discussed in table 3

**Table3: Risks in Agile Distributed Software Development Environment**

Risk Domain	Description of Risk in Agile Distributed Software Development
Asynchronous/Communication Risk	The practice meetings are to be held very rare because in distributed environment's project involves shortage of overlapping hours to work. Various techniques can be used by project managers to guarantee synchronous communication using different meeting practices.
Poor Communication Bandwidth Risk	For good and synchronous communication, good bandwidth in an agile environment is required. Some of the agile projects are frequently slow and less reliable, also with low communication quality. Some alternatives, telephone, web camera, video chat, video gathering, web gathering, mailing list sharing, electronic mails, MMS, instances messages
Project Personnel Size Risk	In agile normally there are five to ten individuals. Consequently, utilizing Scrum for a group of countless work forces (individuals) is thought to be a risk. It is significantly more hazardous to utilize Scrum in an extensive group conveyed over numerous destinations.
Scope Creep	As the introduction of uncontrolled changes, which happen when the extent of the task is not known and characterized. The degree creep issues in established life cycle undertakings is dealt with as missed necessities should be added to the venture without influencing different prerequisites.
Schedules Risk	The time in Agile to have a discharge decreased to be couple of weeks this will diminish the risk since the difficulties confronted while creating a couple of weeks discharge are unique in relation to the difficulties for a while and years item.
Friction Between Developers and Customers	Agile diminishes clashes between the two gatherings and lessens this risk, on the grounds that the connection in the middle of designers and clients that spry gives will build the cohesion.'
Technology Risk	Issues emerge from the innovation that utilized as a part of the conventional activities might require long time to be anticipated. While deft tasks find the innovation issues early and right them.

Organizational Risks	They are those risks that happen due the associations own shortcoming. It is exclusively the flaw of the association that the risk has happened since they worked legitimately towards accomplishing a specific perspective.
External Risks	They are those risks that are brought on because of variables outside of the association e.g. shortages of remotely supplied parts, unenforceable conditions.

**3.5 Tools For Data Collection**

In our research, we used Questionnaire and interviews for the collection of data. The survey in the study was completed by 20 software companies of Pakistan. We interviewed employees of different organizations to gain knowledge about their objectives, and to evaluate associated risks in distributed software development in Agile. Both face- to-face and telephonic interviews were conducted. Each lasted from 30 to 45 minutes.

**4. RESULTS AND DISCUSSION**

There are three possible sources for estimating the likelihood of risk. Statistical data based on historical data, subjective assumptions and theoretical analysis. Software is historical information rarely available in engineering and this possibility can rarely create a reliable basis to predict:

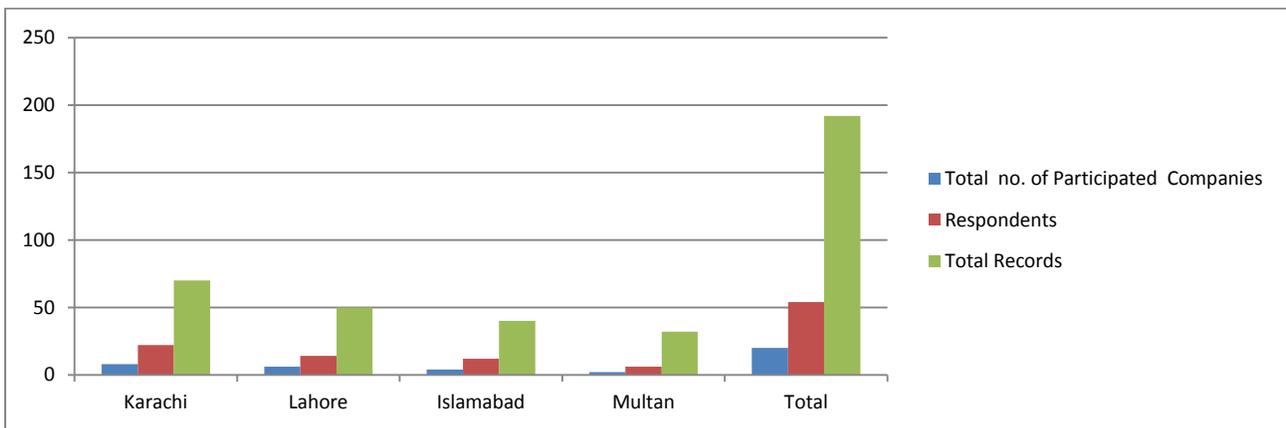
situation and context may have changed and many risks, by definition, in the past to live an improbable probability events, which may be very few Data points to determine the probabilities.

