CHAPTER - 1

INTRODUCTION

1.1 SOFTWARE RISK MANAGEMENT

The advanced development and the new application of a software technology exposes the community to certain threats. The failure of a software project is a business undertaking results in waste of time and money. The risk of such lack of success is known as software project risk. Software Development Life Cycle (SDLC) involves various risk factors during its development stages. Software project risk management is related with activities involved in to attain whether the software is delivered on time, on culmination of planning activity and with the requirements of the organizations developing and gaining the software. Project management is essential since software development is always subject to budget and schedule restriction that are set by the organisation developing the software. The term software risk management is used to identify, analyse, prioritize, planning, address, and remove software risk items before they become failure to successful software project [1].

Risk management is divided in to two types namely risk assessment and risk control. Risk identification, risk analysis, and risk prioritization were used for risk assessment. Risk control depends upon some factors like risk planning, risk resolution, and risk monitoring. Checklists, decomposition, comparison with experience, and examination of decision drivers are important terms used in risk identification. The loss-probability and loss-magnitude associated with each of the identified human risk items, and appraisal of compound risks are involved in risk item interactions and is known as risk analysis. The human risk analysis techniques include individual ability, team communication, product complexity, change notation, network analysis, level of technology and performance models. Risk management plan is described as plans for addressing each of the risk and includes the interaction of the individual risk plans and with the overall software project plan.

The seven principles of human risk management [2] which was defined by the Software Engineering Institute (SEI) is as follows,
• Project tracking and control
• Team work
• Global perspective
• Forward looking view
• Open communication.
• Integrated management
• Uninterrupted
• Processes

The Microsoft Corporation has proposed another set of concepts for the human risk management. They are

• In any planned activity risk is inherent
• Proactive risk management is the effective one
• Risk identification is taken as positive
• Continuous assessment
• Open communications can be done
• Specify, then manage
• Don’t judge a situation simply by taking the number of risks

An improved way of addressing and organizing the software life cycle is provided by risk management. A software human risk denotes an aspect of a process, development task, and environment. Human can assess the degree of human risk by the way either quantitatively as the probability of uncertain events multiplied by the loss associated with their condition or qualitatively by referring to the uncertainty of the project and the effect of latent qualities loss such as staff inexperience, user uncertain of the requirements associated with project lack of success. Risk management helps the developers to assess problematic aspects of a project, emphasizes potential causes of failure, helps to identify the possible actions that is needed on time and facilitates a shared power knowing of a planned activity among its team. Risk frame works and associated tools have previously been successfully developed to identify, analyse and tackle the planned activity.
1.2 SOFTWARE DEVELOPMENT LIFE CYCLE

A software development life cycle (SDLC) is concerned with the development of the software product of the companies. SDLC intention to be the standard that defines all the tasks required for developing and maintaining human risk software. It is step by step execution, which emerges good outcome. Each phase is handled by a team. Nowadays the human software development teams are geographically distributed. The software development life cycle is shown in Figure 1.1.

![Software Development Life Cycle Diagram](image)

Figure 1.1: Software Development Life Cycle

1.3 TYPES OF PROJECT PLAN

<table>
<thead>
<tr>
<th>Plan</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity Plan</td>
<td>Explains the procedures and standards of quality that are used in a planned activity.</td>
</tr>
<tr>
<td>Validation Plan</td>
<td>Deals the approach, resources and work allotment, for individuals used for system validation.</td>
</tr>
<tr>
<td>Configuration Management Plan</td>
<td>Determines the change management procedures and corresponding structures to be used.</td>
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</table>
1.4 RISK & RISK FACTORS

Risk is the potential of loosing something of valued, weighted against the potential to gain something of value [3]. Risk can also be defined as the intentional interaction with a state of some of the unpredictable possibilities involved loss, catastrophic problems (surprises) that could have been avoided or other undesirable outcome. Another definition of risk is the possibility of loss or injury. The word risk is coined from the Italian word "Risco". Risco means a chance to the possibility of danger. Risk cannot be eradicated but can be minimized. Decision will be made without complete information or adequate knowledge of future consequences, the probability of successfully completing the program is reduced. The risk factors are categorized in to six types. They are time risk factor, cost risk factor, software risk factor, hardware risk factor, human risk factor and place risk factor.

