Software Risk Management Practices in Sudanese Universities

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Abstract

Software risk management is an important practice for any software project success.Risk management has been considered an important issue in software development and project management in general.Thispaper describes software risk management practices, approaches and tools used at Sudanese universities.As well as the benefits they gained from using these practices, how it can be improved, and to encourage more Sudanese universities to implement software risk management procedures in their projects. A software risk management assessment has been conducted at Khartoum state universities to study the awareness and practices are being used by using a questionnaire and personal interview.The results of this study show that there is clear need for a formal framework to guide universities in determining the risks and measure the probability and impact of the risks.

Keywords: Software risk management, Risk management planning, Risk analysis, Risk management improvement.

1. Introduction

Software development uses different technological advancements and require a deep level of knowledge, most of the tasks have potential problems associated with them and may lead tasks to failure, these problems known as risks and it must be addressed before the start of the project to prevent them from causing failure to software development which can have many negative consequences like the resources, time and money will be wasted [2].

Risk management is a process to reduce losses by identifying what risks must be addressed, continuing assessment of what could go wrong, and prepare a counter measure to address the risks with the highest priority and impact. Although most of the developers use risk management procedures in software development, many preventable failures occur and some of the reasons are insufficient in risk management practices used by the developers, unsteady risk management practices

used in the organization, poorly integration of risk management with project management, after risks are analyzed the degree of uncertainty and loss must be measurable [7][4].

Risk can also be a gain to benefit the project, to increase the occurrence of this opportunity some resources need to be allocated by defining a plan for the desired gain and also require investment and extra work to increase the possibility of occurrence for the desired gain [5].

In order to control software risks, there are three elements which are considered the heart of risk management, these elements identify the risk before its occurrence, communicate to solve the risk and accept the risks exists, resolve the risks and shift these risk into opportunity and gain[6]. Recently, there are several works in the literature have studied the software risk management [11][12][13].

The rest of the paper is organized as follows. Sections 2 and 3 show the problem and the objectives of the study. Section 4 showsthe risk management meaning in software engineering.Section 5 discusses the methodology. Section 6 presents the results and discussion. Finally, Section 6 concludes the paper and shows the opportunities for future research.

2. The Problem of the study

Risk management has been considered an important issue in software development and significant contributions to risk management have been made, but risk management is rarely applied in practice. The problem of the study concerned about the awareness in risk management and how often a software risk management is used in Sudanese universities. We try to find a recommendation on how useful practitioners consider the methods to use. In addition, how software risk management effect the software development and how software risk management can be improved in Sudanese universities.

3. Objectives of the study

This study aims to evaluate software risk management in Sudanese universities and the awareness developers have about software risk management. In addition, the details of the objectives of this study as follows:

- To study software risk management approaches in Sudanese universities, methods and tools are in practice.
- To study the effectiveness of the methods that used.
- To define and identify the benefits from applying software risk management.
- To recommend a working Risk management model to be used.

4. Risk Management in Software Engineering

Risk management means risk containment and mitigation. First, you have to know and plan. Then be ready to work when the risk occurs, relying on the experience and knowledge of the entire team to minimize the impact on the project [10]

Risk management includes the following tasks:
Identify their risks and triggers.

- Categorize and prioritize all risks.

- Develop a plan that links all risks to mitigation.
- To monitor the risk of triggers during the project.
- Implementation of mitigating measures if any risk is realized.
- Communicate the risk situation throughout the project.

5. Methodology

5.1 Case study

An intensive analysisand description of the entity (single individual or group) case study research methodology is used to study a particular individual, or a program, or event in-depth studies, it is especially suitable for learning about poorly understood situation [9]. Comparing case study methodology with other quantitative methodologies, like, experiments, surveys, histories and analysis of archival information.The case study is the preferred method when "how" and "why" questions are being posed, when there is little control over events, and focus is on contemporary events within a real life context [8].

5.2Data gathering and collecting

In this section we provide the used data in this study and how it collected. We focus on the Khartoum state universities as a case study. Khartoum state universities Develop their own software needs in-house, from websites for the universities to the fully university management system, all Khartoum state universities were chosen for this study, the population has been estimated to be 12 universities from the 12 only 1 university refusedto participate, from the 11 universities 36 respondents answered the questionnaire, the list of all universities in Khartoum state:

Table 1 Khartoum state universities

Institution	Location	Ownership
AlMughtaribeen University	Khartoum	Private
Al-Neelain University	Khartoum and other locations	Public
Elrazi University	Khartoum	Private
Future University of Sudan	Khartoum	Private
International University of Africa	Khartoum	Public
National Ribat University	Khartoum	Private
Open University of Sudan	Khartoum	Public
Sudan International University	Khartoum	Private

Sudan University of Science and Technology	Khartoum and other locations	Public
University of Khartoum	Khartoum	Public
University of Medical Sciences and Technology	Khartoum	Private
National College of Khartoum (NCK)	Khartoum	Private

5.3 Data analysis process

The data had been collected in 11 Khartoum state universities from 36 respondents working on software development in the universities.

