Chapter 4
A Systematic Literature Review on Risk Assessment and Mitigation Approaches in Requirement Engineering

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ABSTRACT

Risk assessment and management practice is an organized way to identify, analyze, and assess the impacts of risks and mitigate them when they arise. Risk can occur in any phase of software development and is a significant step for better supervision of threats. The purpose of this study is to identify and analyze existing risk assessment and management techniques from a historical perspective that address and study risk management and perception of risk. The chapter presents extensive summary of existing literature on various techniques and approaches related to requirements defects, defect taxonomy, its classification, and its potential impact on software development as the main contributions of this research work. The primary objective of this study was to present a systematic literature review of techniques/methods/tools for risk assessment and management. This research successfully identifies and discovers existing risk assessment and management techniques, their limitations, taxonomies, processes, and identifies possible improvements for better defect identification and prevention.

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BACKGROUND, MOTIVATION AND INTRODUCTION

The software industry is going through a revolution at a rapid pace where both business and technology domains are evolving very fast. This time-to-deliver market puts pressure on software development teams to deliver quality software well in time which establishes the need for performing rigorous risk analysis (Arshad, 2007). Studies have shown that inappropriate and misleading requirement gathering is the most expensive and are one of the fundamental drivers of project failures (Glass, 1998). As reported by (Pohl & Rupp, 2010), 60% of project venture disappointments fall into requirements engineering phase and generally aren't found until late in development life cycle or when the project has gone live (Boehm, 1981). The same facts are supported by (Lindquist, 2005) which conclude that "*poor requirements management can be attributed to 71% of software projects that fail; greater than bad technology missed deadlines, and change management issues*". Therefore, one of the significant challenges in requirements engineering is to have legible requirements, which are free from unknowns and failures. Any failures during RE phase have an adverse impact on the overall development process (Hall, Beecham & Rainer, 2002) as it acts as a roadmap for calculating schedule and cost of the system under development.

Risk assessment and management is a sub disciple of software engineering which in an organized way identifies, analyze and assess the impacts of risks and mitigate them when they arise. Risk can occur in any phase of software lifecycle due to the scope of an assortment of potential problems that can emerge in different levels of software development. To have confidence in fulfilling product roadmap and complete release based on their timeline, the risk has to be eliminated as early as possible (Rabia & Muhammad, 2013). It is one of the overlooked aspects in requirements engineering (Stern & Arias, 2011) and is generally considered as a potential problem that can negatively affect the projects. However, risk can also have a positive effect in terms of opportunities. As per guide to the Project Management Body of Knowledge (PMBOK), "*project risk is an uncertain event or condition, that, if occurs, has a positive or a negative effect on a project objective*" (2017). Conventional risk management process as exercised by a larger part of project managers tend to focus on risk by spending considerable effort on identifying and managing threats, ignoring positive side of risk (Hillson, 2002). According to (McConnell, 1997), risk management requires 5% of the aggregate project budget to get a 50– 70% possibility of staying away from time to avoid overrun. Researchers in the past have proposed a considerable amount of risk identification, analysis, and management models, for better supervision of threats (Guiling & Xiaojuan, 2011).

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