1.4.1 Risk Avoidance

It reduces the scope of the software development effort that may occur in additional resources. Risk avoidance involves analysing and studying the problem that may occur in a project.

The four main risk avoidance concepts are

- Identification of risk
- Assumption of risk
- Transference of risk
- Mitigation of risk
1.4.2 Positive Risk

Positive risks are risk that happens in good things sometimes called opportunities. A definition for project risk is an unexpected event that can have a positive or negative effect while meeting the objectives of the project. The goal of project human risk management is to minimize the potential of negative risks and increasing the potential of positive risks.

The strategies for positive risks are

- Risk exploitation
- Risk sharing
- Risk enhancement

The schematic diagram for representation of risk factors are shown in Figure 1.2.

![Risk Factors Diagram](image)

**Figure 1.2: Risk Factors**

1.5 DISTRIBUTED SOFTWARE DEVELOPMENT TEAM

Distributed software development teams are the teams of the software that collaborate with the nations and work on a common system project. Human effort in different places increases the program quality and to improve the product complexity. The distributed software teams coordinate through various technologies like shared work knowledge, video conferencing, discussion boards and electronic meeting. The business
analyst work closely with the system analyst to make establishes an understanding between the client and the software development team concerning the earlier requirements.

The developers are working on a same module in the distributed team to be developed and there is need of the desired task within the collaboration to achieve, although electronic communication infrastructures are now readily available, geographically distributed projects have become increasingly feasible to organize and manage. The human risk state arises when there is delay detected due to some drawbacks faced by the participants on the development team. The developed teams dispersed among various regions of the world, so the serious assessing of the risk should be needed for the management of human risk in distributed software development team.

The principle of risk management is to seek to generalize patterns of relations between organizational contexts and use of technology on the ways that support human task oriented schedule. A software risk denotes a possibility of suffering from loss in software development process, etc. lack of commitment leads to a project failure. Human can assess the degree of risk quantitatively as the probability of unsupportable events multiplied by the loss associated with their product or qualitatively by referring to the uncertainty of the project and the effect of potential loss associated with the project failure. Risk management helps the developers to assess problematic aspects of a project, emphasizes potential causes of failure, helps to identify the possible actions that is needed on time and facilitates a shared perception of a project among its team. Risk frame works and associated tools have previously been successfully developed to identify, analyse and tackle the project.

1.6 HUMAN ORIENTED DEVELOPMENT PARADIGM

Software development is a human oriented development paradigm. Humans are important in the development of a program and each phase of the software development life cycle that is a framework composed of a sequence of distinct steps or phases in the development of the system. For example, the human who works with design phase is simply called as designers. Risk management includes managing the risk which occurs on the current progress, it is far better than the implementation of risk reducing strategy at the end of a project.
1.6.1 Basic Concepts of Human Resource Development

Human resource development is according to the corresponding corporate philosophy and management strategy. It is also based on employee motivation and by instruction and dialogues with superiors in the work place, supported by special training in each division and also by group wide training. Each of the humans is managed by the human resource strategy, first definition of the formative requirement is done by the annual training program. Then the necessary training is provided by the internal and external courses. Evaluation of the effectiveness is done by the learning process. The corresponding human should be aware of the continuous ongoing process and should keep all registration document, proof of instruction, experience of staff by the training curriculum report etc. This development process has the inputs as new employees, unskilled employees, and potential managers. The process is done to get the output as motivated skilled and committed employees. The pictorial representation of human resource development program is given in Figure 1.3.

1.6.2 Effectiveness of Human Resource Development

The effectiveness of human resource development is categorized as organizational effectiveness, managerial effectiveness, team effectiveness, interpersonal effectiveness and individual effectiveness.
1.6.3 Employee Motivation

Motivation is defined as a reason for acting or behaving in a particular way. Employee motivation is a good tool of the managerial parties that is used for the productivity. Motivating the humans in the development process probably increase the capacity of the design progress.