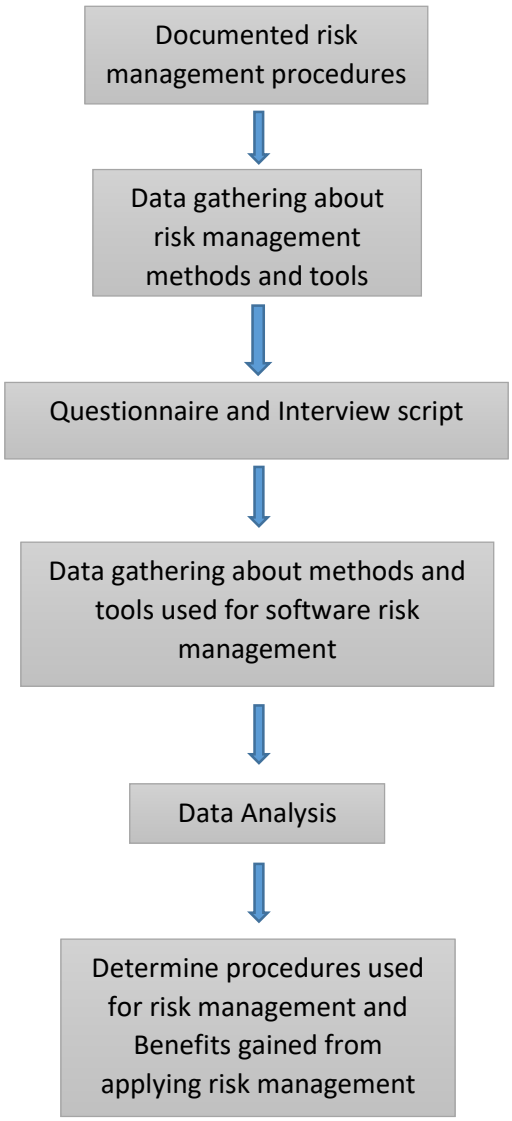

Figure 1: Data Analysis Process

6.Results and discussion

Many standards, processes, and methods are available for risk management projects, and some specific risk management standards and processes are available for risk management in software development projects [3]. In order to learn about the procedures in practice the IEEE Standard 1540 for software risk management procedures was chosen, because its well-known procedures.

6.1 Software risk management used procedures

The study first focused on the awareness of the developers about risk management practices and we found only 5 universities provide formal training for its software developers staff after interpreting and analyzing the data and most of the staff depend on them self in seeking this training by self-study or enroll in a Training Centre.The software development staff is aware of the importance of risk management practices,but most of the universities ignore these practices.

The respondents were asked if any of the applied risk management procedures contain any of the following steps?

a) Risk management planning
b) Risk management profile
c) Risk analysis
d) Risk treatment
e) Risk monitoring

