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Countering user risk in information system development projects

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ABSTRACT

User related issues have long been broadly discussed in the information system development (ISD) project research area. In this study, we focus on user risk and identify two risk countering approaches to demonstrate how to deal with user risk and its negative impact on ISD projects. We hypothesize that (1) user risk has a negative impact on project performance, (2) users' bond with the project and the development team can help reduce user risk, and (3) developers' task knowledge and vertical coordination can ease the negative impact of user risk and increase project performance. A quantitative approach with survey data collected from 240 practitioners confirmed our hypotheses. In addition, we interviewed seven developers and three user representatives to complete our understanding of this issue. Implications for academia and practitioners are discussed at the end of this paper. Suggestions for future research directions are also provided.

1. Introduction

User related issues have long been discussed by different research streams in the information system development (ISD) project research area. For example, user participation research indicates that users should participate in the ISD process to prevent the developed system from deviating from users' actual needs (He & King, 2008; Ives & Olson, 1984). Control based studies have pointed out that users can serve as controllers to ensure the performance of the project and the quality of the developed system (Kirsch, Sambamurthy, Ko, & Purvis, 2002). By jointly reviewing the developed system, the impact of uncertainty can be eased (Hsu, Chan, Liu, & Chen, 2008). Agile software development research, which is growing in popularity and importance in practical and academic circles, emphasizes the importance of individuals, interactions, and user collaboration in software projects (Lee & Xia, 2010). Thus, users not only play an important role but also cannot be absent from the process of software development (Misra, Kumar, & Kumar, 2009; Rumpe & Schröder, 2002). Moreover, previous studies (e.g., Lin & Shao, 2000; Wagner & Piccoli, 2007) concluded that granting users the right to engage not only increases the quality of requirements determination but also raises the users' level of commitment and acceptance. However, it is noticeable that conclusions made by these studies rely on one basic assumption: users are willing to cooperate when needed. In fact, a lack of user support is often cited as one risk factor which amplifies the variation during the development process (Addison, 2003; Wallace, Keil, & Rai, 2004a, 2004b). Thus, in this paper, user risk reflects an unwillingness to cooperate, resistance to change, lack of commitment to the project, conflict between users, and negative attitudes toward the project. Various reasons may induce users not to cooperate with developers during the development process. Uncooperative users may even resist changes brought by the new system (Chatzoglou & Diamantidis, 2009; Kim & Kankanhalli, 2009; Lapointe & Rivard, 2005). Consequently, insufficient support from users makes project planning and control difficult and reduces the probability that the project goal can be achieved effectively and efficiently (Wallace et al., 2004a, 2004b). This suggests the need to consider user-related risks seriously and explore potential approaches to counter them. Therefore, this study aims to explore the means by which user risk and its negative impact on project performance can be eased.

To answer this question, we proposed a model to demonstrate how different approaches can be used to counter user risk through incorporating the reduction and coping concept in uncertainty and risk management literature (Field, Ritzman, Safizadeh, & Downing, 2006; Hsu, Lin, Cheng, & Linden, 2012). While risk reduction refers to ways to bring down the level of risk directly so as to minimize its impact on performance, risk coping refers to attempts to reduce the negative effects of risk without addressing the risk directly. In this study, we proposed that, *first*, users' bonds with

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the project and the development team can help reduce the level of risk. Users are more willing to engage in the development process when they are bonded with the project strongly. *Second*, we proposed the moderating role of developers' business knowledge and vertical coordination on the relationship between user risk and project performance. The concept of vertical coordination can serve as actions undertaken through project managers, functional managers, or even higher level steering committees. The moderating effects highlight the important concept that the negative impact of user risk on project performance can be suppressed when these two conditions exist. Furthermore, in order to complete our understanding of this issue, we adopted a two-phase approach. In the first phase, we adopted survey data to quantitatively test the relationship between user risk and project performance, the effects of users' bonds with the project and the development team on user risk, and the impacts of vertical coordination and developers' task knowledge on project performance. In the second phase, we used qualitative data from interviews with user representatives and project developers to have further insights.

By determining how user risk and its negative impact on project performance can be reduced, this study contributes to information system development research by highlighting the ways to strengthen users' bond with developers and project teams to ensure that user risk and its negative impact can be eased. The remainder of the paper proceeds as follows. We first review the impact of user risk on project performance and develop the concept of the users' bond with the project and the development team. Based on risk reduction and coping concepts, we then hypothesize approaches to reduce user risk and mitigate its negative impact on project performance. In Section 3, methods to collect required data to examine our hypotheses are introduced. Section 4 presents the data analysis result and discussion, accordingly. Lastly, conclusions are made and suggestions are provided.