1.6.4 Leadership and Leadership Qualities

Leadership is defined as the action of leading a group of people or an organization, in a proper way and also helps to achieve the common goal of the employees. Leadership qualities are wisdom, honesty, courage, confidence, passion and sincerity. The good leader should possess the qualities such as delegating, motivating, supporting a development culture, managing the change effectively, coaching and monitoring the team and empowering the team etc. The effective leader can able to bring the success to the organization. The leader should leads to the team in proper way to ensure the success. This is called as effective managerial activity. The leadership qualities can be understood through the Figure 1.4.

Figure 1.4: Leadership Qualities
Effective project leadership by a leader brings the desired output from the human employees. The Leadership qualities such as visioning, listening and questioning, empowering, influencing, communicating, strategizing and team building are used for the success of the project. In the development of software, the project manager is considered as the leader of the project who has the responsibility to maintain the fulfilment of the task provided to the employee. He has to plan, monitor and controls a team of software engineers [4]. Project management is the process and planned activity, organizing, motivating, monitoring and controlling resources, procedures and protocols to achieve certain goals of the organization. Project is a planned activity, that is temporary aspire designed to produce a unique designed outcome, service result with a defined beginning and end undertaken to meet unique targets and objectives, typically to bring about commercial change to the corresponding organization. Each project had the separate set of protocols that are applied for the completion of task in a successful way to the project development. Management styles are also different from project to project, leader to leader, organization to organization, culture to culture and location to location. According to the size of the project the managerial styles also differ from project to project.

### 1.6.5 Software Roles

SDLC is an orderly approach and it consist of various stages during its development, ie; the software process consists of those activities, methods and practices useful in developing a software product. Software product is a computer program combined with those items that make it intelligible, usable and extensible [5]. Software development team includes many developers associated with in it. These developers have to perform different roles depending on the project.

A role is defined by a set of activities and responsibilities related to the artefacts being created, monitored and controlled based on the organization statics. The software development processes are requirement analyst (Business analyst for domain specific projects), system analyst, designer, implementer, tester and maintainer. All these peoples are managed by the project manager.
1.6.6 Risk Management

Management of the software process is the human intensive activity which includes recognition of risk, potential of risk, assessment of risk, prioritizing the risk and developing strategies to manage the risk and minimization of risk using the managerial resources. The steps includes identifying human risk, avoiding the risk, and reducing the negative impact of the risk on the business process. Objective of human risk management is to minimize different risks related to a pre-selected domain to the level accepted by society. It may refer to number of types of event caused by environment, technology and humans. On the other side it involves all means available for humans, or in particular, for a risk management entity including person, staff, organization.

In ideal risk management, importance is given to the human risks with the maximum loss and the main occurrence are handled first, and risks with lower possibility of occurrence and low loss are handled in higher to lower order. Since the greatest risk have the highest impact and low possibilities to eradicate. In practice the process is very difficult to balance the human risks with a higher probability of occurrence and lower loss versus a risk with high loss, but lower probability of occurrence can often be mishandled.

Software human risk management deals with the attempts to formalize risk oriented correlates of development success into a readily applicable set of principles and practices. Understanding the impact of the each risk factor is much important before formalizing the solution. It also includes techniques and steps to identify, analyse and control software risk. Risk management is aimed at taking counter measures to prevent risks from affecting the project and bring the project to the level of success.
The project risk management system is shown in Figure 1.5.

![Project risk management diagram]

**Figure 1.5: Project Risk Management**

Present and recent software projects are often change with respect to customer demands and are put under schedule pressure. The systems are developed according to the size and become increasingly complex. The personnel turnover is large, the size and decomposition of project groups are growing. The involvement of people’s continuous effort adds the factor of human mind and personality to the technical difficulties of the project. The outcome of software is constantly error-prone, the cooperation among the project members is often poor and the expectations of the customers are not satisfied. Overall, it deals for some significant improvements to the software engineering development. One of such novel approaches is risk management. A project with human risk management intent at early identification and observation of risks and then changes the course of actions to moderate and minimize risk [6]. This requires open communication, forward-looking view and team association in the management and developing and maintaining a knowledge base of typical problems. The lack of these exposes a project to a great danger of lack of success.