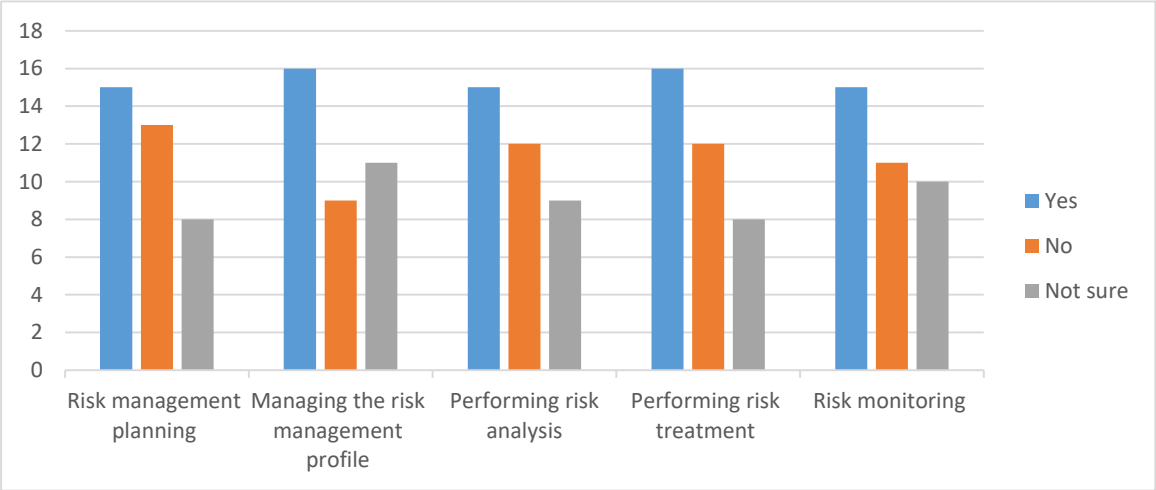

Figure 2: Risk Management Procedures

After analyzing the above figure and the data we found almost all the project have some of the software risk management procedures implemented but not all of them at the same time. These are a poorly usage for risk management procedures.

The respondentswere asked to provide a formal risk management model or framework they use, but no respondents provide answers to this question.

6.2Benefits developers gained from using risk management procedures

The project managers and developers provide the following benefits they gained from using these procedures in software projects:

- Get the project to the right track
- Have clear objectives
- Minimizing and eliminating negative risks
- Enable them to meet their budget and fulfill targeted objectives
- Identify their project's strengths, weaknesses and threats.
- Minimize the problem that may happen
- Minimize the cost which may increase
- Predict and detect failure
- Documentation and steps in building the systems
- Complete the project in best practice
- Insure the project and increase the project success rate
- Help get the project done on schedule (time)
- Reduce failures, cost and waste time.
- Determining is whether the project (software or system) is worth to implement.
- Helps to apply quality assurance in general and for project management especially.
- Avoiding fatal errors.
- Save time on problem occurs.
- Document to solve problems better.
- Assurance of software stability.
- Decrease the possibility of failures
    - Improve testing
    - Reduce cost of the project
    - Get the development tasks complete more quickly

6.3 Risk management improvement

Khartoum state universities use many of the software risk management techniques, but without a clear process or framework, although all the procedures are used, but not all in the same project, it's clear they need a defined process to guide them for better implementation of risk management procedures.

After studying the results and searching for a framework to improve the risk management practices in Khartoum state universities.We found Risk Management Process model are the best suitable one to be used, because of its clear processes and defined steps so anyone can benefit from using it. This framework lets the developers determine how to handle and plan the risk management process activities before starting to identify the risks, it focuses directly at identifies risks and prioritize the risk based on the probability and impact. And it provides continuing monitoring and controlling over the risk management to identify new risks, implementing risk response and evaluate the effectiveness of the plan.

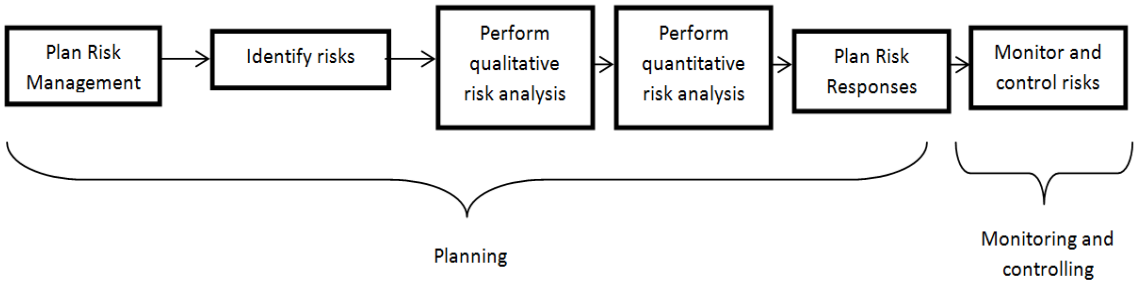

Figure 3: Risk Management Processes [1]

7.Conclusion and opportunities for future research

Software risk management is an important practice for software project success, by reducing the potential losses and increase the positive opportunities, but as we discussed before risk management is rarely applied in practice.This study aimed to see software risk management awareness, approaches and procedures at Sudanese universities.After interpreting the data we found more universities need to raise awareness of the importance of this practice and provide formal training for software development in risk management, most of the developers depend on them self for this training, and most of the time no formal software risk management is applied. Furthermore,we found most of the procedures of software risk management are implemented but not all of them in the same project, there have been always one or two procedures ignored in the development of new projects, this need to be changed by using the recommended framework in this study.

There are opportunities for new studies to include software development companies in Sudan, compare the percentile of the failed projects with the rest of the world,Compare the software risk management practices used in banks and software development companies to study the

effects of each method,Evaluate Sudan software risk management practices and success with the world records.

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