International Journal of Information Management 35 (2015) 80–97

Contents lists available at ScienceDirect

International Journal of Information Management

journal homepage: www.elsevier.com/locate/ijinfomgt

How environment risks moderate the effect of control on performance in information technology projects: Perspectives of project managers and user liaisons

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ARTICLE INFO

Article history:
Available online 5 November 2014

Keywords:
Information technology
Formal and informal control
Stakeholder
Environment risk
Project management

ABSTRACT

Successful management of information technology (IT) projects is a primary concern of project managers (PMs) and user liaisons (ULs). Prior studies have indicated that high risks result in low performance in IT projects, whereas effective enforcement of formal and informal controls enhances performance. These two streams have been integrated by examining the interactions between environment risks and control. However, contradictory findings have been presented given that environment risks can positively or negatively moderate the effect of control on performance. Furthermore, the collective effects of environment risks and controls across different stakeholders remain unknown. Quantitative analysis of data from 128 completed IT projects in China indicates that internal environment risk negatively moderates the effect of formal and informal controls on the product performance of IT projects from the perspectives of PMs and ULs. By contrast, external environment risk positively moderates the effectiveness of controls, thereby indicating the significant and diverse moderating roles of various environment risks in the relationship of control and performance. Environment risks can be threats to or facilitators of the success of IT projects. In addition, external environment risk moderates the effect of formal control on product performance for ULs more than internal environment risk, whereas the moderating effect of internal environment risk for PMs is stronger than that of external environment risk. This finding provides additional evidence that the moderating effects of internal and external environment risks differ among various stakeholders.

1. Introduction

The primary concern of project managers (PMs) and user liaisons (ULs) is the successful management of information technology (IT) projects. According to the 2011 CHAOS report, only 37% of IT projects were delivered on time, within budget, and with the required functions and qualities during that year, which represents a mere 2% increase from 2009 (Curtis, 2012). This unsatisfactory performance, especially on quality and function parameters, is often attributed to the failure to exercise controls or manage risks (Henderson & Lee, 1992; Wallace, Keil, & Rai, 2004a).

Prior research has shown that a high level of risk directly or indirectly results in low IT project performance (Han & Huang, 2007; Wallace, Keil, & Rai, 2004b), whereas the effective enforcement of formal control (i.e., a mechanism that relies on process and outcome evaluation) and informal control (i.e., a mechanism that relies on social and self-regulating strategies) enhances IT project performance (Gopal & Gosain, 2010; Ji, Kumar, Mookerjee, Sethi, & Yeh, 2011). Researchers have combined these two streams and have argued that risks, particularly environment risks, interact with control to affect performance (Harris, Collins, & Hevner, 2009; Verano-Tacoronte & Melián-González, 2008). However, existing studies have exhibited at least two gaps.

First, previous arguments and findings on the joint effect of environment risks and control are contradictory. For example, Dermer (1974) empirically finds a weak effect of self-control (a form of informal control) on performance, given high environment risks (i.e., environmental uncertainty). Keil, Rai, and Liu (2013) further propose a conceptual model, in which risks negatively moderate the relationship of formal and informal controls with performance. They argue that nearly all types of risks, including

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http://dx.doi.org/10.1016/j.ijinfomgt.2014.10.003
0268-4012/

environment risks, manifest this moderating effect. These findings present empirical support and have an intuitive appeal. However, other researchers have argued that the effect of control on performance intensifies when environment risks are high (Jaworski, 1988; Rustagi, 2004). Harris et al. (2009) confirm this result, which contradicts the findings of Dermer (1974). Rustagi (2004) similarly demonstrates the increased effect of formal client control on the success of information systems (IS) outsourcing with high environmental uncertainty, which is a type of environment risk. However, empirical results have failed to support the hypothesis. Therefore, whether environment risks positively or negatively moderate the effect of control on the performance of IT projects requires further examination. Understanding this issue is critical for managers because such an understanding may enable them to apply appropriate controls over a project and to minimize investing unnecessary resources in an uncertain environment. Furthermore, the literature in this area has yet to distinguish explicitly the types of environment risks. Risks inside and outside the organization may pose varying moderating effects on the relationship between control and performance. Therefore, the present study categorizes environment risks into two types, namely, internal environment risk (i.e., uncertainty surrounding the organization in which an IT project takes place) and external environment risk (i.e., uncertainty about competitors, customers, and business partners outside the organization in which an IT project is developed) based on prior literature (Keil, Cule, Lyytinen, & Schmidt, 1998; Wallace et al., 2004a). In this study, we examine how internal and external environment risks moderate the effect of control on the performance of IT projects.