In general software project risk management is the art and science of identifying, analysing, monitoring, assessing, prioritizing and responding to human risk throughout the life of a project and in the best interests of meeting project objectives. It is often overlooked in projects, but it can help to improve project success by selecting good
projects, the process of being determined, project scope and developing realistic estimates. Software human risk management is important, since it helps people to avoid unfortunate consequences, avoid rework, avoid overkill, and stimulate win-win situations on software projects.

There are six categories of risk available in the software risk management. They are human risk, software risk, hardware risk, cost risk, time risk and place risk. The present study focuses mainly on human risk. The human risks are classified into six levels. They are very low, low, medium, high, very high and extremely high. The human risk is considerable only if the risk is very low and low. The risk is not considerable when the risk is high, very high and extreme high.

1.7 SCOPE

In recent times several software projects are getting failed due to the inadequate work progress of the developers. Software project development is the human oriented process. So the peoples play vital role in the development process. According to some case studies only 40% of projects meet schedule, budget and quality targets. Further it is noticed that the biggest access to success are people factors and it shows a way to concentrate on the human factors. Geneca, a software development company, noted from its studies that ‘fuzzy business objectives, out-of-sync well wishers and excessive to process again means that 75% of project participants lack confidence that their projects will succeed. One Canadian study actually stated: “Bad communications between parties are the cause of Information Technology (IT) project failures in 57% of cases they studied”. Success or failure is generally based on the ability and effectiveness of the people involved in their skills to focus on the project, team dynamics and honesty to change.

Failure to engage stakeholders is a authoritative mistake. IT projects often fail due to a lack of centre of attention among group members. Sometimes nobody on the team is exclusively focused on the project and everybody retains some level of responsibility for other projects, a piece of work to be done, or jobs. More frequently, IT resources are committed to the project, but the business users and sponsors try to fit project tasks around every day jobs. Under these circumstances, IT projects always go taking place away from a racetrack, normally very quickly, and leading to the failure.
1.8 OBJECTIVES OF THE RESEARCH

The objective of the risk management technique is to bring detail information about the risk areas in the distributed software development environment and to introduce the managerial framework for those risk areas. These risk areas shows the defects which are faced by the development teams, i.e.; the human. So the risk factor is named as the human risk. The dispersed team is normally always having the defects and drawbacks. The basic problem is management of the dispersed team. This risk management involves the assignment of the risk manager, to avoid the negative feedback of the process. There are so many ways are suggested for the better completion of distributed projects with minimum risk on the developing environment.

Each risk area is first assessed by identification, analysis, prioritization and controlled by the management planning, resolution technique and monitoring process. The corresponding problem of the risk is identified, assessed and the controlled techniques are involved. The risk resolution techniques are also recommended for minimizing the risk in the mentioned risk areas.

In general the objectives of the research work are summarized as follows,

- To bring detailed information about the risk areas in the distributed software development environment.
- To introduce the managerial framework for risk areas.
- To assess each risk area by identification, analysis, prioritization and control it by the management planning, resolution technique and monitoring process.
- To introduce human resource allocation for secure project management.
- To identify the corresponding problem of the risk assessed and implement the control techniques.
- To Implement the risk modelling and analysis for human resource in secure
- To study and understand the various risks attached to human factors in project management.
➢ To implement risk recognition and risk reduction strategies in global software development.

➢ To introduce Bayesian network model for evaluating trustworthiness.

All the above specified objectives for proceeding with the research can be included with in these 3 main objectives and are

1. Analysing the problems and prospects of human risk factors.

2. Human resource allocation for secure software development.

3. Analysing risk factors for resource allocation using Bayesian networks in secure software development.