2. Literature review and hypotheses development

2.1. User risk and project performance

Wallace et al. (2004a, 2004b) defined software project risk as *a set of factors or conditions that can pose a serious threat to the successful completion of a software project* and identified six risk factors, including team risk, organizational environment risk, requirements risk, planning and control risk, user risk, and complexity risk. Furthermore, Alhawari, Karadsheh, Nehari Talet, and Mansour (2012) noted that risk is a barrier to success and may lead to a negative impact on the project goal. To avoid project failure, managers should identify and control those risk factors which may lead to cost and schedule overruns, unmet user requirements, and the inability to deliver business value. Among those identified risk factors, user risk drew our attention. User risk reflects an unwillingness to cooperate, resistance to change, lack of commitment to the project, conflict between users, and negative attitudes toward the project. User risk is a critical problem because users should be involved in the ISD process. For example, from knowledge integration perspective, Grant (1996) pointed out that knowledge resides within the individuals in an organization and certain integration is needed to generate effective cross-domain solution. In ISD, since developers have technical knowledge for carrying out the final system and users possess business knowledge to guide the direction of development, effective knowledge integration is needed for effective system development (Mitchell, 2006). However, boundaries between users and developers may limit the effectiveness of knowledge integration between these two parties (Carlile, 2002, 2004). Empirical studies indicated that user risk may lead to lower system quality (Barki, Rivard, & Talbot, 2001; Choe, 1998; Hunton & Price, 1997; Hwang & Thorn, 1999), and unwillingness to use the system (Baroudi, Olson, & Ives, 1986; Choe, 1996, 1998; Gallivan & Keil, 2003; Guimaraes & Igbaria, 1997; Kim & Lee, 1986; Mak, Schmitt, & Lyytinen, 1997). Wallace et al. (2004a, 2004b) further argued that, as a component of social subsystem risk, user risk leads to technical subsystem risk. Through technical subsystem risk and project management risk, the final process and product performance are undermined. On the other hand, the agile software development approach is getting popular recently. It is noticeable that users cannot be excluded from the development process, given the nature of some agile approaches (Misra et al., 2009). Specifically, users need to collaborate with developers intensively during the development process to verify the developed function for every short period. If cooperative support from users is lacking, the agile approach must not be adopted or the outcome is doomed to fail. Therefore, project managers should minimize user risk so as to reduce the variation during the ISD process, which then leads to better project outcomes.

Project management literature has classified project outcomes into two types: product and process (Nidumolu, 1996; Wallace & Keil, 2004). Product performance is defined as the extent to which the designed system contains adequate design or can reflect users' needs (Wallace et al., 2004a, 2004b). To have high product performance, the project team should possess mature analyzing knowledge and methodological tools to capture users' actual requirements (Faraj & Sproull, 2000; Nidumolu, 1995). However, in addition to the availability of required analyzing knowledge and methodological tools, users play an important role in helping clarifying the actual requirements. They should engage in the early stages to verify the design or join the review meeting in the later stages to ensure that the quality of the developed system can really meet their needs (Hsu, Lin, Zheng, & Hung, 2012). One of the most direct consequences of lack of support from users is that actual user requirements are difficult to obtain and, therefore, the developed system cannot support the operational needs of business.

H1a. User risk is negatively associated with product performance.

The lack of user support may also lead to low quality process performance. Process performance refers to the extent to which a project team achieves predefined project goals within budget and on schedule (Schwalbe, 2002). Many projects cannot adhere to predefined schedules or budgets because development teams are unable to determine the actual requirements or fail to identify serious fatal designs in the early stages. It is not uncommon that a flawed and inappropriate system is first presented to users in the late stages of system development. The cost for reworking flaws found in the later stages is much higher than for those found in the early stages (Boehm & Turner, 2003). The most direct consequence is a delayed schedule or budget overrun. Therefore, flaws should be identified and corrected as early as possible. Users should serve as a control tool to monitor system development and identify potential flaws from the business perspective (Kirsch et al., 2002). The project is, therefore, able to adhere to the predefined schedule and budget. Therefore, we hypothesize that:

H1b. User risk is negatively associated with process performance.

Although user risk may cause variation in the development process and undermine final performance, it is not totally uncontrollable. In this study, we propose that the impact of user risk on project outcomes can be managed through two ways: reducing the level of risk (reduction) and mitigating its impact on performance (coping). These two concepts were proposed by Field et al. (2006) to address the mitigation of the negative impacts resulted from operational uncertainty in service area. They argued that uncertainty-countering approaches should be classified into reduction and coping two types. *Reduction* refers to ways to bring down the level of uncertainty directly so as to minimize its impact