

Software Development Project Risk: A Second Order Factor Model Validated in the Indian Context

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ABSTRACT

Software development risk points to an aspect of a development task, process or environment which, if ignored, tends to adversely affect the project performance. Observations from literature show that while many studies on software project risk construct have been done in developed countries, there is scarcity of literature from Asian countries, especially India. Hence, this research was formulated with an objective of studying software development project risk in the Indian context. Data related to the presence of risk items was collected from 527 software development projects in India. This data was factor analyzed to identify five major risk dimensions namely Team risk, Project planning and Execution Risk, External risk, User risk and Project complexity risk. The resulting factor structure was validated through Confirmatory Factor Analysis. Software project risk was seen to be best represented by a second order factor model with five first order factors.

Keywords: Exploratory Factor Analysis, India, Risk, Software Development, Software Project, Structural Equation Modeling

INTRODUCTION

All the software development organizations across the globe face the challenge of successful completion of the projects. In spite of the huge advances in development techniques, tools, and software technologies, most software development projects still use more resources than planned, take more time to be concluded, provide less functionality and quality than

expected. There have been frequent reports of high profile cases of mismanaged software development projects. The Standish Group's 2006 'CHAOS' study update shows that only 35% of IT projects started in 2006 were categorized as successful, 19% were judged to be outright failures, and the remaining 46% were challenged, meaning they had cost or time overruns or didn't fully meet the user's needs (Rubinstein, 2007). Gordon (1999) found that, on the average, a company will complete only

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37% of its major IS projects on time and only 42% will be completed within budget.

To minimize these problems, it is frequently recommended that the risk associated with a software project be managed. A task that is critical to the proper management of software development risk is the assessment of the risks facing the project (Charette, 1996). A software project risk points to an aspect of a development task, process or environment, which if ignored will adversely affect the success of the software project (Barki, Rivard, & Talbot, 1993; Boehm, 1991; Lyytinen, Mathiassen, & Ropponen, 1993; Lyytinen, Mathiassen, & Ropponen, 1998; McFarlan, 1981). Various research studies have identified risk factors affecting software development. There are case studies, action research, surveys and theoretical work on this topic. But most of these studies address software risk in developed countries and have come out with generalized conclusions. This has been acknowledged as a major limitation of the research on software development risk (Ropponen & Lyytinen, 1997; Schmidt, Lyytinen, Keil, & Cule, 1996). There has been little research documenting Asian perceptions of software project risk (Shan, Jinlong, Keil, & Chen, 2009). The validity of the findings and theories on software project risk needs to be tested in different environments in order to assess their universal applicability. Hence we have decided to undertake a comprehensive risk research in India, a country that has become the software development hub of the world.

Growth and development of Indian software industry has caught the attention of the world market so much so that India is now being identified with software development. There is a substantial increase in software development outsourcing from the developed world to firms in India. The Indian IT industry has achieved an iconic status in Indian economy. Today software development in the country is a nearly \$50 billion strong industry employing over 1.5 million people. The industry has registered a growth rate of around 40% per annum over the last 6 years.

The rest of this paper is organized as below. First, we present a brief review literature highlighting the output of similar studies and detailing the motivation for the current research. Then, the methodology used for the current research is detailed. After, we present the underlying factor structure of the risk construct based on the Exploratory Factor Analysis. Next, the measurement model for risk is tested for conformity with Structural Equation Modeling. Finally, we summarize the implications of the research for theory and practice.

REVIEW OF LITERATURE

Risk is described as an event that may or may not occur, coupled with a consequence that follows if it occurs (Dedolph, 2003). Project risk is a problem that has not yet occurred but which could cause loss to the project if it did (Wieggers, 1998). Software development project risk points to an aspect of a development task, process or environment, which if ignored tends to increase the likelihood of software project failure (Lyytinen et al., 1993). The risk factors may be technical, economic or behavioral in nature (Barki et al., 1993; Lyytinen, 1988). Such incidents pose danger to the development of a successful project leading to inadequate software operations, software re-work, implementation difficulty, delay or uncertainty (Boehm, 1991).

One of the most common methods for identifying the presence of risk factors has been the use of checklists. These checklists present a list of all potential risks that might be applicable in a software development project.

One of the pioneering studies in this regard is the top 10 risk list of Boehm (1991). His list has been compiled by probing several large software projects and their common risks. The list is also well-known and has been widely applied in practice to orchestrate risk management plans (Ropponen & Lyytinen, 1997). Barki et al. (1993) tried to produce a more comprehensive list of risk factors based on the data collected from 120 ongoing projects

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