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CRITICAL RISK FACTORS IN VIRTUAL SOFTWARE PROJECTS

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Abstract
Virtual software development project teams are required more today primarily due to increased usage of outsourcing and offshoring with future predictions indicating a continued increase in usage. Many other driving factors such as reduced business travel due to security concerns, telecommunications improvements and improvements in collaboration tools have affected the dependence on virtual project teams. Risk management is attracting more attention in technology due to the field of project management and the continued incidence of software project failures. Little or no research has been conducted on the intersection of these three areas; virtual projects, project risk and project failure, being labeled as Virtual Software Project Risk. The goal of this research is to identify the critical risks in virtual software development projects. This research will contribute to industry through improvements in risk management strategies that can reduce or eliminate project failures. Fewer failures will provide benefits to corporations in cost savings and improved products and services.

Keywords
Risk, virtual teams, software development, project management

Statement of problem and research question
Offshoring, outsourcing, improved online communication packages, and reduced business travel due to security concerns are all increasing the occurrence of virtual software projects. However, much of the research identifying critical risks in the software development process was completed ten or twelve years ago and centers on traditional, rather than virtual, projects. The research question for this study is: Which risks are critical to the successful completion of virtual software projects? The main objective of this study is to identify a set of comprehensive yet concise critical risk factors for virtual software projects, by conducting a survey of industry practitioners. The resulting list of critical factors will provide guidance to project managers when managing risks in a virtual team environment. The importance of this study lies in its ability to enable virtual software project managers to avoid major risks and achieve greater rates of project success.
Literature review

Researchers have identified the important risks in traditional, but not virtual, software projects. The risk factors that have been identified are, however, not consistently and concisely named across studies. Thus, a charting technique was used to create a comparative framework of the prior research. In addition, results of focus group and pilot interviews with practicing project managers and analysts were also added into this framework. The resulting chart contained data grouped into the following eight general categories:

- Resources
- Technology
- Environment
- Requirements
- Planning & Control
- End-user
- Quality
- Communication

The first column of the chart contains data identified in a focus group session. The second column contains data from the research by Boehm, who conducted a survey of experienced IT project managers who worked with him at TRW in the early 1990’s. The result was his “top ten software risk items” (Boehm, 1991). The third column contains data from research by Barki et al. (1993) who sent their 144 item questionnaire to the largest 100 companies across a variety of industries in Quebec and surveyed 120 software development projects. The result was a list of software project risks grouped in five risk categories: technological newness, application size, lack of expertise, application complexity and organizational environment (Barki et al., 1993). The fourth column contains data from the research by Keil et al. (1998) who conducted a Delphi study of 41 experienced software project managers in different parts of the world (Keil et al., 1998). The result was a “somewhat” universal list of risks. The last column contains data from the research by Wallace (1999) who conducted interviews with software project managers to identify risks and used mass distribution of a survey to the Project Management Institute Information Systems Special Interest Group (ISSIG). The result was six risk categories/dimensions: team, organizational environment, requirements, planning and control, user, and project complexity. (Wallace, 1999) The purpose of most of these studies was to improve risk management on traditional software development projects by identifying the top risk factors to help with risk analysis and risk management. The primary limitations of these studies center on small or vary narrow samples, and selection of risk factors either exclusively from prior literature or from practitioners, but not both. This study seeks to remedy these limitations and also move the focus away from traditional software development and onto virtual software development.
Research methodology

The research methodology steps are detailed below. Steps 1 through 6 have been completed and step 7 is in progress.

1. Review of prior literature on risk management, virtual projects and project failures
2. Identification of project risk factors from the literature
3. Creation of a survey instrument, a questionnaire for use in interviews
4. Face to face interviews to validate the risk factors from literature
5. Focus Group to validate the risk factors from literature and interviews
6. Creation of a comprehensive list of risk factors to be included in the survey instrument
7. Pilot and modification of the survey instrument
8. Mass distribution of the online questionnaire
9. Collection and analysis of data

Theory development and hypotheses

The hypotheses are based heavily in the literature, combined with knowledge that is axiomatic in the Information Systems field.