Second, investigations on the interactive effect of environment risks and control on the performance of IT projects lack insights from key stakeholders (e.g., PMs). In the control literature, PMs and ULs can act as controllers in IT projects (Gopal & Gosain, 2010; Henderson & Lee, 1992; Kirsch, Sambamurthy, Ko, & Purvis, 2002). The differences in the roles and responsibilities, as well as the business and technological knowledge, of PMs and ULs result in varying perceptions on environment risks in IT projects (Keil, Tiwana, & Bush, 2002; Tiwana & Keil, 2007). However, studies that integrate these two areas have focused heavily on the perspective of ULs or clients (Keil, Rai, et al., 2013; Rustagi, 2004) and ignored PMs. Thus, whether internal and external environment risks moderate the relationship between control and performance from the perspective of PMs remains unknown. The investigation of this perspective is essential because PMs manage the development of IT projects and considerably influence the outcome of the project. In addition, little evidence is available on the differential moderating effects between internal and external environment risks for these two stakeholders. Understanding this issue can help managers avoid potential conflicts between PMs and ULs and foster their collective controls in an uncertain environment.

This study focuses on the moderating role of environment risks because environment risks can significantly influence the value of the ultimate system and the resources that should be put into the project (Liu, Zhang, Keil, & Chen, 2010). One environment risk factor (i.e., lack of top management commitment) is regarded as the first important risk factor from the perspectives of different stakeholders (Liu et al., 2010; Schmidt, Lyytinen, Keil, & Cule, 2001). By contrast, other risks (e.g., user and requirement risks) are perceived to be less significant than environment risks. Moreover, some risks (e.g., user risk) are not the primary concern of the key stakeholders (e.g., ULs), who focus on the importance of certain risks associated with project management capabilities and skills (Keil et al., 2002). In addition, the interactive effects of certain risks (e.g., user and requirement risk) and controls have been examined in previous research (e.g., Keil, Rai, et al., 2013), and the findings are consistent. Given the relative importance and attention received by different stakeholders, environment risks are examined in the current research. This study also focuses on the perspectives of PMs and ULs because the two important stakeholders in IT projects are frequently examined in the literature. The PM is the individual responsible for the day-to-day management of projects from an IT perspective (Kirsch, 1997), whereas the UL is the individual in charge of overseeing IT projects to ensure the delivery of the business value (Kirsch et al., 2002). The input from PMs and ULs can directly influence the success of the project (Keil, Rai, et al., 2013; Nidumolu, 1995). However, the PMs and ULs have different perceptions on risks. Failure to examine the two perspectives can raise significant practical issues because they may employ different control strategies in the presence of environment risks and impose unnecessary costs. Thus, we aim to address the following research questions:

(1) How do internal and external environment risks change the relationship between formal and informal controls and the performance of IT projects from the perspectives of PMs and ULs?
(2) How do the moderating effects of internal and external environment risks differ for PMs and ULs?

The rest of the paper is structured as follows. First, a relevant theory is introduced and the literature is reviewed. Second, the research model and hypotheses are developed. Third, the methodology is described, and each hypothesis is empirically tested through hierarchical regression analysis based on the data from 128 IT projects. Finally, the results of analysis are presented and the implications of our findings are discussed.

2. Theoretical background

2.1. Control theory and mechanisms

This study regards control as a behavioral attempt to ensure that individuals involved in organizational IT projects act according to agreed-upon strategies to realize desired goals (Kirsch, 1997; Kirsch et al., 2002). Prior studies have presented two forms of control, namely, formal and informal. In formal control, the behavior of the controlee is influenced by the evaluations on the process and outcome as well as the corresponding rewards. In informal control, social strategies and self-management between the controller and controlee are employed to achieve common goals (Choudhury & Sabherwal, 2003). We conceptualize the UL as the controller and the project development team as the controlee in accordance with prior studies (Keil, Rai, et al., 2013; Kirsch et al., 2002). ULs often cooperate with PMs to exercise control because PMs are responsible for managing the development team and provide considerable guidance for ULs (Kirsch, 1997). The project management skills and technological knowledge provided by PMs are also valuable resources of which ULs should take advantage. PMs often interact with ULs (the controller) and the development team (the controlee) throughout the course of the project to obtain a comprehensive understanding of the control process. PMs may also develop a close working relationship with ULs, which enable the latter to influence the actions of the development team (Kirsch et al., 2002).

Behavior and outcome controls constitute formal control. Behavior control is the mechanism employed by controllers to evaluate the performance of the controlee based on the adherence of the latter to the prescribed steps and procedures (Eisenhardt, 1985; Kirsch et al., 2002). Outcome control is the mechanism that controllers use to evaluate the performance of the controlee based on the extent to which output targets are realized. These targets are also defined initially and controlees are permitted to determine their approach to fulfill them (Henderson & Lee, 1992; Kirsch et al., 2002). Meanwhile, clan and self-controls constitute