Risk Management in Software Development Projects: Systematic Review of the State of the Art Literature

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ABSTRACT

Effective risk management contributes to the success of the software development project. The goal of this work was to identify risk management gaps, perspectives, the evolution of the theme and the study trends, in software development projects, using systematic literature review as a method. For the bibliometric analysis, articles referring to the topic were selected in the period from 2010 to 2018. As tools of analysis, Citespace and VOS Viewer software were used, allowing a comparative evaluation between the articles, as well as the analysis of clusters. Beyond content analysis of articles found. Gaps were identified for performance; team involvement; attention to failures; identification of tools for decision-making; and business strategy. In turn, perspectives were determined for research trends, such as the close relationship between business strategy, risk management and new management models. The research can propose new strategies and perspectives for risk management in software development and show their importance to the academic and practical spheres, demonstrating that the themes are complementary and important in the current technological and innovation sector.

KEYWORDS

Bibliometric Analysis, Project Management, Risk Management, Software Development

1. INTRODUCTION

Risk is an event or an uncertain condition that, if it occurs, will have a positive or negative effect on at least one of the project objectives (PMI, 2017). The presence of risks throughout the project life cycle can affect the technical feasibility of cost, product market’s launch time, financial performance and strategic objectives (Loch, Solt, & Bailey, 2008). Good risk management models should be able to identify risks and monitor changes as the project progresses (Khatavkhotan, Ow, & Siew, 2015). There are a number of risk factors that affect the entire software development process (Kumar & Yadav, 2015). Thus, many software projects do not achieve the expected results due to poor management. This justifies the research on risk management in software development (Lindholm, Notander, & Höst, 2014).

Software project management has evolved and risk management is increasingly seen in industry as a tool to improve project success, but practices remain non-standard (Olechowski, Oehmen, & Seering, 2016). In this way, new approaches to risk management have emerged and new trends can be addressed, in addition to the traditional ones (Eiras et al., 2017).

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In the present day, a large number of studies are established in the area of software development methodologies, comparing similar models, as well as studies based on risk factors and their consequences in software evolution from different perspectives (Rai, Agrawal, & Khaliq, 2017). But these studies are not absolute at the point of deciding the precise risk factors and how the models succeed from these effects (Ruchi, Deepali, & Ashish, 2016). The work by John, Alex, & Konstantinos (2016) emphasizes the notion of risk assessment and the experienced management in agile methodologies, attempt to make clear the major steps and techniques involved in software risk management. The study by Edzreena, Des, & Darryl (2014) indicates about risk factors and the evolution of techniques.

Software development firms are the most risk-prone firms according to Kendrick (2003). For Hu et al. (2013), Lindholm, Notander, and Höst (2014), and Neves and Silva (2016) are more prone to a multiplicity of risks that result in changes in requirements and scope. These organizations are subject to unstable environments and frequent changes. In this scenario, the software development industry has used agile approaches to project management rather than the use of prescriptive approaches (Eiras et al., 2017). Risk management in projects is an important area from a software engineering perspective. Being associated with the logically changeable nature of software, promoting the need for new project management methodologies that are supportive of software development environments. These methodologies are designed with a single objective: to ensure the success of projects and the use of risk management practices. In addition, the consequence of using risk management processes, techniques and tools is more familiar in software development environments. Some authors believe that managing projects is managing risks (Rai, Agrawal, & Khaliq, 2017). In this way, it is evident the importance in analyzing risks in software projects. Risk management is one of the disciplines related to project management and its use becomes progressively more necessary as the size and complexity of the software grows. It is currently a necessity for companies working in this field. In this splendor, we can say that there is a need for indicators and metrics that support risk management for software in the context and belief of software project management, even when we consider organizational factors (JuhaniIlivari, 2011; Menezes & Cristine, 2013).

This study aimed to analyze the articles resulting from research focused on risk management in software development projects, in order to identify their gaps and perspectives, the evolution of the theme and the study trends, stimulating the studies of this subject. The research question is about: what are the new perspectives in risk management in the development of software projects? The methodological approach adopted was the literature review, covering bibliometrics and article analysis.

The relevance of the study is justified by other research, such as the study of the importance of well-structured risk management for organizational development (Ferreira et al., 2013). How much risk interferes with project management (Suri & Narula, 2013) and studies on how an organization that best manages its risks can develop its potentials and create value. All of these cases highlight the importance of understanding and studying organizational risks and the best way to manage them.

The article is structured in sections: 1 presents the research, its objectives and the justifications; 2 is a review of the literature on risk management and its application in software development projects; 3 presents materials and methods; 4 analysis of results; and finally, 5 presents the conclusions and direction for future research.

2. LITERATURE REVIEW

2.1. Risk Management

The activities of an organization are influenced by internal and external factors that make it uncertain whether the company will achieve its objectives. The effect that this uncertainty has on the organization’s goals is called risk (Ferreira et al., 2013). Risk management involves a set of
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