**4.1 Research Sample**

In our study, 100 questionnaires were distributed for data collection to 20 software companies currently working on agile technologies in distributed locations. From those distributed questionnaires only 52 were filled and reconceived. In those filled questionnaires only 192 records are found and analyzed to find the risks in agile distributed software development environment. These records are based on 54 respondents working as team members in these selected software companies. All the details are shown in table 4.

**Table 4: Research Sample**

Location of Companies	Total no. of Participated Companies	Respondents	Total Records
Karachi	8	22	70
Lahore	6	14	50
Islamabad	4	12	40
Multan	2	6	32
Total	20	54	192



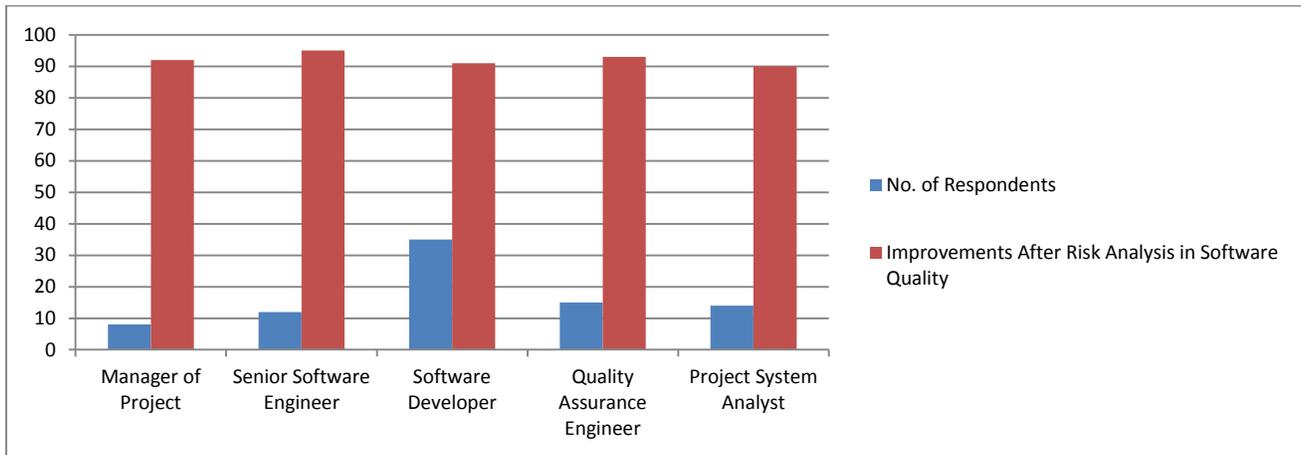
**Figure 1: Records for Risk Analysis**

In our study, the response from different software development members is received in the form of survey in which the major respondents are senior software engineers

and software developers. Their response is for improving the software quality after risk analysis in the development process of software is shown in the table 5 below

**.Table 5: Improvements in Software Quality After Risk Analysis**

Software Development Members	No. of Respondents	Improvements After Risk Analysis in Software Quality
Manager of Project	8	92
Senior Software Engineer	19	95
Software Developer	35	91
Quality Assurance Engineer	15	93
Project System Analyst	14	90



**Figure 2: Risk Analysis Results in Improvement of Software Quality**

Our survey results shown that the software development process quality can improve 90% if all the associated risks are analyzed during the development process in an agile distributed environment.

**5. CONCLUSION**

In our research the survey is based on 20 Pakistani software companies working on agile methodologies in distributed environment. In our study we analysis different risks those are specific for agile distributed software development environment. Our study concluded that if these risks are analyzed and handled carefully, then the successful completion of software development distributed agile environment is very easy and it also helps to improve the quality of software. The main objectives of this research are to find out the areas and stages where software risks may arise and must be avoided for successful completion of a software project. Critically study the nature of risks and its contents that may involve in distributed agile software development. Our study helps in idea to make software developers understand the software risks and necessary practices of distributing agile development. It also emphasis on more effective risk analysis study and techniques need to be used in software projects to improve projects success rate.

**5.1 Future Work**

In this study, although the practical and feasible approach in industrial projects, we have performed a qualitative risk analysis that eliminates many of the limitations of current approaches. The risk analysis in the distributed environment agile software company of Pakistan is presented in this survey.

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In future studies, there may be systematically different methods of software development and open; So the results will be forwarded to transparent and several stakeholders and project stakeholders. Low cost new risk analysis methods that can be used in software projects produce tangible results, and can also be used for future risk management.

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