H1: Issues in the Environment category dealing with conflict will score higher than other types of Environment risk factors on virtual software projects. Reasoning: Beise (2004) suggests globalization of project teams has changed the demographic and cultural diversity of teams (Beise, 2004). Majchrzak et al. (2004) proposes there are differences on virtual teams, such as different styles of working, different approaches to solving problems and differences in language based on the resources’ discipline, i.e. an accountant versus a programmer (Majchrzak et al., 2004; Melymuka, 2001). Differences are more likely when teams are physically distributed across the country or the world. Hence, it is reasonable to expect difficulties coordinating a diverse group of team members at a variety of locations.

H2: The Communication category as a whole will score among the top three categories. Reasoning: Wallace et al.(2004) indicated a significantly higher level of team risk, as well as planning and control risk(Wallace et al., 2004). Virtual software projects are likely to incur the same challenges as outsourced projects since they usually involve multiple sites of the same or different organizations. Wallace theorized this might be due to greater challenges in team communication and coordination, especially when at least two organizations were involved (Wallace et al., 2004).

H3: The Planning and Control risk category, which includes project management, will score among the top three categories for virtual software projects. Reasoning: Melymuka (2001) indicates IT global projects are “loaded with new opportunities for failure” that even veteran project managers may find difficult to coordinate (Melymuka, 2001). Wallace and Keil (2004) concluded project execution risk, including project planning and control, was likely more important than any other type of risk in influencing project outcome(Wallace & Keil, 2004).
H4: Experienced project managers will identify different critical risks than project managers with little experience.  
Reasoning: It is axiomatic that with experience generally comes the ability to better recognize and handle risks.

H5: Large projects will experience more risk factors in the Communication category, especially, more communication and coordination risks than other types of risks. Furthermore, an increase in project coordination risk is directly related to an increase in team member locations on virtual software projects. Reasoning: 
Capers Jones (1995) noted the failure and/or cancellation rate of large traditional software projects was high, at over twenty percent (Jones, 1995). It is common knowledge in the IT community that large projects are generally more risky. Therefore, we can deduce the set of identified critical risk factors will vary by project size, as measured by attributes such as duration, cost, number of resources and/or number of resource locations.

H6: Projects with teams having less experience with the technology and/or the application will score higher on Resource risk than projects run by an experienced team. Reasoning: It is axiomatic that with experience generally comes the ability to better recognize and handle risks.

H7: Project team structure has an impact on which risks are critical. A pure project structure where team members report to the project manager will have fewer communication risks while a matrix project structure where team members report to a line manager will have more communication and conflict risks. Reasoning: In a pure project type of structure the project manager usually has line authority over the project. Strong communication channels develop since team members report to one person (Kerzner, 2003). In a matrix type of structure “conflicts and their resolution may be a continuous process, especially if priorities change continuously” (Kerzner, 2003).

H8: Risk management processes are more likely to be used on virtual software development projects. Reasoning: Lack of face-to-face communication on virtual teams requires more planning and control which usually comes in the form of a project manager. When a project manager leads a project it is reasonable to expect risk management to be included in the project management practices and procedures.

Preliminary findings
The preliminary findings are a result of data obtained in the face-to-face interviews and the focus group. These findings show two categories were identified by all the literature and the focus group; Resources and Technology. Four categories were identified by the focus group and two of the literature sources; Environment, Requirements and End-User. One category was identified by the focus group and two of the literature sources; Planning & Control. Two categories were identified by the focus group and only one of the literature sources; Quality and Communication. Risks in every category were identified by the focus group. One risk factor identified by the focus group and not mentioned in prior literature was poor quality project management. This factor may not have been identified in prior studies since they typically surveyed the project managers themselves.

References


Wallace, L. (1999). The development of an instrument to measure software project risk. Georgia State University College of Business Administration, Atlanta, GA.
