

# Risk management in software projects through Knowledge Management techniques: Cases in Brazilian Incubated Technology-Based Firms

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## Abstract

In businesses such as the software industry, which uses knowledge as a resource, activities are knowledge intensive, requiring constant adoption of new technologies and practices. Another feature of this environment is that the industry is particularly susceptible to failure; with this in mind, the objective of this research is to analyze the integration of Knowledge Management techniques into the activity of risk management as it applies to software development projects of micro and small Brazilian incubated technology-based firms. Research methods chosen were the Multiple Case Study. The main risk factor for managers and developers is that scope or goals are often unclear or misinterpreted. For risk management, firms have found that Knowledge Management techniques of conversion “combination” would be the most applicable for use; however, those most commonly used refer to the conversion mode as “internalization.”

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## 1. Introduction

Software projects are high-risk activities yielding variable performance results (Charette, 2005). For Bannerman (2008), software projects are complex endeavors in any context and are particularly susceptible to failure. Corroborating these statements, Rodriguez-Repiso et al. (2007) considers that the information technology (IT) project management is a challenge even when the measures necessary for its success are known and understood.

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Despite the improvements already achieved, many software development projects still use more resources than planned, take longer to complete and provide less quality and functionality than expected (Barros et al., 2004). But why do software projects fail so often? For Charette (2005), among some of the most common factors are: unrealistic goals; inaccurate estimates of necessary resources; system requirements badly defined; poor presentation of the project status; and risks not managed.

According to Dey et al. (2007), although some managers claim that they manage risks in their projects, there is evidence that they do not manage them systematically. The high failure rates associated with projects of information systems suggests that organizations need to improve not only their ability to identify, but also to manage the risks associated with these projects (Jiang et al., 2001). Neef (2005) complements saying that an organization cannot effectively manage its risks if it does not manage its

knowledge. For Cooper (2003), one of the most powerful tools in managing risk in projects is knowledge.

Such statements provide a useful link between risk management and knowledge management. Thus, it is intended to answer the following research question: How Knowledge Management techniques contribute to risk management in software development projects?

Based on the research question, this article aims at analyzing the integration of Knowledge Management techniques to the activity of Risk Management in software development projects of micro and small Brazilian Incubated Technology-Based Firms (ITBF). It has as specific aims: (1) To analyze the main risk factors in software development projects of ITBF; and (2) To assess the techniques of Knowledge Management (KM) as used by the ITBF in the management of the risk factors of software development projects.

Justifications for research development make reference to the following statements:

- Relevance of the theme: After performing a review of risks in the software development process, Bannerman (2008) concluded that there is a need for better Risk Management, both in research and in practice. According to Wallace et al. (2004), “Unfortunately, despite these recommendations, there are relatively few tools available to help project managers to identify and categorize risk factors in order to develop effective strategies.”
- Relevance of the objects of study: The objects of study are software developers and managers of micro and small ITBF. Dahlstrand (2007) defines a technology-based firm as one that depends upon technology for its growth and survival; not necessarily meaning that the technology must be new or innovative. For Radas and Bozic (2009), small and medium-sized firms are considered the engines of economic growth, as well as job creation; and because of this importance, developed and developing countries are interested in learning ways these firms carry out innovations. The Serviço Brasileiro de Apoio às Micros e Pequenas Empresas—SEBRAE (2010) reports the, micro and small firms responded, in 2010, by 99% of the total formal firms number, by 51.6% of private no-agricultural formal employments and for almost 40% of the salary mass. According to the similar survey, carried on in 2005, the lifting of closing rate of Brazilian firms, carried on in the first quarter of 2004, showed that 49.9% of the firms closed their activities after two years of existence, 56.4% after three years and 59.9% after four years. Opposed to this aspect, the 2006 Panorama report by Associação Nacional de Entidades promotoras de Empreendimentos de Tecnologias Avançadas - ANPROTEC (2006a, 2006b) showed a closing rate of incubated firms of 20%. In five years, the movement of the incubators grew by over 300%, being 70% of the generated business by technological-based firms. This information underlines the importance of incubators related to the survival rate of micro and small firms, the importance of ITBF for the economical growth and the development of surveys in this area.

Fig. 1 shows a diagnosis result performed by Product Development Center of Technology-Based Incubator of Itajubá (INCIT) in eight ITBF software projects in 2008 and 2009. The results showed that the projects major part is carried out without the use of a formal methodology, this one being the main activity expected by the managers for the processes improvement (100%). Other expected activities were the lessons learned structure (75%) and the projects risks analysis (63%), both of them as a way to avoid working again and keeping up knowledge.

- Most importantly, the academic contribution: Gaps in literature regarding theoretical and practical research on risk management (Bannerman, 2008), related to project management applied to small firms (Murphy and Ledwith, 2007; White and Fortune, 2002); and Knowledge Management in the context of Risk Management approaches (as can be seen in Section 2.2).

The paper is structured as follows. Section 1 presents the research, its objectives and contributions; Section 2 states the theoretical foundation of Risk Management applied to software development projects, approaches that address the theme of Risk Management in software development, knowledge sharing and transference and Knowledge Management techniques; Section 3 defines the classification of the research and the planning of the case study; Section 4 presents the form of data collection; Section 5 analyzes the result; and finally, Section 6 presents discussion, conclusion and direction for future research.

## 2. Literature review

### 2.1. Risk Management in software development projects

For Wallace et al. (2004), risks in software projects consists of a number of factors or conditions that may represent a serious threat to the successful completion of the project. They imply quantifying the importance of such risks, assessing their frequency and their potential impact on project performance; as well as in the development of strategies of control (Huang and Han, 2008). There are important studies relating to the various risks of software development projects, and the foci of some of this research are:

- Mitigation of risks in software projects using methods of decision aid as the Analytic Network Process—ANP (Krishna Mohan et al., 2010).
- Identification of risk factors (Bannerman, 2008; Costa et al., 2007; Han and Huang, 2007; Nakatsu and Iacovou, 2009).
- Structuring the framework for risk management (Dey et al., 2007) and how specific conditions impact risk perception and the decision to continue the projects (Du et al., 2007).
- Use of a risk checklist (Keil et al., 2008), a record of software projects that were canceled, and the delivery results of those that have not been canceled (Emam and Koru, 2008).

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